



Thinking Schools: Educating Students in the Cognitive Age

**We no longer live in the information age. We are in the
*COGNITIVE AGE.***

David Brooks May, 2008 N.Y. Times

**Neuroscientists tell us that the brain organizes information in
networks and *MAPS.***

Pat Wolfe

The Challenge:

*How do you develop a
Thinking School?*

Thinking Maps®

as dynamic visual patterns
based on fundamental cognitive processes
as the medium for thinking and communication

for Thinking Schools

where information is transformed into knowledge
problems into solutions
ideas into action

to improve

Student Learning

Art Costa has proposed that schools become “a home for the mind for all who dwell there.” How, then, does the use of Thinking Maps advance this idea and secure the involvement of all members of the school community in this pursuit?

Thinking Maps for Mapping KNOWLEDGE

Mapping is a rich synthesis of thinking processes, mental strategies, techniques, and knowledge that enables humans to investigate unknowns, show patterns of information, and then use the map to express, build, and assess new knowledge. If the world is flat as Thomas Friedman proposes then we will need maps to navigate on this dynamic technological plane for thinking and communicating.

Consider the impact on your school or system if everyone could navigate information, communicate options, and see solutions as fluidly as they can read a GPS in their cars.

We have not yet become fluent tool users in this new knowledge age, as were hunters fluent with the bow, farmers with the plow, and line workers in shaping metal. On a day-to-day basis we make attempts to shape information into knowledge as we once so fluently transformed a rocky field into furrowed crops and ore into folded metal. The problem is that while we may good at compiling information, putting it into power point slides, or sending information around the globe...

We have not become fluent as individuals (or in group processes) in transforming information into actionable knowledge and clearly communicating our thinking We now need to become much more adept with mapping tools for our thinking, so that we can transform information into knowledge, create solutions people can understand and invest in, and communicate with clarity and efficiency.

The Cognitive Age: What is it?

In this new century the technological worlds of work, work-at-home and global networks overlap to require a different set of thinking and communication tools—mental knowledge tools—beyond those for even the most recent generation gone by. David Brooks recently stated in an op-ed piece in the New York Times (May, 2008) that we are no longer in the information age, or the global communications age, but rather, in ... *the cognitive age*.

Here is the key to understanding the Cognitive Age:

It is not the 25,000 miles that information travels from computer screen to handheld device that matters most. It is what happens in the last few inches from the eyes to the brain.

The computer may deliver information, but **our minds** process the information and create actionable knowledge. We make decisions based on these processes.

In Summary

“David (Hyerle) also proposes that the use of these tools (Thinking Maps) is not just “kid stuff.” Cooperatively inventing and employing such tools benefits the human intellectual capacities of the adults in the school as well. When the staff design, generate, and employ these maps, they too become more aware of their data generating, storing, and retrieval systems. All staff members are at once beneficiaries and leaders of the learning organization. They more readily see the parts-whole relationship. They view their particular operation as part of a larger whole and see that innovative/creative thinking in one part of the system affects the total system. Everybody in the system is perceived to be a continual learner—a caring, thinking individual capable of complex decision making, creativity. School life consists of not only the continuity and use of visual tools across departments and grade levels but also the use of a shared, common language throughout the organization. Perhaps it is this fractal quality that is the unique characteristic of a mindful school.”

Art Costa, from the Prologue to Visual Tools for Transforming Information into Knowledge, Hyerle, Corwin Press, 2009

“In his work on visual tools, David Hyerle has expanded the frontiers of strategies involving nonlinguistic representations far beyond what I and others have attempted to do. He provides not only a comprehensive theoretical basis for the efficacy of visual tools but expands their application to new and exciting areas...Hyerle also addresses five levels of implementing Thinking Maps and provides criteria for determining whether visual tools are being used effectively by an individual or by an entire school. In short, David’s work is the most comprehensive and useful to date on the topic of visual tools and what I have referred to as nonlinguistic representations.”

