Words for the Mind

Analysis of a Language of Thinking

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Thinking Classrooms: Creating a Culture of Thinking hit Borders Bookshops in 1995 and introduced a framework that connected teacher wisdom and cognitive research.

Almost intuitively, the Harvard University authors didn't hand out a prescription. Their book was not a how-to build a thinking classroom. Instead they offered a flexible tool for creating a living culture in which students and teachers became partners in the enterprise of thinking.

Tishman, Perkins, and Jay, three researchers at Harvard University Project Zero Research Center invented what I will call for short the **Harvard Model.**

Their book opens with four forces of enculturation:

- Modeling
- Explaining
- Interacting
- Feedback

In the researchers' view, good teachers everywhere model the kinds of thinking students are to perform.

Also, good teachers explain ideas, create situations for students to interact with each other as well as with the ideas, and give feedback about student success.

Then, when following the Harvard Model, one-by-one the teachers present six dimensions of a culture of thinking, each one interacting with the four forces of enculturation.

When a teacher talks about a dimension of a culture of thinking, modeling, explaining, interacting, and giving feedback serve as benchmarks, not necessarily for every lesson. But over time, students get frequent experience in the four forces. Also, as the culture of thinking itself matures, students, in addition to the classroom teacher, model, explain, interact and give feedback. Together, they create what Peter Senge called elsewhere, a " learning organization."

The forces connect with each of the dimensions, as well.

Tishman, Perkins, & Jay offer the dimensions of a culture of thinking as follows:

- Language of thinking
- Thinking dispositions
- Mental management
- Strategic spirit
- Higher order knowledge
- Thinking transfer

Of interest in this paper, however, is the **language of thinking.**

Using David Perkins' knowledge as design method of critical thinking, it is possible to analyze the language of thinking dimension from the perspectives of purpose, structure, model case, and arguments (explanatory, evaluative, and deep explanatory levels). This analysis may be particularly timely because a real time project with 150 high school students to co-create a culture of thinking is already underway. The work here might offer a point of reflection.

Thus, my analysis explores the language of thinking dimension of the Harvard Model with attention to what has been happening with 150 tenth graders in an urban senior high school.

Reframed as questions, the following must be addressed in the analysis.

1. **Why is a language of thinking so vital?**
2. **How do the thinking words carry the day as nouns and verbs?**
3. **What happens when high schools students think about the language of thinking?**
4. **What is missing from a language of thinking?**
5. **How sound has my analysis been and how might I improve my thinking?**

Why is a language of thinking so vital?

No one has yet to explain how early humans invented language. The argument ranges from Chomsky's view that the ten to tenth power neurons in the human brain eventually massed to create an emergent property—the capacity for language--to Darwin's view that natural selection led to language.

But to some degree the evolutionary perspective does not matter. Directly observable is the universality of humankind's development of the capacity for language. People all over the world in developed and developing cultures alike have language with all its hierarchical complexities.

Chomsky has further argued that the capacity for language is innate. So by age five, children all over the world create and recognize adult-like structures in their home language communities. Most of the recent evidence accumulating from the research supports his hypothesis.

What makes language vital, however, is not its universality. Language serves to help humans to function as members of their language community. People communicate with each other through language and this communication itself serves multiple social functions.

Researchers such as Vygotsky argue that language is even vital in the development of thought, which, in turn, enables people to exchange ideas and feelings in social settings. Also, in Vygotsky's view, the development of inner speech serves as a benchmark in the capacity of thought no longer bound to just images. With inner speech, humans can make even more sense of their culture, and they can reflect on better ways of negotiating that very culture.

The 150 students participating in the "Creating Cultures of Thinking Project" already have a command of English. But at a metalinguistic level, they have not been aware that of the 800,000 or so words in the hard drive of English, only a floppy disk full are thinking words. Words such as evaluate, analyze, investigate, clarify, hypothesize, imagine, postulate, deny, ponder, pose, analogize along with words such as illumination, substantiation, elevation, hypothesis, reflection, metacognition, analogy, and generalization have more power to aid thinking than ordinary words.

