

I Catalyst

Thinking Schools as a Catalyst for Transformational Change

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WHY THINKING? ■

In the past dozen years—the first decades of the 21st century—I have journeyed hundreds of thousands of miles around the globe to collaborate with and learn from fellow educators. My recent travels to such places as Malaysia, Thailand, Japan, South Africa, Ethiopia, Mexico, Brazil, New Zealand, Australia, the United Kingdom, and here within the United States have filled me with a renewed sense of optimism. In the course of these travels, I frequently encounter a recurrent question from seatmates, taxi drivers, and others with whom I cross paths: “What are you doing *here*?” When I offer my typical response, “I’m here to help build thinking schools,” my new acquaintances usually smile politely. Some even laugh and say, “Isn’t that what every school is supposed to do . . . teach children to think?” I tell them that many organizations and individuals have helped build actual school buildings in underserved regions, and then ask them to consider what happens inside the walls: What happens between teachers and students? And then, in a millisecond of insight, they answer their own question: “Not really, I guess. Schools don’t teach you how to think. I wish I had learned how to think better. We’ve got to teach students how to think.”

These informal conversations reflect a rapidly shifting awareness of the need for changing all levels and dimensions of education—from pre-K through college and workplace training—in response to increasingly complex problems. Across continents, I am aware of the tension between unbridled optimism and the hard realism of the challenges to change. I read about a renewed effort to focus on developing students’ thinking, collaborative problem solving, decision making, emotional intelligence, and an entrepreneurial drive for

social change as a central focus of education. But at the same time, I continue to encounter policies and practices that seem antithetical to these goals. Some say, “Why change?”

Because the world doesn’t just *seem* to be more complex. It *is*.

Dynamic new tools and technologies, social media, access to information, and globalization have led many to question whether we have adequately prepared our children for the challenges of higher education and a rapidly changing workplace. Of course, our minds and brains have also been opened to (and assaulted by) a daunting, sometimes overwhelming, new level of cognitive load. Students now have whole libraries and dynamically changing Wikipedia in their palms as well as powerful software for immediate communication and knowledge creation. This information overload is also a common point of conversation in the public square and global media network, and not just about educating, but the day-to-day experiences of our children. Too much information, too much entertainment, not enough time to think, and not enough quality thinking occurring in classrooms. Yet, with access to unlimited information at our fingertips, why are so many schools fixated on multiple-choice, one-answer responses and rote memorization of testable knowledge bits?

There is an unstated fear—and sometimes a hardened polemic argument—that if educators actually refocus their efforts on teaching for thinking they will somehow need to abandon teaching content. Some leaders across different fields and many educators believe that the direct facilitation of thinking draws the focus away from “hard” content learning into an unmanageable (read “untestable”) morass of “soft” learning-to-learn processes.

A central premise of this book, as evidenced by the work of the gifted educators who have contributed chapters, is that we have proven that we can, in fact, accomplish both goals simultaneously. The recurring themes throughout this book crystallize to these three key points:

1. The dramatically changing world requires changing the educational paradigm toward a focus on applied thinking, problem solving, and collaborative decision making by students in classrooms, not after they leave schools.
2. New technologies and access to information not only have had many benefits, but also have a downside by overwhelming students and teachers without offering them the requisite tools for dealing with the overload.
3. Teaching for, of, and about thinking—and teaching for content—are not antithetical but are deeply complementary when unified in classroom practice.

One reason for the misperception that thinking process approaches are “soft” is that traditionally, such skills have been ill-defined and not explicitly and rigorously integrated into daily content learning in the classroom. Additionally, cognitive development and critical reflection is not systematically developed over time in schools to a point where students, as independent

learners, become metacognitive and thus aware of their own thinking processes. We have often promoted the idea of “aligning” the curriculum so there is continuity within each content area. There is now a dramatic need for aligning the development of thinking for every student from preschool to the workplace.

Framing “content” and “thinking” within a polarity construct is no longer relevant and an antiquated point of view for understanding the purpose of education given what we now know about the brain, the mind, learning, and thinking. Delivering evermore challenging and conceptually complex content knowledge—without the direct facilitation of higher orders of thinking, and then testing for the “expected” outcomes in schools—may be challenging but certainly not scaffolding and thus supporting our diverse student population in meeting these lofty goals. More provocatively stated, this model of change is actually replicating an educational achievement gap linked directly to the growing disparities in income across many countries around the world. Of course, educational attainment and income levels *are* tied together. So is the wealth and well-being of nations.

In sum, using multiple-choice formats along a statistically formed bell curve grading system is no longer viable as a feedback mechanism to accomplish the needs of an information glutted, global society. Moving the goal posts by making tests more complex every few years only increases the separation between the underserved and the privileged few in societies (who can afford test-prep courses and private schools), while weakening the adaptability of the broad range of people within a country. More specifically, we must have a clear break and alternative to the disproven “IQ” bell curve mindset that tests children to a certain growth point compared to others on the some finite *curve of memorized content knowledge* rather than toward their own arc of brain-mind development as learners, as adaptable thinkers.

Our profession continues to be driven by an endlessly scattered range of isolated solutions for improving education (all “proven” in isolated studies), and it is often much ado about adding and subtracting, and using carrots and sticks: teaching *more* content, more time in school, and more homework for students (and teachers), more and/or better technology for virtual learning, decreasing or increasing class or school size, monetizing teacher performance based on questionable year-to-year statistical growth in student test scores, creating competition via magnet or charter schools, or just privatizing schools completely. Perhaps, most notably, we have endured an ever-growing push to *increase* the complexity and frequency of multiple-choice tests that are reported, but from which *students* learn very little. The idea of teachers continuously “disaggregating the data,” while of importance on one level, has now become the mantra of “high-quality” teaching. Within our education industrial complex, “content providers” market packaged content information, often tethered to test publishers, as if delivering more engaging individualized content at greater speed of access across multiple platforms will bring about improved learning and decision making. However, these approaches do not go to the source of learning—the human mind and brain—and thus do not directly draw from the animating source of knowledge: thinking.

This book offers a reframing of the work of education without throwing out much high-quality work in schools. Thinking Schools is an evolutionary, transformational vision and pragmatic design for education and a distinct redefinition of the phrase *academic rigor* in the 21st century: *Rigor is grounded in thinking as the foundation for content learning*:

Academic rigor is the *simultaneous* teaching of content deep learning within and across disciplines *with* the explicit, systematic and continuous development of thinking processes, dispositions and inquiry methods for thinking across whole schools.

We now need a defined, continuous, sustained “thinking” approach and models as much, or more as some would argue, as we need an “academic” vocabulary in each content area. In this chapter, and throughout the book, the vision, framework, and professional development design for Thinking Schools is described. However, rather than simply offering another “vision piece,” the book introduces readers to a school-wide approach and classroom models for *explicitly* teaching cognitive processes via visual tools, explicitly teaching dispositions via habits of mind, and explicitly teaching the processes of inquiry via questioning. The expected outcomes are that students are able to independently orchestrate these processes in an integrated way and consciously transfer these tools in novel ways to content learning at every educational level, in the workplace, and in their personal lives.

