



This *draft* chapter will be included in a comprehensive book focused on the wide ranging applications of Thinking Maps, from preschool through college. Please do not duplicate without permission from *Designs for Thinking* 603.795.2757 The working title of this book of collected chapters from 15 authors is: *Thinking Maps: A New Language for Learning*

Thinking Maps: The Cognitive Bridge to Literacy
A Visual Language for Bridging Reading Text Structures to Writing Prompts
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Thinking about *How Leo Learned to be King*

While I am reading, my mind adds to my Thinking Maps all by itself, and suddenly I know more than I knew! (1st grade student, Mt. Airy, Maryland)

At Mt. Airy Elementary School, in a classroom of first grade students, on a morning in mid-May of this year, we watched as a third year teacher read the guiding question for the day: “How will you organize your thinking about this book?” While this may seem to be an unfocused question, the teacher knew the students would respond with rigor. The book, *How Leo Learned to be King*, rested on the chalkboard tray with its colorful picture of a crowned lion on the cover, set there after it had been read aloud the day before. This is an inclusive classroom of students in a modest neighborhood school, a school that had shown declining writing scores and mediocre reading scores just a few years back, predictably as the population of the building swelled beyond the original walls and into portables. This year student performance changed significantly upward and was reflected on tests as state and county wide scores generally fell across Maryland and Carroll County. Mt. Airy Elementary School has risen to the highest performing Maryland school in Carroll County since providing reading and writing instruction with Thinking Maps.

While this is important news for this year, for the long term, students have changed how they are understanding texts: they are surfacing dynamic patterns of content from the linear landscape, the wall of text. The range of structures bound with line by line text

become unveiled in the form of mental maps. They are changing the form, *transforming* text.

We entered Ms. Christine Smith's classroom and sat down behind the students: Thommie, as principal-instructional leader, clacked away notes on her laptop and David, a researcher-consultant, videotaped the entire twenty minute exchange. We were witnessing something that is within reach of any school, replicable, and may refine and even reframe reading, writing, and even cognitive science research. Students gathered on the floor near their teacher and the blank, open space on the chalk board below the guiding question. *How Leo Learned to be King* had been read aloud the day before, but the students and all of the teachers and administrators across this school, Mt. Airy, had learned about Thinking Maps the year before. These excerpts may heighten your understanding of Thinking Maps yet underrepresent the richness of the classroom conversation. Here is how 1st graders organized their thinking about this book:

Erin: You could use the Circle Map... put the topic in the middle and all ideas that you get in your mind from that topic, you write down in the circle... Leo... details about Leo... he was mean and he was nice.

Megan: A Bubble Map about a mouse. You say a word about what the mouse is... like furry... describing words.

Billy: We could do a Double Bubble....we could compare *How Leo Learned to be King* and *The Lion and the Mouse*.... they (both books) both have a lion and a mouse.

Mark: A Tree. I am thinking of.. about Leo.. what he looks like.. and, um, I think, and what he is like... and what he did.

Thomas: You could organize it with a Bridge Map.. In the *Lion and the Mouse*, the lion was mean to the mouse, but in *How Leo Learned to be King*, the lion was nice to the mouse by helping him get over the river.

Alexis: You could use a Flow Map. First he was mean. Then when they took off the crown he, like, got a little embarrassed. He walked away, he got surprised, because he met a mouse. And at the end he helped the mouse and they became friendship.

Regan: Multi-Flow... What caused him to be mean. The crown made... the crown could have caused him to be mean. Erin: No one liked him. They took away.. they didn't want him to be their king.

Shawn: We've got a lot of maps, don't we?

Teacher: That makes me think...

Shawn: ... that we are like second graders!

As the students spoke and Ms. Smith facilitated, Thommie and I glanced at each other a few times. This teacher had brought students to such a level of fluency with Thinking Maps that they could begin to identify text patterns on their own. They were able to use fundamental thinking skills vocabulary (describing, compare, causes, etc.), respective cognitive maps (Bubble, Double Bubble, Multi-flow, etc.) and had the metacognitive awareness of being able to transfer these process and tools to reading comprehension. They were then able to return to their seats with blank sheets of paper, and with varying results, choose a Thinking Map and expand their thinking. They later went on to write about the story using the maps.