How do thinking words carry the day as nouns and verbs?

"Write with nouns and verbs." That was the first rule Strunk and White gave writers. Long held in journalism programs as a kind of Bible, their *Elements of Style* offered the keys to good writing in a single little book.

But almost 50 years later, their suggestion has a new meaning.

Think with nouns and verbs.

Why might this be true?

Well, morphologically speaking, only content words can be thinking words anyway. Only nouns, verbs, adjectives, and adverbs can serve.

But nouns and verbs tell what guided the action and what the acting does. They are more immediate to experience. Adjectives and adverbs modify the noun or verb. Thus, they have more distance from the experience.

Take, for instance, these sample-thinking words from the "Starter Thinking Words Chart" based on Tishman, Perkins, and Jay chapters on the language of thinking dimension and additions from participants in the "Culture of Thinking Project."

Language of Thinking: Collective Thinking Words from the Culture of Thinking Project--Six Tenth Grade Classes at McKinley Technology High School

dream	comprehend	question	**estimate**
hypothesize	decide	imply	**realize**
conclude	ken*	deny	**relate**
investigate	demonstrate	illustrate	**consider**
recite	opinion	doubt	wonder
confirm	justify	interpret	**review**
prophet	belief	grasp*	**analyze**
experiment	reason	**infer**	**strategy**
paradigm*	**why**	synthesize*	theory*
claim	reflect	reflection	**analogy**
research	verify*	falsify*	**expand**
scenario*	evidence	evaluate	**discover**
ponder	**epiphany**	metareflection*	**imagine**
what if*	**explain**	how*	**enlightenment**
what else*	**pretend**	metanoia*	**decipher**
metacognition	**evaluation**	**create**	frontal-lobe-power**
Language of Thinking	**onomatopoeia**	**thesis**	**complication**
Thinking Dispositions	**metaphor**	**scrutinize**	**categorize**
Mental Management	**inspire**	**predict**	**erudition**
Strategic Spirit	**illustrate**	**apprehending**	metapattern*
Higher Order Knowledge	**explore**	**justification**	**proceed**
Thinking Transfer	**comprehension**	**realize**	what's missing*

The tenth graders who are co-creating the "Culture of Thinking Project" added more thinking words on six chart papers hung up in the classroom. Their additions are in bold face. Their words came from the language of thinking workshop. They will be able to add more words as the project unfolds. *These are facilitators' additions. One of the facilitators coined the term "frontal-lobe-power ("the human capacity to imagine possibilities unbounded by time and space") in an article entitled "Convergence." The phrases in italics stand for the six dimensions of a culture of thinking. The rest of the starter words in plain type are from Tishman, Perkins, and Jay.

A word such as conclude has a noun form, namely, conclusion. Conclusion like its verb-mate, captures the experience directly. Conclusively, the adverb form, however, carries some distance from the experience of deriving at a belief drawn from deductions of evidence.

Similarly, reason (both a noun and verb) closes the distance in reasonable, the adjective. Distance from experience, however, is rather abstract.

More obvious is the compactness of thinking verbs. Generally, like the Struck and White rule "omit needless words," verbs omit needless letters. Investigate has fewer letters than its noun and adjective counterparts investigation and investigative. Infer condenses inference.

Even when an adjective such as false takes a verb-making-suffix such as –ify, the gain is in power. Falsify says more than false. The act of making untrue lacks ethics while the quality of being untrue has no inherent ethical implication.

Justify has more power than just.

The six classes of tenth graders created a thinking word wall from a language of thinking. They contributed about half the words in the chart. Collectively, when combined with thinking words from the facilitators and Tishman, Perkins, and Jay, 88 thinking words stand out. That's 88 words (about .001 percent) out of >800,000 English words.

The nouns and verbs cited stated experiences directly. The verbs tended to be more compact than the nouns, adjectives and adverbs. The nouns and verbs tended to clearly meet the Tishman, Perkins & Jay criteria that a thinking word both tells the kind of thinking required and a standard for doing that thinking well.