Why should we focus on something called “thinking” in the 21st century? In a “back to the future” way, Albert Einstein long ago framed our present dilemma by suggesting that *the significant problems we face today cannot be solved at the same level of thinking we were at when we created them*.

What did Einstein mean by suggesting that we need to *think* at a different level? In a similar vein, what is the meaning of Apple Computer’s popular advertising campaign that was built on the phrase *think different*? Both suggest that the *ways* in which we think—not “what” we think—needs to shift dramatically with the demands of our changing times.

■ CAN WE DEFINE THINKING?

This brings us to the ancient, seemingly unanswerable question: What is thinking? The oft-told Sufi parable of the six blind men and the elephant offers us a metaphor: Each of the men touches a different part of an elephant, yet none are able to define the whole. Let’s update the parable and tell a story of a group of six people sitting around a table trying to define “thinking” for a parent whose child is entering school: a philosopher, a kindergarten teacher, a college professor, an artist, a CEO, and a social entrepreneur trying to make change in the world. They might become as disoriented in their dialogue as the six blind men touching the elephant, yet over time they would find agreement about common dimensions of thinking and even practical approaches, if they focused on how to support students as adaptive problem-solvers over their

lifetimes. If our group of six had access to the behavioral cognitive sciences, research and practice in classrooms, and the new neurosciences, they would find distinct pathways for giving definition to the term *thinking*. We do know how to improve every child's ability to think, as cognitive psychologists and researchers have shown for decades.

One entry point is the well-documented thinking skills movement of the last decades of the 20th century. The history, research, applications, and range within the field of thinking-based education may be found in a comprehensive text *Developing Minds* edited by Art Costa (2001). This primer for offering different definitions for thinking and showing how different approaches and models are integrated into classroom practice is a precursor to what we call *Thinking Schools*. During the thinking skills movement, Drs. Art Costa and Ron Brandt offered three broad categories for engaging schools in bringing thinking to the center of the school. Costa (2008) uses the metaphor of a "Schools as a Home for the Mind." The school house is a place wherein all who live there focus on these areas:

Teaching FOR Thinking: Creating school-wide and classroom conditions that support thinking development.

Teaching OF Thinking: Instructing students in the skills and strategies of thinking directly and/or implementing thinking programs.

Teaching ABOUT Thinking: Helping students become aware of their own and others' thinking processes, brain research, and use in real-life situations and problem solving.

From present times, our group of six could also draw theory, research, and concrete applications derived from leaders in the field of education who have directly influenced existing practice in some schools with now well-known models and approaches: Howard Gardner (multiple intelligences), Art Costa (Habits of Mind), David Perkins ("Smart Schools"), Matthew Lipman (Philosophy for Children), Daniel Goleman (emotional intelligence), and Edward de Bono (Lateral Thinking and "Six Hats Thinking"). Over the course of this book, you will be introduced to these models within the context of Thinking Schools designs.

Collectively, from cognitive-neurosciences and learning theory backed up by research-based practices and proven classroom *models* for applied thinking, effective and efficient ways of developing *all* students' thinking is the grounding for Thinking Schools. The animating concern of each school taking this journey is *how* to refine and synthesize these definitions and models so that they are practical *and* scalable *and* sustainable across their learning community. There is a need to catalyze whole learning communities toward improving thinking abilities and in practice developing new models for engaging the human mind and emotional "intelligence." Brain sciences and artificial intelligence studies will add significant insights along the way.

The missing link is that while there may be a unified understanding of the need to teach students to think "better," there have been no reliable

approaches for whole schools to use for changing the processes to support this shift. There are calls by leaders across all fields for isolated “techniques” to develop thinking, or turns to new technologies as “the” answer, and/or a scattered array of seemingly disconnected lists of “21st century” skill sets and umbrella approaches that ultimately don’t put forward an integrated design.

There is no one way forward or cookie cutter design, but here is an offering: In this book we are sharing

- a clear and adaptable definition for thinking schools,
- a sustainable approach for transforming schools over time,
- five broad dimensions for a school to use to consider a range of models,
- six practical “starting points” for student use immediately, and
- three “student centered” models (what we call *pathways*) for implementation over 3 years that are integrated and used together by students.

The definition, approach, dimensions, practical starting points, and three major models for long-term implementation are presented in summary below and surfaced throughout the chapters of this book. (In addition, in Chapter 4, 14 criteria for guiding the implementation, assessment, and optional accreditation as a Thinking School from Exeter University are described by Bob Burden.) The fundamentals of this framework are excerpted in part from the awareness and planning guide, *Growing Thinking Schools from the Inside Out* (Hyerle, 2010). This Growing Thinking Schools (GTS) guide is used by facilitators who are working with school faculties in one- or two-day workshops as they begin investigating the needs of their school, plan a multiyear design for systematic change, and engage in a dialogue about how to move forward, and why.

I. The Thinking Schools Definition

The overall approach of Thinking Schools was developed through the collaborative efforts of U.K. and U.S. educators who over many years worked to refine the resources for Thinking Schools that could be translated into different languages and adapted for use in different countries. The Thinking Schools International network formally began 6 years ago and is a synthesis of a rich history of educational approaches to improving thinking abilities. Its vision is to *catalyze* and support schools using an organic structure that is adaptable by design yet systematic in focusing on development of students’ thinking in a school and across networks of schools.

Our development group, after working across whole schools in pilot approaches, knew we needed a formative definition of a thinking school, and fortunately one of our colleagues, Professor Bob Burden (2006), offered a thoughtful description that has been revised several times, and that almost every school has used and adapted for their own community:

A “thinking school” is an educational community in which all members share a common commitment to giving regular, careful thought

to everything that takes place. This will involve learning how to think reflectively, critically and creatively, and to employ these skills and techniques in the co-construction of a meaningful curriculum and associated activities. Successful outcomes will be reflected in students across a wide range of abilities demonstrating independent and co-operative learning skills, high levels of achievement, and both enjoyment and satisfaction in learning. Benefits will also be shown in the ways in which all members of the community interact with and show consideration for each other and in the positive psychological well-being of both students and staff. (para. 1)

In order to achieve this goal, a whole school approach will be necessary whereby all stakeholders (including parents and school board members/governors) are fully committed to the school's aims and how they can best be achieved. Staff will need to be specially trained and methods will need to be introduced into the curriculum for teaching the skills of thinking and associated cognitive and meta-cognitive strategies. The widest possible application of these skills and strategies should underpin all other aspects of the curriculum and should guide behavior policies and expectations about human interactions at every level and care for the environment. (para. 8)

This definition is purposefully broad to support school faculties and their wider learning community as they establish their own principles. At the same time, it is clear that by definition this undertaking is not about simply implementing a single thinking skills "program" or seeking to create a parallel curriculum based on developing thinking. It is a whole school approach that focuses on the development of every student's range of abilities to consciously learn to apply integrated models for thinking content learning in collaboration with other students, teachers, and administrators beyond the walls of the classrooms, down the halls, and into the community.

A renewed ethos across the learning community of Thinking Schools that draws from multiple meanings of the word "thoughtful" has been documented over the years. It is in this term through which we may find a useful definition for thinking: The mental and emotional skill and behaviors of the individual to skillfully reflect on their own perceptions and processes of making sense of the world by engaging with empathy and care with others, thereby improving their ability to learn and the infinite capacities for thinking.