This sample of classroom activity is a practical and symbolic representation of a new *form* of literacy and a transformation of how we perceive the interrelationships between thought and language.

Thinking and Maps

Thinking Maps are the paper of my mind. (3rd grade student)

If text on paper is what we produce for linear communication, Thinking Maps is a palette for the mental mapping that goes on in our brain-minds. Thinking Maps were developed as a language for learning in 1987 by David Hyerle. This language is described, documented, and presented with results in *Visual Tools for Constructing Knowledge* (ASCD, 1996) and *A Field Guide to Using Visual Tools* (ASCD, 2000). Thinking Maps are third generation visual tools, drawing from--but distinctly different from--other types of visual tools.

Teachers began using first generation “brainstorming webs” and Tony Buzan’s Mindmapping techniques as visual tools for prewriting and general brainstorming in the 1970’s. While these semantic maps are still used, many students have difficulty organizing the scatter of stormed information across their page. During the 1980’s teachers began

using second generation visuals, a more systematic use of highly structured “graphic organizers” that have become ubiquitous blackline masters in many writing and reading programs. The U.S. Department of Education sponsored publication, *Put Reading First*, targets both semantic maps and graphic organizers as essential keys for unlocking text structures and thus reading comprehension. The strength of graphic organizers is the highly scaffolded structure of each tool. The weakness is that there is a static nature to these templates and a discontinuous use of the tools by students. There is also a glass ceiling for thinking with these organizers: students go from grade to grade, classroom to classroom across schools, often filling in blanks on isolated worksheet handouts without much reflection.

As shown in figure 1, Thinking Maps provide a conceptual and concrete bridge between common text structures and a full range of writing prompts, based on the cognitive skill that grounds both reading and writing skills. For example, the ability to comprehend a text based on “problem-solution” depends on the student understanding the fundamentals of cause-effect reasoning. Cause-effect reasoning is essential thinking skill for being able to produce a coherent and well organized piece of writing in response to a prompt based on prediction.

Following from the research on concept mapping by Novak and Gowin (1982), Thinking Maps brings together form and function. Thinking Maps are theory-embedded: each map is defined by a respective thinking skill. The tools are used together to make meaning, just as carpenters *working together* use many tools to construct a building. This was demonstrated by the first graders as they used seven of the eight maps to think about the learned King Leo. Given this array of flexible tools, Thinking Maps are a third generation synthesis of the open quality of brainstorming webs and highly structured graphic organizers.

Thinking, Mind, Brain

The eight foundational thinking skills upon which the maps are based have been identified by early psychologists such as Piaget, within many generations of tests of cognitive skills, and present cognitive scientists as basic *cognitive* structures for thinking, language development and learning. Each of the Maps have user-friendly names, but

similar definitions drawn from fundamental definitions.

From the perspective of language use, the cognitive roots are revealed: the eight parts of speech are the isolates for generating “language” that is interdependent with cognitive patterning such as categorization, comparatives, causality, attributes, etc. The eight Thinking Maps are the practical bridge explicitly connecting the linearity of language use to the deeper, multifaceted, overlapping patterns of thinking that exist in our minds. Yet, our daily communication in classroom language use for presenting nonfiction content knowledge and concepts is often sequential, whereas the concepts and our students’ thinking are not. Thus there is cognitive dissonance between how we *represent* information to students and how they are *processing* that information.

To make this point in stark terms, let’s look at some present understandings of brain research. The human brain *patterns* and constructs *mental maps* of information. This complex, evolving organism is only *partially* driven by sequential processes, for we know that the holism of the human brain cannot be reduced to left and right hemispheres, as words and concepts are not held in isolation, but spread like intricately spun webs across the hemispheres. The brain actively binds ideas together through neural networking, pruning as needed, chunking information into associative schemata, grasping bits of linked information in working memory, and then, holding them, sometime latent in long term memory. Additionally, the human brain is a *predominantly* visual-spatial processor, which makes sense considering our visual acuity and seemingly infinite capacity to remember images.