Robert J. Marzano, from the Foreword to Visual Tools for Transforming Information into Knowledge, Hyerle, Corwin Press, 2009

“The brain remembers what it has seen because humans are intrinsically visual beings...The ability to transform thoughts into images is often viewed as a test of true understanding...The Thinking Maps program takes full advantage of the natural proclivity of the brain to think visually. The authors describe Thinking Maps as a language of visual tools grounded in the thinking process, a most neurally apt description. Neuroscientists tell us that the brain organizes information in networks and maps. What better way to teach students to think about ideas and organize and express their ideas than to use the very same method that the brain uses.”

Pat Wolfe, from the Foreword to Student Successes with Thinking Maps, Hyerle, ed., Corwin Press, 2004

Buckminster Fuller used to say that if you want to teach people a new way of thinking, don’t bother to teach them. Instead, give them a tool, the use of which will lead to new ways of thinking...When dealing with complex issues... it helps to have a “pattern language,” a way to visualize and talk about the deeper patterns.

Peter Senge, from The Necessary Revolution, Doubleday, 2008

Thinking Maps: Transforming the Way We See Learning and Leading

Introduction

The Thinking Maps® program takes full advantage of the natural proclivity of the brain to see and think visually... as a language of visual tools grounded in thinking process. Neuroscientists tell us that the brain organizes information in networks and maps. What better way to teach students to think about ideas than to use the very same method the brain uses.

Pat Wolfe, leading expert in brain research;
author of *Building the Reading Brain*

from the Foreword to
Student Successes with Thinking Maps
Hyerle, (ed.); Corwin Press, (2004)

Because thinking is based on the innate capacity of the brain to *seek* patterns, what better way to ensure student-centered, deep learning than through tools that are defined by fundamental *thinking* skills and directly activated and applied to content learning via explicit cognitive patterns shown in *maps*? Thinking Maps, a research-based language of visual tools for teaching, learning and assessment, is the animating center of a proven implementation design for delivering high quality visual tools to students through professional development for teachers, supervisors, and administrators. Our customized implementation designs for elementary, middle and high schools are supported by Marti Richardson, President of the National Staff Development Council, in a forward to *Student Successes with Thinking Maps*:

All students and staff members should have high quality learning on a daily basis. Student Successes with Thinking Maps presents a powerful argument for using this tool at every level, and illustrates how students have systematically and deliberately taken charge of their own learning via the transformational power of Thinking Maps...[a] view into schools that have successfully used this unique tool kit to bridge the gap from research to practice. All are worthy models to examine—and follow—as schools focus on continuous growth for all through individual and school improvement.

This process explicitly links instruction, learning, and technology with the teaching of higher order thinking skills for students. The core outcomes of Thinking Maps implementation are grounded in research while focusing on students becoming independent, fluent users of these cognitive tools:

- 1.) an explicit focus on cognition, student learning and higher-order thinking—including special education populations;
- 2.) support of whole schools and districts in sustaining research on cognition and learning through standards-based curriculum design;

- 3.) whole school implementation of practical, cognitive tools across diverse learning communities and for constructive conversations by leadership teams

The Thinking Maps model, the research design, and our fifteen years of in depth professional development and programs in urban, suburban, and rural schools around the country is now shifting the paradigm for how we see students' thinking, teaching, and research in cognition. What is this shift? As documented in his recent book on visual tools, Visual Tools for Transforming Information into Knowledge (Corwin Press, 2009), Dr. Hyerle points out that previous models, research, and attempts to implement cognitive-based programs have relied to a great degree on purely *linear* verbal/written and numerical representations of thinking by students whereas the Thinking Maps model—a language of cognition based on fundamental *patterns* of thinking represented through visual mapping—effectively integrates verbal, written, and numerical forms through maps. Thinking Maps are a third generation tool set, integrating the creative form of mind mapping with the analytical structure of graphic organizers into a dynamic 21st century language for teaching, learning and assessing.

Most importantly, Thinking Maps are eight cognitive tools directly taught to students who then become fluent in the conscious, purposeful and most rigorous, integrated use of these tools, rather than as an isolated collection of blackline graphic organizers distributed by teachers and filled in by passive students. This “effort-based” approach means that while teachers become more effective in their pedagogy, students are the primary focus as tool users.