2. An Approach for Developing Thinking Schools Over Time

A near universal metaphor of "life is a journey" (Lakoff, 1980) is explicitly used as the guiding concept for the Thinking Schools approach. The "journey" described in the GTS text is much like one you might take to a foreign country. Imagine yourself holding a guidebook, describing possible options, and accompanied by an actual local guide who can provide deeper background information about the sights around you as well as recommend additional

options for exploration based on *your* interests. GTS facilitators “guide” whole school faculties in reflecting on the context of their learning community, framed by their culture, for planning the itinerary for their own change and development. Each school faculty begins drawing its own ideas together for what will work in their school environment—with their students—while not depending on western frameworks and definitions for thinking as the sole source for creating a plan of action and implementation.

Within the initial workshop, it is stated unequivocally that the development of thinking schools will not be effective if it is episodic; it must be *planned* by the school that will be making the change in the short term and for years ahead. Such a shift needs to be well-structured, sustainable, and adaptive to every school. Most important, it must be fully owned by the school community. The process of change, the explicit shift toward a new paradigm for schools, also needs to be congruent with the vision of open-minded, more democratic thinking, again not solely defined by one absolute definition of “democracy.” Obviously, this shift is about thinking, and not “thought control.” To be authentic rather than prescriptive in our “thinking” requires a process that is not about imposing a template—a Western model—on each school. Rather it involves *catalyzing* and thus empowering local stakeholders to take ownership of the change process as a community, committed to a sustained focus on developing thinking. This is not easy, because many “change” processes are often forced down from the top or implemented somewhat randomly across schools with very little professional development support on the front end nor sustained over time. Though demands to “make” thinking a foundation from learning may often come in many countries from the top down and tied to funding, ultimately a sustained focus on the development of thinking in a school community must come *from the inside out*.

GTS facilitators are *catalysts* for *third-order change*. Organizational change is often characterized as having different *levels* or *orders* of development. One practical model, identified by Baruntek and Mock (1987) describes first, second, and third-order change. Consider as you read that each of these orders of change may happen in a school simultaneously.

First-Order Change is the most common path for schools as they focus on improving existing practices and patterns. This is especially problematic when deeper changes are needed. This may be good for less complex problems, troubleshooting, and meeting short-term needs (such as raising test scores), but not for long-term shifts in the school as a whole. It rarely, if ever, brings about significant shifts in student performance.

Second-Order Change occurs when school members believe that significant change is needed to meet new challenges—such as we have now with schools needing to adapt to the “flat world” global economy. Schools may bring in new programs, new technologies, expert consultants, and aligned curriculum to help them respond to the new challenges. Though big picture ideas like becoming a “21st century school” may loosely frame the change, and the change may be significant, it often does not shift the school into renewal and the self-guided transformation that is possible. Many of the changes may not

be integrated together: There may be more technology, more hands-on learning, more cooperative problem-based learning, and even the deep and systematic use of a single “thinking skills” program, but ultimately the outcomes in real terms of student learning may not shift the school forward to a new vision of education given all the positive efforts and financial investments that are made.

Third-Order Change happens when school members decide that they want to shift the organizational vision into practice. Taking on this level of change cannot be sustained from the outside, but must be driven from the inside, by the school at large. The school must take control of the change process. It is not about a single program or a “heroic,” charismatic principal who single-handedly changes the course of a school, though focused, collaborative leadership is essential. Third-order change requires articulating a new direction or paradigm by creating a dynamic and flexible plan that all educators attend to regularly (not a stale “strategic plan”). It also includes nurturing differentiated teaching approaches and the existing practices and programs that are working. It does not mean just throwing high-quality programs and processes out the door!

At the same time, it means that teachers agree to ensuring that as new students come into the classroom the thinking process models are reinforced with each year so that there is alignment in practice, just as there is alignment with scope and sequence in content learning, and flexibility in how each teacher engages students in the content.

For Thinking Schools, third-order change thus encapsulates improving existing best practices (first-order change) and bringing in outside expertise and programs (second-order change) while projecting a new vision for school change over time. Important to note, this order of change envisions that all members in the school community are actively and skillfully engaged in the process of shifting and shaping the ethos and culture of the school. It is within the context of third-order change that Thinking Schools work. The third-order processes of Thinking Schools, embodied in the school-wide development and GTS guide, offers an approach that engages the balancing act of offering structure and adaptability, providing clarity and guidance without prescribing a singular direction that every school should take on the journey of becoming a thinking school.

The broad dimensions of thinking, “starting points” for initiating the work, and three pathways for implementation offer teachers and whole schools a synthesis of the field of possible ways forward and a high degree of flexibility for each learning community to make this paradigm shift in their own way.

3. Five Broad Dimensions of Thinking

In the early stage of the introductory GTS workshop with faculty, the question that is on everyone’s mind has surfaced: *So . . . what is thinking?* As discussed above, this is not so simple. Given a few thousand years of recorded history, it seems plausible to at least have a general sense of the categories, or dimensions, of thinking. There are so many ways of framing and categorizing

different types of thinking, so these five dimensions are offered as a summary and not as a definitive, exclusive view:

1. *Cognitive Processes*, which are sometimes called “mental operations,” are generative as well as logical in form.
2. *Inquiry Processes* focus on questioning, philosophical dialogue, cooperative learning, and collaborative problem solving.
3. *Dispositions* include facilitating characteristics of a high-quality thinker, instilling habits of mind, and development of emotional “intelligence.”
4. *Learning Modalities* as represented through visual, auditory, and kinesthetic modes of processing information and the theory of multiple intelligences.
5. *Creativity* or what may be called “generative” thinking is being able to search for unique or novel alternatives during problem-solving processes.

Facilitators ask participants in the workshop to question, critique, and add to this model and engage with each other in discussion about what is missing and how these dimensions interact and overlap. It is less important to get a definitive taxonomy of thinking “right” than to become aware that the ongoing questions (What is thinking? or How do we think?) will be an engaging part of the journey of discovery over many years, no doubt without end! Just as travel guides are helpful, no guide can replace the experience of being there and seeing the subtleties of people and places. The journey toward a thinking school is exciting, year after year, as these questions become one of the animating centers of students’ classroom interactions.

Here are the brief descriptions of the five dimensions offered participants:

1. *Cognitive Processes*. There are many different models of cognition, starting long ago with Jean Piaget’s identification of mental operations such as comparison, categorization, and cause-effect reasoning. In the past, these have been defined as logical operations, but this severely constrains our understanding of these skills. Benjamin Bloom’s *Taxonomy of Cognitive Objectives* (revised) includes six types of cognitive processes (from knowledge to creative) and four types of knowledge (from procedural to metacognitive). (Anderson, et al., 2001)
2. *Inquiry Methods*. Methods of enquiry often engage deep questioning techniques, problem-based learning, decision making, cooperative learning, and use of the scientific method. Matthew Lipman’s *Philosophy for Children* program is one example of how to integrate critical thinking, questioning, and Socratic processes applied to important issues. Another area more recently developed is the field of conflict resolution.
3. *Dispositions*. The development and mediation of the “character” of thinkers is a focus of Reuven Feuerstein’s *Instrumental Enrichment* program. Art Costa’s *Habits of Mind* model includes dispositions such as persistence, flexibility, and metacognition that are used by students to understand how they

approach problems where solutions are not immediately apparent. Many schools also focus on development of emotional intelligence or social-emotional learning.