Of course, our thinking is in continuous flux and flow with our emotional states and our memory of experiences. From what we are beginning to discover, our emotions are often gatekeepers of the mind, allowing entry and access, denial and self-deception. And few would say that emotions are linear! Linking cognition and emotion, Daniel Goleman writes, “... schemas are intelligence in action... when driven by emotions like anxiety, schemas impose themselves with special force.”

In sum, the powerfully multifaceted brain-mind, with its capacity for thinking in different schematic patterns, is often tightly funneled into the sequential flow of language in classroom as participants attempt to speak in linear sentences, read lines of text and write

sequential passages. This is the mental chasm our students must bridge in order to be “literate.” It is uncanny and provocative to say, but it is clear that the linear representations and logic of classroom discourse often get in the way of our most rigorous thinking.

Reading and Writing: From Phonemic Awareness to Metacognitive Tools
Thinking Maps just happen! They work automatically while I am reading! (grade 5)

If you accept the premise that we are still framed by a linear mindset, it is easier to see how we are still caught in the dichotomous debate between phonics and whole language, nestled within the most heavily researched and publicly financed area in education, namely, literacy development. Teachers, researchers, major publishers and test developers have attempted to synthesize the two sides, and the field remains discordant, failed. Our cyclical failures to break through this dichotomy is revealing that the problem lies not merely in balancing phonics and whole language. We are caught in a vicious cycle.

How else does one explain the deficits our nation is experiencing in reading as indicated by NAEP scores from 1971-2000? NAEP has reported that our *at risk* population has improved slightly despite receiving enormous resources. For our students who are *not* at-risk--those who have the fundamentals of decoding, fluency, and pertinent vocabulary--reading comprehension scores are not any better than they were twenty-five years ago. It is time to accept the minimal impact on reading comprehension that research and instruction have made since the 1980's. Why has there been limited change in standardized and performance assessment scores of reading comprehension despite the enormous effort over nearly two decades to overhaul reading comprehension instructional techniques?

One missing link is the cognitive *interconnections* between the processes of phonemic awareness, vocabulary learning, and meaning making. Sasha Borenstein, Director of the Kelter Center for Literacy Development that serves students from the Los Angeles region, states that

... the recent research in the area of literacy done by the National Institute of Child Health and Human Development has documented the need for explicit, systematic instruction in “breaking the code,” phonics and word study, as well as in 'making meaning' strategies for comprehension. The research supports an active, thoughtful instructional approach rather than a return to repetitive, passive work.

So, how then do Thinking Maps become the bridge from the brain-mind to reading comprehension and writing process? Looking at three areas of the *Put Reading First* report distributed widely by the U.S. Department of Education, it is clear that Thinking Maps provide a cognitive bridge for supporting phonemic awareness, vocabulary instruction, and text comprehension.

Phonemic Awareness

Sasha Borenstein has found that Thinking Maps are a set of tools for helping students to see, break down, and put words back together. Through her work with students who are at risk and falling behind in the Los Angeles area, she and her staff have found that Thinking Maps work as micro-cognitive tools for seeing how to work with words:

Thinking Maps are flexible, active tools for exploring literacy. The maps are highly interactive and provocative, pushing learners to discern patterns and interactions in materials and concepts. Thinking Maps are used in discerning the concepts which organize the expectancies and rules of phonics. Performing the sounds of the past tense, /t/, /d/, and /id/ can lead to the understanding that the sound of this morpheme is based upon the last sound in the root word to which it is affixed. The Brace Map is used by students to identify these **part-whole** relationships. Finding the **similarities and differences** between syllable types using the Double Bubble Maps leads to the understanding that each syllable is defined by its vowel. Creating a Flow Map for **sequencing** the spelling of /ch/ , ch or tch, /j/, ge or dge, and /k/ k or ck at the end of a word can lead to the concept that the spelling depends upon what type of vowel is in that word.

The summary page for on phonemic awareness in *Put Reading First* recommends guiding students to categorize phonemes, see part-whole patterns in words, and put them back together through blending. These are key strategies for developing this one area of early reading development.

Vocabulary Instruction

A second area of *Put Reading First* focuses on learning vocabulary. Teachers

unanimously state that by using Thinking Maps vocabulary learning is enriched. This is because the brain is constantly networking bits of information, and the maps facilitate patterning of related words, which become a context for definitions. Vocabulary learning is a networking process involving not only “direct vocabulary learning” through word learning strategies and repetition, but as the report summarizes, also on the “indirect” acquisition of vocabulary in different contexts.