The level of accountability by all participants in the learning process is very high because of the very fact that the tools are visual displays of STUDENT thinking related to products such as writing, text structures “mapped” as rich documentation of reading comprehension, and maps showing the problem solving processes of a mathematics word problem. Thus when the principal, a colleague, a central office observer, or a researcher steps into the classroom, there is clear evidence of the effort put into the use of the maps generated by students. This is in clear contrast to prior attempts to improve students' cognitive-learning abilities solely on the basis of teacher performance: teacher questioning, curriculum design, pre-formed curriculum guides based on higher order thinking, and other forms of interventions that do not directly support students' automaticity in transferring thinking processes as *patterns of thinking* within and across disciplines. The rigorous, student-centered approach using Thinking Maps offers a new form for seeing the HOW of students' thinking and the WHAT of content knowledge, and thus a unique framework for evaluation, assessment, and instruction.

From within the present research base and our own research and practice in schools, the reasons that students perform better in the areas of reading, writing, and mathematics when using Thinking Maps by all students across whole schools, including a range of second language learners and special needs children, may be traced to four areas of foundational research: cognitive science research from the past fifty years, recent brain research, *What Works in Classrooms* research conducted by Dr. Robert Marzano, and the Federally funded “Put Reading First” research.

Cognitive Science: *fundamental thinking skills*

Over the past 50 years cognitive science researchers have identified fundamental cognitive skills which support higher order thinking. The eight Thinking Maps

are a synthesis of these foundational skills and are found in tests of cognitive skills and models of thinking skills instruction.

Brain Research: *visual patterning and cognitive mapping*

The experts in brain research unify around a common understanding that the brain is a “pattern detector” (Caine and Caine); that 80-90% of the information that comes to our brain is visual (Eric Jensen); and that “the brain organizes information in networks and maps”(Pat Wolfe).

Research on Best Practices (Marzano): *nonlinguistic representations*

A meta-analysis of educational research conducted by McCrel Lab, lead by Dr. Robert Marzano, found that nonlinguistic forms (graphics) have a very high degree of impact on learning. They also found that a focus on cognitive skills such as “similarities and differences” has a high degree of effectiveness. The Thinking Maps synthesize cognition and graphics into dynamic, common visual Language of representations based on these processes. There is also extensive research on the efficacy of even the most simple graphic organizers, Thinking Maps being a synthesis of this research.

“Put Reading First”: *text structures as visual patterns for reading and writing*

This federal study that synthesized reading research strongly recommends that graphic representations be used by students to identify a range of text patterns for reading comprehension and for writing processes. Thinking Maps training and resources explicitly link these cognitive maps to reading and writing in a systematic way. Unlike the endless, chaotic array of graphic organizers found across any school, Thinking Maps create a meaningful, cognitive-theory-based tool set that are used in an integrated way. The author of the “Put Reading First” document, Dr. Bonnie Armbruster, was one of the first researchers to establish that graphic organizers significantly improve students’ reading comprehension.

Toward Cognitive-Visual Tools that Work

A major challenge for students in our current, information rich society, is to capture and analyze information thoughtfully, read information text critically, and craft new knowledge at higher levels of thinking and understanding. Unfortunately, this is especially true for students of poverty for whom the challenges of learning and the consequences of failure are profound. The achievement gap exists and can be closed.

Unfortunately, most instructional change efforts for teachers offer an overwhelming, complex array of “best” instructional practices that focus on teacher behaviors, not on the direct facilitation and mediation of student-centered thinking and learning. Thus the cycle of systemic underachievement deepens as only incremental changes occur. Low expectations mixed with negative perceptions of students’ cognitive abilities persist. Students in large urban school systems are caught in a vicious cycle of

perception and performance not of their making. In the context of a history of underachievement within whole schools, school systems throughout the country need a focused, research-based strategy, grounded in cognitive theory, with short term impact *and* long term effects on student performance. Instructional leadership capacity in schools must be an organizing theme.

We offer the use of Thinking Maps, a model developed by Dr. David Hyerle, as the animating center for instructional improvement and shifting perceptions of, and performance by, students. This focus builds expertise over time through collaborative, comprehensive professional development. For students to perform at these higher levels, research has shown that teachers also must instruct at higher levels. Teachers involved in the implementation of Thinking Maps have the opportunity to develop their instructional expertise and their effective use of technology at a higher order thinking level by transforming student learning through the use of Thinking Maps and Thinking Maps Software. The knowledge and use of Thinking Maps as powerful tools for knowledge creation, information processing, cooperative learning, communication, and problem-solving will be embedded within multiple technologies.