4. *Learning Modalities*. Learning modalities commonly focus on visual, auditory, and kinesthetic learning. Howard Gardner's *Multiple Intelligences* does not offer an IQ or measure for each type of intelligence, but a range of how knowledge is represented. Visual tools and the language of *Thinking Maps* is a model of how the visual processing and organizational capacities of the human brain and mind support learners at any age. This model (Hyerle, 2010) draws deeply from the cognitive processing dimension.

5. *Creativity*. Directly facilitating creativity engages students' open-ended, innovative, and expressive thinking. Many techniques for focusing on flexible, creative thinking have been developed. Some models are Edward de Bono's *Lateral Thinking* and *Six Hats Thinking* for problem solving within and across disciplines. Here are the "hats":

White hat thinking identifies the facts and details of a topic

Yellow hat thinking focuses on the positive aspects of a topic

Black hat thinking examines the problems associated with a topic

Red hat thinking looks at a topic from the point of view of emotions and feelings

Green hat thinking requires creativity, imagination, and lateral thinking

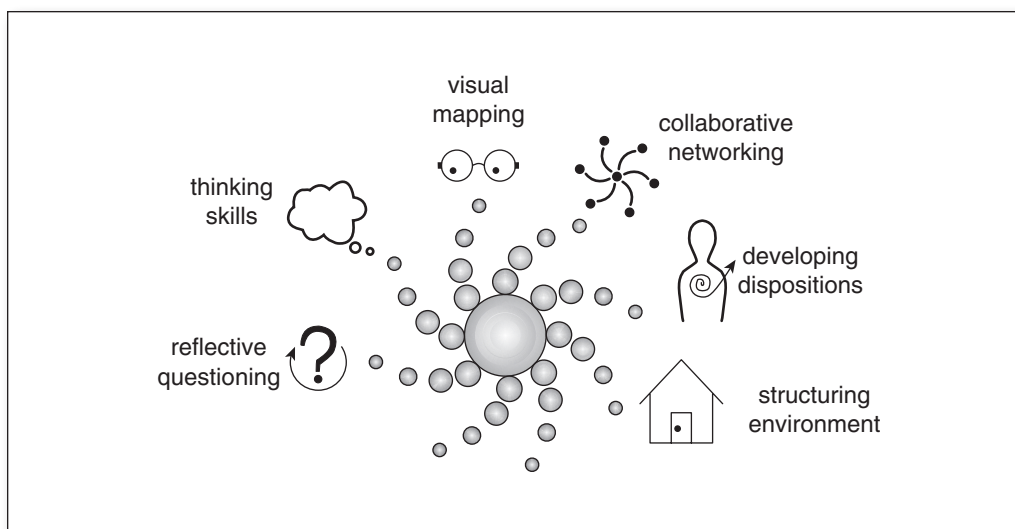
Blue hat thinking focuses on reflection, metacognition

As with the other three models taught to students across the whole school as described in the sections below, students learn to independently put on one or several "thinking hats" when they are learning content, problem solving, and decision making.

The five dimensions of thinking are overlapping, unified in our daily thinking, and certainly not exclusive of other definitions, approaches, and models, and ways of thinking that may surface inside and outside schools. Even more important to realize is that most richly developed models for implementation cross many if not all these categories.

4. Starting Point Classroom Strategies

The five dimensions described above initiate a rich discussion of broad types of thinking. The next step in the GTS workshop is to introduce teachers to "starting point" thinking strategies that may be used immediately on returning to classrooms and for use in faculty meetings. This is essential as teachers see in concrete terms how the five broad, abstract "dimensions" may inform fundamental, pragmatic, everyday strategies in classrooms—some they may already use as regular tools of the trade.

Figure 1.1 Six Starting Points for Thinking

The six starting points for thinking that are modeled and used during the work include

1. Visual tools for mapping content using concept mapping, inductive towers, and Thinking Maps.
2. Thinking (cognitive) skills such as comparison, cause-effect reasoning, categorization, sequencing, and metaphor (also supported by visual tools).
3. Reflective questioning that engages upper levels of Bloom's taxonomy and metacognition.
4. Habits of Mind such as persistence and open-mindedness.
5. Collaborative networking through well-designed cooperative learning techniques and questioning techniques via an inquiry cycle.
6. Designing a classroom habitat that supports a "thinking" environment.

There is often a range in degrees to which teachers who attend the initial seminar already use some of these "best practices" strategies. Many teachers often feel that they do use best practices, yet we also surface two essential questions during the workshop:

1. *To what degree are your students practiced and fluent in these processes so they can integrate these models of thinking together while independently and interdependently using these models without your continuous guidance and direction?*
2. *To what degree do your students have continuous follow-up use and improvement of their thinking that is developmentally appropriate from year*

to year across disciplines, whether at the elementary, secondary, or college level?

These two questions together are the fulcrum for propelling a school forward toward the long-term, consistent development of students' fluency in thinking. Simply stated: How does a school move from *best practices* to *best models* for developing students' thinking over time across the entire school so that students are *fluent* with integrated *models* for thinking?

5. Implementation of Three Pathways and Best Models

The five dimensions of thinking are broad brushstrokes on an evolving tapestry that help establish an Understanding that a Thinking School is not simply about using a few starting-point best practices that create a more open classroom for thinking across the schools. On the other extreme, taking on a highly generalized school-wide theory such as "interdisciplinary" learning or asking more "philosophical" questions may be useful ways to begin, but then what?

This is why during and after the initial GTS workshop a select few research-based models are introduced to faculty as exemplars that have been shown in practice to support a school through more systematic implementation. These models are purposefully *student-centered*. There are many worthy and strong theories, models, and programs for thinking that have been developed with a primary focus on improving teacher quality and engaging students in their thinking. Most of the other models, on close analysis, may promote student-centered *instruction*, but not necessarily student-centered fluency and automaticity with the approach. There are very few models that have at their core the intent—built into their implementation design—for students to become fluent with explicitly using the model independently and in cooperative groups to learn and improve their thinking.

Let's look at a very common situation in many schools in the United States. Bloom's Taxonomy of Cognitive Objectives (even in revised form) is primarily used as a teacher-centered model. But it doesn't have to remain that way and may be used by students during the inquiry process, for their own development of questions, and to see different types of cognitive areas. The taxonomy has been used thoughtfully, but almost *exclusively* by teachers for structuring and designing curriculum, for improving teachers' range of questioning skills, and even for school-wide curriculum alignment. Some teachers may hang a poster of Bloom's taxonomy on their walls and consistently reference the vocabulary *for* students and say, "Let's analyze this and then we will evaluate what we have learned." There are some students who are relatively fluent with the vocabulary of the taxonomy, *but rarely as an independent model for their own use*. This is crucial: If you ask students what they know about Bloom's taxonomy, or better yet, if they can apply Bloom to their own learning, they will sit in stunned silence. The transition from a primary focus on teacher quality of instruction to student quality of thinking is an essential discovery on the path to a Thinking School.