In a single thinking word, analysis, this entire paper is stated. If I carry out the knowledge as design method well, then I will have analyzed effectively.

What happens when high schools students use the language of thinking?

James Glick once wrote about chaos theorists who felt that unobvious ideas were more interesting. Think of this: how does the language of thinking connect with Piaget's reflecting abstraction studies?

If an analogy exists between these seemingly unrelated ideas, then such similarity might provide a framework for describing what happens when tenth graders use the language of thinking.

On my study desk at home is a blue glass ball used as a paperweight. A close look reveals that two kinds of blue are on the tennis-ball-sized, heavy object (about two pounds in spite of its small size). Where a lighter blue appears, oceans also appear. Darker blues are in the shape of the Continents. Now these qualities are actually observable in the ball. Roundness, blueness, North America, Africa et al can be easily verified as properties inherent in the object. To Piaget these qualities serve as empirical abstractions.

At another level, these qualities become seas, and lands—the ball becomes a tiny globe. Piaget would call this reflecting abstraction, taking the empirical abstractions and creating less concrete qualities.

Reflected abstraction emerges when the new qualities are reordered as organic and inorganic matter, energy, ecosystems, cultures, infrastructures, and biosphere are added. These higher order, more abstract qualities not directly observable in the blue, glass ball are the reflected abstractions.

But Piaget's model does not stop there.

At a still higher order, the spherical shape of the globe resembles other spherical shapes such as the grape and the moon. These spherical shapes are not limited to physical objects but apply to ideas as well. The Harvard Model is spherical like Piaget's reflecting abstraction model. More so, each one contains interconnected smaller spheres making up their respective parts. I am engaging metareflection in Piaget-talk (or metapatterns in language of Tyler Volk).

All this explanation provides a way of observing the language of thinking.

Take the word grasp. Before my grandbaby Asha was yet one, she grasped for many objects. In this sense, grasp (to reach and hold), as in grasping a bottle of juice, is empirical abstraction. But the same word also means to understand. That is a reflecting abstraction. Now it is a thinking word, telling what kind of thinking must be done and suggesting a standard: to grasp means more that just holding; it means penetrating as well.

At a still higher level, grasp is a case of reflected abstraction when viewed along side a family of thinking words that mean to understand. Seeing both the similarities and fine differences among words classified as synonyms for grasp is reflected abstraction.

At a metareflection level, I might find that the 150 students create classifications for the thinking words. Besides the obvious noun and verb classification of thinking words is one that deal with comprehension. Such thinking words as understand, ken, penetrate, enlighten, insight, study, intuit, imply that there is something to comprehend as well.

Thinking words can deal with problem solving (riddle, puzzle, perplexing) Others deal with decision-making (pick, select, discriminate, distinguish). Still others emerge from the disciplines such as science and the arts. In any case, classifications that students might create from the language of thinking would be metareflections—thinking about thinking about thinking.

Asha is now three years old and grasping ideas instead of juice bottles. She already knows the people she talks with in Spanish vis a vis the people she talks with in English. That is reflecting abstraction.

She already has a command of phonemes in both languages and is well on her way to phonemic awareness. In fact, like her father, uncle, and grandfather, she has already begun to read at age three. By age 15, she might be performing both reflected abstraction and metareflection, too.

What is missing from this analysis of a language of thinking?

Underpinning the language of thinking in the Harvard model is language acquisition theory. Until now such notions have been missing from my analysis.

An old paradigm view of language fails to hold explanatory power when faced with understanding how adolescents acquire a language of thinking. In fact, beliefs about language acquisition rooted in behaviorism don't say enough about how children learn language by age five let alone something as metalinguistic as a language of thinking.

Fromkin, Rodman, & Hyams summarized the failures of the old paradigm view, nicely.