Returning to the above reading of *How Leo Learned to be King*, Thinking Maps create multiple pathways for students and teachers to gather vocabulary from the story into several patterns. These patterns are explicit visual patterns that show a word *in context*. When the student independently offered that the Circle Map could be used, she stated that you put the topic in the center (Leo) and the details around it. Contextualization requires that students not just attempt to give definition to a word by what proceeds it, but often by reading ahead so that a full context may be brought to bear on the word. The Circle Map is the visual representation of the thinking skill of labeling through Defining in Context. Students learn to use the tool and also learn the vocabulary of thinking and interpretation.

The Syracuse City Public Schools have implemented Thinking Maps training over the past few years in sixteen elementary schools and two middle schools. Along with a capacity building training at the high school level, this year Syracuse began the first cohort of sixty pre-K teachers. You can see that Thinking Maps have been co-generated by the teachers and the students on the walls in these classrooms. These documents *are not lists* of vocabulary words. The words are *visibly* held together in Tree Maps (word families), Bubble Maps (adjectives describing characters), Double Bubble Maps (comparisons of animals), Flow Maps (for writing down the events from the beginning, middle, and end of a story), Brace Maps (showing the interrelated parts of a whole flower). After these maps are generated, they are put up on the wall so that the class can add to them over time, refer to them for vocabulary reinforcement, and see how a word in one map may be used in another map, thus extending the context of the word.

In the outside hallway of one pre-k classroom was a series of Circle Maps, including one on the topic “dirt.” In the center of the map was stapled a bag of dirt, and associated words and pictures gave context to this concept. At this same school, up through all the

grade levels on the hallway walls were Thinking Maps *explicitly showing* content learning, these created by students who had been using the same tools with evolved complexity, vocabulary, and conceptual development for multiple years.

Text Comprehension

Correlating with NAPE data is the National Reading Panels report explaining that future implications for reading comprehension include evidence based assessments. Affirming this concern, Donald Graves asserts that educators and the public are in a frenzy over how to boost reading comprehension scores.

We must to teach students how to synthesize and show their thinking. What we have needed is the physiology of reading comprehension, the actual working parts as a reader interacts with text. But what would the working parts look like? Graves writes that when a reader engages with print, we have had no idea where he or she is or what types of thinking are in process. Fifteen long years ago Lauren Resnick noted that if we cannot produce a more substantial explanation of the internal events that produce improved comprehension, it will be difficult to develop an instructional training approach. She later suggests that research has located a psychological (metacognitive) space, in which educationally powerful effects seem to occur, but it has not yet adequately explained what happens in that space to produce the effects. The compilation of these reading researchers combined with DePinto Piercy's dissertation research (2000) have confirmed the need to change our instructional techniques. We must move from the panoramic lens of a wide variety of strategic instruction to include a zoom lens for specific instruction focused directly on what students do *during* the process of reading.

In the document *Put Reading First*, proficient readers are described as active and purposeful, and strategies are suggested for guiding students to self-monitoring and metacognition. Central to this section of the report is the focus on graphic organizers and maps that support students in identifying text structures within fiction and nonfictional texts. The report states that these visual tools:

- *help students focus on text structure as they read*
- *provide students with tools they can use to examine and visually represent*

relationships in a text: and

- *help students write well-organized summaries of a text.*

Dr. Bonnie Armbruster, one of the lead authors of *Put Reading First*, was an early leader in the research on text structures. Her work showed that using a “problem-solution” graphic before reading gave students an awareness of this key structure and their comprehension improved on those specific texts. Of course, texts are not identified as “problem-solution” or “chronology” just as quality responses to writing prompts are not completed by staying inside the lines of a graphic template. Thinking Maps extends this work by giving students a cognitive and metacognitive tool set for adapting their thinking to *varying contexts*.