There are three pathways for systematic focus and implementation that have been used across most Thinking Schools and described in more practical detail in this book. Within each pathway a school normally chooses one research-based model that drives to the heart of the pathway and has proven, practical applications and success in other Thinking Schools. Here is a summary of the three “pathways” that are suggested:

Visual Tools for Thinking, which focuses on students applying thinking skills (cognitive processes) using a consistent set of nonlinguistic tools (visual, spatial, and often verbal) such as the Thinking Maps model.

Dispositions for Mindfulness, which gives students access to and a language for improving their intellectual-emotional behaviors as they learn, such as Costa and Kallick’s Habits of Mind model.

Questioning for Inquiry, focusing on improving *student-centered* abilities to ask questions in the context of developing a Community of Inquiry, integrating high-quality questioning models, Bloom’s revised taxonomy, Six Hats Thinking model, and norms for using cooperative learning.

Of course, there are many other models or programs that a school may decide on implementing and GTS facilitators support schools in creating their own approach. Schools normally implement only one new model each year or even longer so that students (and teachers and administrators) can learn these models deeply, focus on how to integrate the models together for improved thinking and performance, and not be overwhelmed by too many new tools at a time. Each of these models has unique characteristics. The models need to be accessible and practical for teachers *and* students to use in everyday classroom activities and transferrable across grade levels and content areas. The models are also “tool-based,” meaning that students can learn to use the processes without buying extensive written “programmatically” materials or a separate “thinking” curriculum that becomes an “add-on” program in the school.

There are few approaches that actually have these characteristics. Important to note, as described in several chapters, these models approach thinking from different pathways yet work together as a coherent framework when used by students year after year. After a school is satisfied with basic student fluency in one model, they begin layering in second and third models within the broad pathways for thinking, creating a differentiated approach unique to that school over several years. Here are brief descriptions of select models within each pathway. Remember that this is not about learning a simple “skill set” but rather that students are learning about how they think and how to weave together visual thinking tools, develop dispositions for thinking, and deep processes of inquiry and questioning.

The Visual Tools for Thinking Pathway and the Thinking Maps Model

Visual tools, or “nonlinguistic” symbols systems, include three basic categories, each with a specific purpose for supporting learners in creating visual patterns from information, ideas, and experiences. Visual tools reflect the brain’s

capacity to construct patterns from information and construct relationships between and among ideas and concepts.

As shown in the tree map, there are three general, overlapping categories of visual tools that are now seen across many schools, but often in scattered fashion.

The research behind this pathway may be reviewed in *Visual Tools for Transforming Information into Knowledge*, along with a synthesis model, Thinking Maps (Hyerle, 2009). One type of visual tool is “brainstorming webs,” used for fostering creativity and open-mindedness and often called webbing, clustering, semantic mapping, and Mind Mapping. A second type of tool is now common in schools: graphic organizers for fostering analytical content and process specific learning. These tools are often “performed” visual displays for guiding students to systematically organize information or to follow a specific task. A third type of visual tool is “conceptual mapping,” supporting students in building interconnected, nonlinear conceptual understandings. Concept maps, inductive towers, and systems thinking modeling are all conceptual visual tools with different theories and practice driving classroom use. All these visual tools, in unique ways, facilitate students in deep patterning of connected information or “factual” content into organized, dynamic, connected knowledge.

A synthesis model of visual tools, Thinking Maps, was developed in the early 1990s and is often used in Thinking Schools. This “language” or model has a common visual grammar and in practice by students integrates the creative dynamism of webs, the analytical structures of content-specific learning, and the conceptual model building fostered by concept mapping.

Students become fluent with the eight Thinking Maps by creating them from blank paper, white boards, or computer screens, linking information across multiple maps. A rectangular frame may be drawn around each map as needed, within which students jot down and reflect on the “references” that influenced

Figure 1.2 Types of Visual Tools

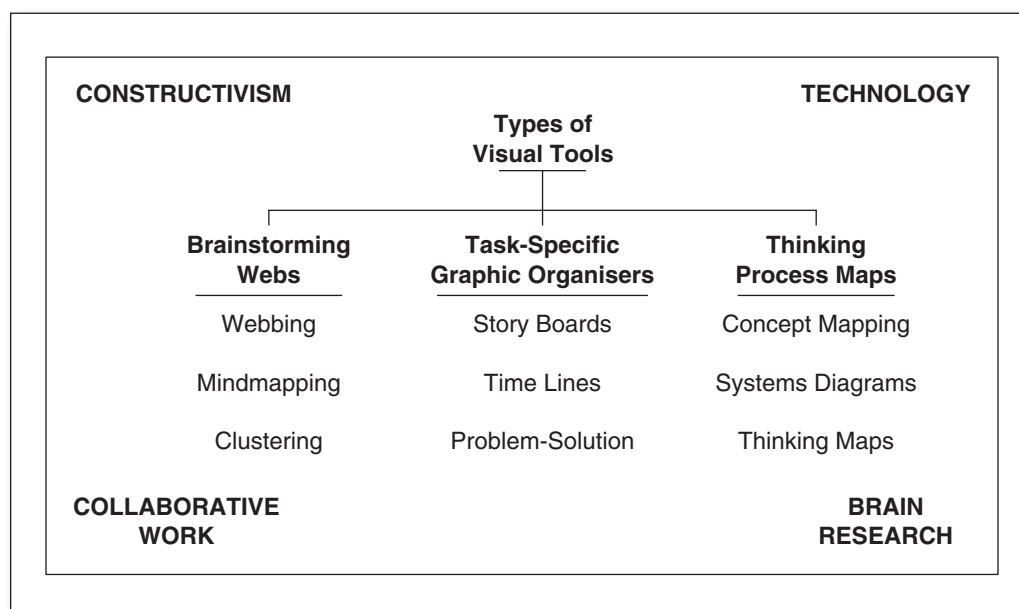
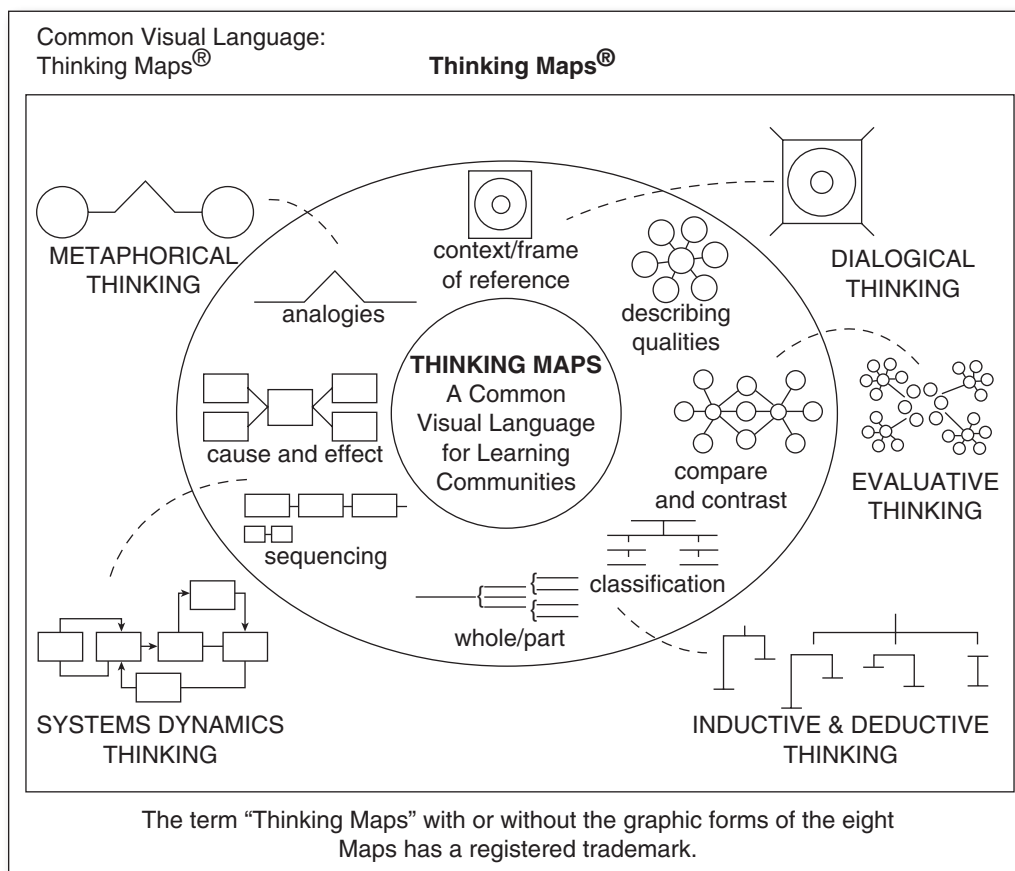