Overview of the Thinking Maps Model

The Thinking Maps model was developed in 1987 by Dr. David Hyerle as a theory-based practical language of visual tools based on eight interrelated cognitive skills. His teaching experiences in inner city Oakland, California, his Master's Degree in Urban Education from U.C. Berkeley through the Teacher Corps and the National Writing Project, and his early work with Dr. Art Costa using *Cognitive Coaching* and *Habits of Mind* models grounded Thinking Maps in theory and practice. The model was refined by Dr. Hyerle while he was completing his combined doctoral studies at Schools of Education at Berkeley and Harvard in the early 1990's. As noted above, theories of cognitive development, language, and culture, schema theory, multiple intelligences, new brain and emotional intelligence research, Robert Marzano's research with colleagues, and the *Put Reading First* summary (No Child Left Behind) of research on graphic representations have all influenced the use of Thinking Maps and Software for learning across disciplines in pre-K-12 schools and beyond. Extensive and detailed documentation of the outcomes of this work are shown through a book of collected chapters from national and international schools and authors, and published by Corwin Press (May, 2004; Hyerle, ed.). The title is: *Student Successes with Thinking Maps: School-based Research, Results and Models*. One of the most important applications of Thinking Maps in the area of literacy development is highlighted in a chapter on reading comprehension showing how the maps are an explicit bridge between reading text structures and writing. Additional research and documentation of the impact of Thinking Maps on learning and leading can be found at the Thinking Foundation website, <http://www.thinkingfoundation.org/>

Each *Thinking Map* is based on a fundamental *Thinking* process and directly linked to essential organizing questions grounded in cognitive skills. This model is a non-hierarchical, integrated set of third generation visual tools used at every level of Bloom's Taxonomy. Each Thinking Map expands from blank pages as content is formed

by students (no black line masters!) and students soon link multiple maps, transcending together simple brainstorming webs and preformed, static graphic organizers.

Through training and coaching, teachers *learn how to teach* with these questions, thinking skills vocabulary and maps as an *everyday foundation* for instruction, management, curriculum design and assessment. As adult learners, the tools help teachers and leadership teams guide their own growth while simultaneously becoming the lynchpin for directly improving student performance. Improvement of teacher instruction and their own levels of reflection have also been documented. In a qualitative research design in District 27, Queens and in Syracuse, NY, we found a significant shift in teacher reflectiveness.

Most importantly, teachers learn how to immediately instruct ALL of their students in the language of thinking processes (e.g. comparing; sequencing, cause-effect, analogy). Thinking Maps are especially useful for special needs students because the tools visually scaffold information. All students in inclusive classrooms then have common tools for explicitly applying their thinking in content learning.

So why are Thinking Maps so effective? Here are some of the key points:

- Thinking Skills are directly taught to and then applied by students, because each map is based on a fundamental cognitive process...and the maps are used along a novice to expert higher order thinking model
- Students are able to use multiple maps together, in flexible ways, to think through content learning in every discipline...for independent and cooperative and team learning
- The consistent visual representation of thinking skills means that the natural networking of the human brain is brought to the surface...the visual/spatial form of each tool helps all learners to stay focused and enriches the thinking of students with special needs, speech and language difficulties, and emotional problems
- Communication skills and literacy development, as well as conceptual understandings, are improved because individuals and teams of students are enabled to express their thinking
- Self-awareness, reflection, and meta-cognition are enhanced because students, teachers, administrators, and parents are able to look at evolving and/or finished maps and *see* the thinking of the student

In America's schools we have not systematically and explicitly supported teaching and learning for higher order thinking. It is rarely realized across a system through which a child grows. There are extreme inequities, particularly in our urban schools, through which only some schools and only some classrooms and only some students receive effective instruction and tools for thinking. The use of Thinking Maps as a common visual language throughout a school and system for developing, applying and transferring cognitive skills across all aspects of learning, over multiple years, provides *continuous cognitive development* for every student while simultaneously improving content learning.