When we are out driving in an unfamiliar region, we need a map. The reading comprehension landscape is much more complex as students’ eyes hit the page running. Reading instruction typically walks students right up to the road of comprehension and says, *now you’re on your own*. Dropping their hand, after developing prior knowledge, students are expected to cross the road of comprehension alone. Teachers voices only say.. *if you make it safely, I’ll be waiting for you on the other side, to ask you comprehension questions*. Students, especially at-risk children, often make a run for it thinking that the faster they get down the page, the better. Then we provide “fix-up” strategies. Vygotsky’s Zone of Proximal Development is the critical region where instructional guidance for students is crucial. Yet, it is exactly this zone of comprehension where we provide limited instruction.

Rather than dropping students off at the edge of the road, we need to give them maps to help them see their way through to the end. By guiding them across an unfamiliar text with Thinking Maps, we are providing direct instruction to the students for using their reading strategies independently. Through direct Thinking Map instruction for use DURING reading, students practice crossing their reading comprehension road safely. Ultimately, Thinking Maps instruction for reading and writing provides students with instruction beyond *what* and *how* to use strategies.

Thinking Maps require students to understand *why* and *when* to use them. Strategic reading behavior--and writing processes--require that the learner must select an action for a specific purpose. It is the *intentional self-selection of a particular strategy* to achieve a specific goal which is the critical component of strategic reading behavior.

Literacy in a New Language

My Thinking Maps have power. I have all these ideas and no where to put them. Thinking Maps let me get them out!

(1st grade student, Mt. Airy School)

Literacy alone is not power in the age of information and technology, multicultural and multilingual communication, and around-the-world economies. A new critical literacy is required. To this end, The International Reading Association and the National Urban Alliance recently joined together in an effort to shift the political dialogue from the theoretical grounds of basic literacy development to reveal the clear inequities that exist in delivering to those students at risk the tools to exceed our expectations. Phonemic awareness and metacognitive strategies must develop together. These at-risk students--many in urban schools--are given an overwhelming, repetitious panoply of strategies that heighten their awareness of words, yet leave them short of the cognitive and metacognitive tools for deeper thinking and comprehension.

To move beyond the failures of past research and practice to shift literacy to a new language requires a shift in tools and mind shifts by leaders. The outcomes described above have been attained because of ongoing professional development commitment within the unit of change that makes a difference for individual students over time: the whole school. The whole faculty of the Mt. Airy school were and still are committed to ongoing training. The design for implementation closely mirrors the 10 quality indicators established by the National Staff Development Council (Dennis Sparks). Thinking Maps training consists of an initial full day of training and follow-up days while classrooms are in session (for modeling, coaching, curriculum design, and leadership support). At this writing, since

1990, there have been over 3000 whole school faculties trained using this design in the United States, Canada, New Zealand, and in over thirty schools in Singapore.

The central outcome of this continuous professional development design is represented in the first grade classroom conversation at Mt. Airy School. Teachers leave the initial training with the goal of explicitly training their students in the use of Thinking Maps, thus supporting them in internalizing the tools for direct transfer to content learning and process outcomes.

If this is a new language for literacy, we must look beyond k-12 schooling to adult literacy as well. A similar outcome can be found with adult learners in the largest community college in Mississippi, Jones State College. As reported in a dissertation by Marjann Ball, pre-post control groups were used, one group receiving Thinking Maps instruction for reading comprehension, the other group given a high quality reading approach without these tools. The Stanford Diagnostic Reading Test, Forms G and H (level blue) was used before and after the course of study. Highly significant main effects were found for five variables for students using Thinking Maps: fast reading, comprehension, structure, vocabulary, and word parts.

The implications of this research for a new form of literacy are profound, especially for those adults who have barely made the grade in high school or those who are returning to continue their education. They have become empowered not just by being able to read the words, but to read with reflection, to read and write with concrete patterning tools that will self-propell the lifelong development of their thinking and learning.

Like a good story, the end often creates a resonance with the beginning. So it is here. The 1st grade students of Mt. Airy Elementary School in Maryland have much more in common with these Jones Community College students in Mississippi than one would expect. They could sit together in a classroom right now with a common visual language for learning about Leo the Lion, the lion and the mouse or even about *Of Mice and Men*. One community college student said as much when she exclaimed:

Why didn't we learn these in elementary school?

13. *Thinking Maps: The Cognitive Bridge to Literacy* Hyerle/DePinto