Figure 1.3 Introducing the Thinking Maps Language

Source: Hyerle and Alper (2011).

or "framed" their ideas, how they patterned the ideas, and even their decisions about what cognitive processes and multiple patterns of "thinking" they decided on using to build their understanding and make meaning. This "frame of reference" is also defined as a *metacognitive frame* so that students begin to see where their ideas are coming from, to critically reflect on who and what media may be influencing how they think, as well as engaging empathically with their peers and their teacher by concretely *seeing* each other's thinking in maps.

The use of each Thinking Map (Hyerle and Yeager, 2007) also reflects a range of essential questions, each based respectively in a cognitive process (shown in bold below) and used during inquiry processes. Here are a select few questions fostered through the use of each map as a thinking process:

- Circle Map: How are you **defining** this (concept) and in what context?
- Bubble Map: How would you **describe** the sensory, logical, and aesthetic/emotional attributes?
- Double-Bubble Map: How are these similar and different, and how would you **compare** these things?
- Tree Map: How are these grouped together or **classified**?
- Brace Map: What are the **parts** and subparts of a physical, whole object?

- Flow Map: *What was the **sequence** or cyclical steps of events?*
- Multi-Flow Map: *What were the **causes and effects** and feedbacks?*
- Bridge Map: *Is there an **analogy** or metaphor that is guiding these ideas?*

In many Thinking Schools, and as described within chapters in this book, students have significantly improved their capacities to learn academic language, think through information, read and write with greater depth and organization, and become more metacognitive about their thinking. They also see how their different thinking processes may be orchestrated as they comprehend text, write essays, understand complex concepts, and work collaboratively to solve problems with peers. As with the other approaches used in a Thinking School, Thinking Maps are introduced, modeled, and used by students so they internalize the maps as a language for learning and their long-term fluency with fundamental processes of thinking is fully developed.

The Dispositions for Mindfulness Pathway and Habits of Mind Model

There is a long history of theory, research, and practical means for giving students a clear model for the often-elusive and ill-defined area of thinking: how to develop the qualities of mind that support thinking, or what are called *dispositions*. This is not to be construed as “character education” driven by a dominant cultural value system. This field of thinking is explicitly framed by the cognitive psychology research on how we as human beings, in general, approach and solve problems. Teachers in classrooms, as well as parents at home, are concerned about how children may develop dispositions for engaging confidently and openly with any problem, content learning, complex cross-disciplinary concepts, challenges of college and the workplace, or life decisions they grapple with every day. Here is a definition of *dispositions*, or Habits of Mind, developed by Art Costa and Bena Kallick (2000), who have over the past 40 years done the most systemic and well-documented work in this area:

By definition, a problem is any stimulus, question, task, phenomenon, or discrepancy, the explanation for which is not immediately known. Thus, we are interested in focusing on student performance under those challenging conditions that demand strategic reasoning, insightfulness, perseverance, creativity, and craftsmanship to resolve a complex problem. Not only are we interested in how many answers students know, but also in knowing how they behave when they DON'T know. Habits of Mind are performed in response to those questions and problems the answers to which are NOT immediately known. We are interested in observing how students produce knowledge rather than how they merely reproduce knowledge. The critical attribute of intelligent human beings is not only having information, but also knowing how to act on it. (p. 3)

Yvette Jackson (2011), in *Pedagogy of Confidence*, describes how the direct mediation of cognitive processes and dispositions, such as those framed by the Habits of Mind model, directly influences students who are underachieving. This highlights the need to focus on emotional intelligence as well as direct

instruction in content learning for all students, but especially those who do not *feel* confident and have not yet developed the resilient character of a high-quality thinker.

A unifying theme across these descriptions is that the essence of thinking does not simply lie at the foot of pure reason and logic, or “information processing,” but in a wide array of interdependent social-emotional-intellectual traits and attitudes that grow over time within each person. How each of us responds independently, internally, as we think in the relative quiet of our own minds also happens as we interact with others, interdependently, as we solve problems and make decisions with others. The more effective we are in supporting mindful, reflective thinking, the greater opportunities there are for learners to master the cognitive load of information in the world and not get overwhelmed while being able to bend, mold, and create knowledge, innovate, and make better decisions.

Every day in classrooms teachers observe, often with exasperation, that so many students don’t persist and persevere when confronted with a problem; they don’t think openly and creatively about alternative solutions, and they do not draw on the innate powers of their mind to systematically check or reflect on their work. In the daily practice of teaching and learning, many teachers and students move on to the next set of exercises and activities, rarely pausing to mindfully step back and think about *how* they are thinking. Benjamin Bloom long ago named this problem: one-shot thinking. While intuitive leaps are key to insight and novel breakthroughs in thinking, many learners (of every age) jump to conclusions regularly as they go with “whatever comes to mind.”

So how does a school develop more reflective students in explicit ways? Students need to be systematically introduced to more than single “dispositions,” or told repeatedly to “pay more attention,” or use a few problem-solving strategies out of context. The Habits of Mind model for students is introduced in the classroom slowly, systematically, and explicitly over time, enabling students to grow to a more sophisticated awareness of how each disposition has a direct influence on their thinking and their classroom performance.

Here is a brief summary of the 16 Habits of Mind (Figure 1.4):

Costa and Kallick believe that these dispositions may be understood as fundamental outcomes, or goals for education. Within the vision of a Thinking Schools approach, when students explicitly begin the lifelong development of these dispositions as a *habitual* dimension of their approach to learning, they have these habits reinforced within each classroom. At every grade level they are challenged by more complex problems requiring persistence, flexibility, and an openness with others as they work interdependently. Thus, a sustained attention to these dispositions is important over time and not perceived and defined as a “soft” skill, rather as an essential array of interdependent traits of effective learners and lifelong thinkers.

The Questioning for Inquiry Pathway and Cycle of Inquiry Model

The pathways described above, Visual Tools for Thinking and Dispositions for Mindfulness, are just two possible first steps for a school, and there is no “correct” order of implementation. Thinking Maps and Habits of Mind, as

Figure 1.4 16 Habits of Mind

Persisting—Persevering in a task through to completion; remaining focused. Looking for ways to reach your goal when stuck. Not giving up.

Managing impulsivity—Thinking before acting; remaining calm, thoughtful, and deliberative.

Listening with understanding and empathy—Devoting mental energy to another person's thoughts and ideas; making an effort to perceive another's point of view and emotions.

Thinking flexibly—Being able to change perspectives, generate alternatives, and consider options.

Thinking about your thinking (metacognition)—Being aware of your own thoughts, strategies, feelings, and actions and their effects on others.

Striving for accuracy—Always doing your best. Setting high standards. Checking and finding ways to improve constantly.

Question and problem posing—Having a questioning attitude; knowing what data are needed and developing questioning strategies to produce those data. Finding problems to solve.

Applying past knowledge to new situations—Accessing prior knowledge; transferring knowledge beyond the situation in which it was learned.

Thinking and communicating with clarity and precision—Striving for accurate communication in both written and oral form; avoiding overgeneralizations, distortions, deletions and exaggerations.

Gathering data through all senses—Paying attention to the world around you. Gathering data through all the senses: taste, touch, smell, hearing, and sight.

Creating, imagining, innovating—Generating new and novel ideas; striving for fluency and originality.

Responding with wonderment and awe—Finding the world awesome and mysterious and being intrigued with phenomena and beauty.

Taking responsible risks—Being adventuresome; living on the edge of one's competence. Trying new things constantly.

Finding humor—Finding the whimsical, incongruous, and unexpected. Being able to laugh at oneself.

Thinking interdependently—Being able to work and learn from others in reciprocal situations. Engaging in teamwork.

Remaining open to continuous learning—Having humility and pride when admitting you don't know; resisting complacency.

student-centered models, both draw on questioning techniques for facilitating thinking. This brings us to a third pathway that may be an important first step for a school that has not had exposure to questioning processes, or for a school that uses high-quality questioning and has yet to help students internalize these skills within a cycle of inquiry process or problem-based learning. The capacity to confidently pose thoughtful and challenging questions in a more systematic way is essential to learning, lifelong, and critical thinking when engaged in complex problems requiring attention to value-driven solutions with “moral” or ethical contexts. Supporting *student-centered* questioning, embedded within a more comprehensive focus on inquiry, is a third pathway along the journey toward becoming a Thinking School.

We use questions every day. As educators, how many of us in classrooms, in professional development contexts or in faculty meetings hear ourselves, in a pro forma way, ask this question and then *very* quickly move on: “Do you have any questions?” We may (or may not) want to know if our students or colleagues understand something we have said or if they *really* have questions. But most of time—and often because of time constraints or force of habit—we don’t even give our audience time to think before we move on. Many schools have used different models for questioning and often with sophistication at higher orders of thinking. Frequently, though, these questions have a glass ceiling: They are initiated by and scaffolded by teachers alone. Students remain receivers and responders. Developing student-centered questioning and collaborative learning approaches within the processes of inquiry takes questioning beyond these artificial ceilings of use.

Questions are powerful, and they can be deadening as well as provocative. Professional development for improving teacher questioning over the past decades has brought a welcome focus on the importance of questioning, mostly through the use of Bloom’s taxonomy as a framework for “higher-order” thinking. Additionally, isolated techniques such as “wait time” to give students time to reflect and grounding curriculum unit development in “essential questions” have been useful additions to the field. Unfortunately, Bloom’s model has been misconstrued as being a *sequential* model, one that moves up step by step, much like being on a ladder. This means, in practice, many teachers have been trained for making sure that students can thoroughly answer lower-level questions before asking higher-order questions. Because of the sheer amount of content “to cover,” content mastery questions then hold sway in classrooms.

Curriculum designers, publishers, and test makers who are key drivers of teacher quality performance create teacher resources with this hardened view that students must show that they have acquired lower-order “factual” basic knowledge in a subject before higher-order questions that involve synthesis, reflection, creativity, and evaluation may be asked. A teacher who is asking questions every day is *implicitly* modeling for students how they may become better at using questions to improve their own learning and thinking. When the questions year after year focused on low-level responses, students came to see learning as fundamentally about “right” and “wrong” answers to closed-ended questions *from someone else* rather than generating a questioning mind-set from within.

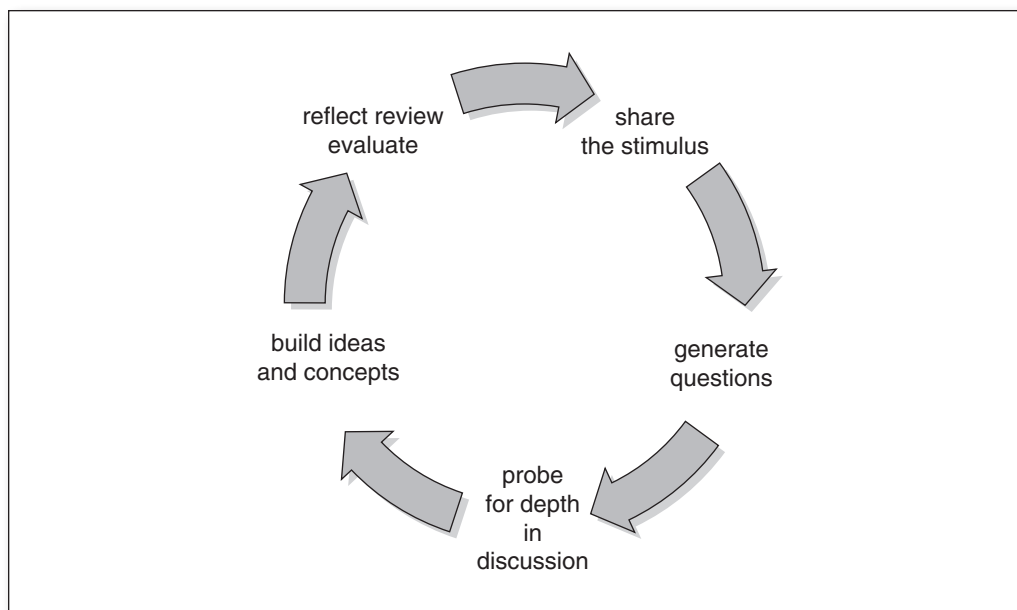
Much of the research and practice of questioning techniques in education have been on teachers' use of questions to promote student understanding of content and concepts and very little about developing students' fluency within more comprehensive processes of inquiry. Evident in schools across the United States and around the world is that questioning in classrooms remains relatively low level, focused on rote responses and testable items, and often disconnected from meaning making. Additionally, teachers may structure their classrooms for cooperative learning and even set clear roles and norms for "group work," yet these essential parts of the inquiry processes are also left to the service of content specific learning alone. Cooperative learning groups are the perfect venue for students to develop questions on their own rather than as places where "work" is done in groups.

Asking questions has been perceived as *the* key tool set for teaching since Socrates. During the aforementioned "thinking skills" movement of the 1980s and early 1990s, Matthew Lipman (2008) developed the *Philosophy for Children* approach that still is used based on his guiding vision, embedding questioning in a wider vision of a community of inquiry:

The approach that I have created in *Philosophy for Children* is not about prescribing any one philosophy to children, but about encouraging them to develop their own philosophy, their own way of thinking about the world. It is about giving the youngest of minds the opportunity to express ideas with confidence and in an environment where they feel safe to do so. (p. 32)

Roger Sutcliff and Larry Alper have developed a focused, school-wide pathway called *Questioning for Inquiry*, drawing from a select few proven models

Figure 1.5 The Cycle of Enquiry



that have been used in Thinking Schools. An overarching design that students learn is the cycle of inquiry.

Embedded in this cycle over time are the use of Bloom's revised taxonomy (Anderson, et al., 2001), techniques from *Questioning for Reflective Thinking* (Walsh & Sattes, 2011), and the "What, Where/When, Which, Who, and Why" dimensions in a questioning matrix, or "Q-Matrix."

The larger vision of developing a classroom community, or culture of inquiry, is essential to Questioning for Inquiry. Here are outcomes of the *Questioning for Inquiry* design developed by Alper and Sutcliffe, for students:

1. Explore and develop their own views and the beliefs and values of others.
2. Learn to be clear in their thinking and make responsible judgments.
3. Learn to be more thoughtful by basing decisions and actions on reasons.
4. Make links between matters of personal concern (friendship, fairness, growing up, love, and more general philosophical issues), change, personal identity, free will, and truth.
5. Learn to listen and respect each other, developing self-esteem and self-confidence.

How teachers scaffold questions so that students' thinking is engaged and supported as they learn is a key to high quality education. There has been a shift in the field toward student-centered questioning. Consider, as an example, the following outcomes *for students* from teachers' use of quality questioning articulated by Jackie Acree Walsh and Beth Dankert Sattes (2011):

- Focus their thinking on specified content knowledge
- Use cognitive processing strategies to develop deep understandings and long-term retention of content
- Ask academic questions to clarify or extend understandings
- Monitor progress toward learning targets through self-assessment and use of formative feedback
- Develop personal response ability by using structural supports for thinking
- Contribute positively to the creation of a classroom learning community in which thinking is valued (p. 3)

Notice that at the core of these desired outcomes is the ability of each student to develop as an agent of his or her own learning in the context of a school focused on student thinking. The specificity of the work by Walsh and Sattes is part of the larger purpose teachers have in mind for this approach as students are engulfed in the tsunami of information they are accessing and the complexity of living in the 21st century.

It is a rare learning community that explicitly and systematically develops questioning *students* and *their abilities* to question in skillful and intentional ways. It is even rarer that teachers across a whole school develop students' questioning

within the more encompassing processes of inquiry over many years. Questioning—within the overall vision of developing inquiry as foundation for Thinking Schools—invites students to ask their own questions, gives students “wait time” or time to think in response to questions, asks students questions that support them in thinking through their reasoning, engages students in questioning how their own lives are concretely related to abstract ideas, and most important, gives students time to practice asking high-quality questions and listening with openness. These specific techniques, along with the introduction and ongoing use *by students* of Bloom’s Taxonomy, the Q-matrix, and the Walsh-Sattes techniques noted above, are used in the service of developing a classroom culture within a community of inquiry: a Thinking School.

Questioning for Inquiry also offers a broad and deep pathway for the *Visual Tools for Thinking* path as well as crucial to the successful integration of dispositions, or Habits of Mind, into classrooms. As a matter of design, the *Growing Thinking Schools* process, as described above, reaches maturity when, after 3 or 4 years, students and teachers have fluency across these models and see their thinking as a boundless integration of possibilities, not dictated or tightly framed by one model or another. It is the integration of using these student-centered models together along with other unique aspects of each school that shows the sum as being greater than each part or pathway.

SUMMARY VIEW: DIALOGUE AT A NEW DEPTH ■

Reaching out beyond borders, networking between Thinking Schools, and making change from student to student, school to school, and country to country, is a grounding for the idea of transforming education globally. To this end, Thinking Schools is initiating a video web-based network so that people can share quality classroom practice using a similar constellation of approaches that will ensure “thinking” is not defined by one cultural frame of reference. This reflects the work of Thinking Schools International: to *catalyze* a network of educators from around the world that is evolving from a synthesis of proven practices, documentation, research, and the development of new designs in different contexts.

A catalyst is an agent that is added to two or more ingredients in a process that activates cascading change. As described in this chapter and across the following chapters, this catalyst metaphor for Thinking Schools represents

- a big picture vision of broad dimensions and definition for thinking to begin the journey toward a focus on thinking “school wide” for every student,
- the professional development with the school community so that the school creates its own systematic plan for third-order change, and
- training across several pathways with specific “best models” for student-centered use and for improving teaching across the whole school.

There is no one solution for different countries, cultures, or, really, even one classroom, one student. But we must catalyze the thinking abilities of every

student. We now face the reality that students live: They are increasingly deluged by the overweighted and overtested “tree of knowledge.” The branches are breaking. Education has become for many students a burden and a wall of frustration from which they mentally and emotionally retreat. Many students who have access to computers and handheld devices sit in classrooms knowing that after school they can easily access the “information” that teachers, textbooks, and closed computers offer in tidbits hour by hour. This *must* be frustrating, especially when students are tested on “the facts” that they could easily find in an instant using Google. This dissonance harkens back to the times when students at the high school level were not allowed to use readily available calculators and had to do basic but time-consuming calculations on paper.

Too often students drop out of school, with so little time offered to them to think and no clear way through the forest of information to an opening of their own minds. We must honor their abilities to think and offer them the tools and time to build their capacities. Many people in the business world repeat the mantra that the jobs of the future have not even been created yet, thus students need to know how to think, adapt, work together, and communicate. At the same time, we cannot reduce the idea of *thinking* as skill sets for workers in the reductionist fashion of the 20th century. We face systemic, global problems that will require our children to *think* differently, not perform within walled cubicles of tested performance at every turn. There is no crystal ball, and this is the lesson of the moment: We must now prepare our students to do what humans have done best—adapt.

The Council of Chief State School Officers, in partnership with the Asia Society, recently published a document outlining the need for “Educating for Global Competence: Preparing our Youth to Engage the World.” They state that “global competence is the capacity and disposition to understand and act on issues of global significance” (Asia Society, 2011, p. xiii).

The world needs to develop competence and, as Paulo Freire offered, a *critical consciousness* within our children from the inside out. *Growing Thinking Schools*, as described by the authors of this book, broadens our view of what is needed while refining the focus to the pragmatics for making change in schools. We all saw this need coming, but we have not responded to the degree we need to in order to make the shift. We now can offer *every* student open windows into their own unique ways of perceiving and pathways to competence drawn from practical tools for their own internal dialogue and thinking, and for the collaboration that is absolutely required across cultures around the world for dialogue at a new depth.

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