Analogy, imitation, and reinforcement cannot account for language development because they are based on the (implicit or explicit) assumption that what the child acquires is a set of sentences or forms rather than a set of grammatical rules. Theories that assume that acquisition depends on a specially structured input also place too much emphasis on the environment rather than on the grammar-making abilities of the child. These proposals do not explain the creativity that children show in acquiring language, why they go through stages, or why they make some kinds of 'errors' but not others. (Fromkin, Rodman, & Hyams 2005) p. 347

New paradigm language acquisition theory, however, explains how children learn language and suggests how adolescents might learn the language of thinking.

Say Fromkin, Rodman, and Hyams.

Language acquisition is a creative process. Children are not given explicit information about the rules, by either instruction or correction. They must somehow extract the rules of the grammar from the language they hear around them, and their linguistic environment does not need to be special in any way for them to do this. Observations of children acquiring different languages under different cultural and social circumstances reveal that the developmental stages are similar, possibly universal. Even deaf children of deaf signing parents go through stages in their signing development that parallel those of children acquiring spoken languages. These factors lead many linguists to believe that children are equipped with an innate template or blueprint for language—Universal Grammar (UG)—and this blueprint aids the child in the task of constructing a grammar for her language. This is referred to as the innateness hypothesis. (Fromkin, Rodman, & Hyams) pp 347-348

Given a new paradigm framework, it is clear that the adolescents co-creating a culture of thinking including a language of thinking already have language competency. That capacity was innate and in place before first grade.

Now in tenth grade they are engaging a language of thinking that will not be learned without explicit instruction even thought many of the words are already part of their lexicon.

The language of thinking occurs at the level of language about language. Unlike spoken language, it is used selectively to first empower the mind, and then empower writing, reading, speaking, listening, and viewing as an unbroken whole.

Yet, like acquiring a language, it is best learned within a culture that simply pays attention to such special semantics from time to time. In other words, once the language of thinking has been introduced, students will master the words naturally as they move through the other five dimensions, and, ultimately, apply the entire culture of thinking framework to subsequent disciplinary work in Literature as well as other disciplines.

In the case of the collaborating teacher and Educational Psychologist at McKinley High, if they are able to follow up next year with the same students but in English III, the next layer can added to a culture of thinking, namely, Harvard's visible thinking program. Add to that a future studies approach in which each student extends frontal-lobe-power, the capacity to imagine possibilities beyond time and space. It is easy to see that thinking words will emerge naturally.

Restated, my hypothesis is that adolescents will learn a language of thinking naturally within the context of a culture of thinking. Along the way, the teacher may strategically point out, and encourage students to point out, the power of thinking words.

Think with nouns and verbs.

How sound have my responses been in this analysis? What might I improve?

Each response addressed the question, balancing observations and research based fact, original thinking and store bought knowledge. Yet, no knowledge is ever really complete about any demanding idea. For example, in my discussion of language acquisition, I said nothing about the fullness of views from Chomsky, Vygotsky, Piaget, Brunner, the collected research on language and thought. Nor did I discuss a modern intelligences perspective such as that inherent in Howard Gardner's multiple intelligences theory, particularly higher order, verbal linguistic intelligence. Nor did I include the insights from African Psychology, especially my paper on convergence with its insights about how human intelligence might evolve during the next 100 years.

However, within the limitations of a ten page or so, analysis paper, this one offers a fair amount of depth. Also, it creates new puzzles to solve.

For examples, how do adolescents acquire a language of thinking? What counts for a language of thinking in a culture of thinking? To what degree does Piaget's model for reflecting abstraction explain language performance? To what degree does acquiring a language of thinking enhance human capacities to write, read, speak, listen, and view? What role does a language of thinking play in the development of language and thought? How does a discussion about a language of thinking add value to two larger practical application projects: "Creating a Culture of Thinking" and "Creating a Culture of Thinking in DCPS"? Or how might I factor in a discussion about the language of thinking in the book I am researching (Thinking Classrooms for a Flat World)?

Left with such puzzles, I am reminded of my favorite quotation from the words of science fiction writer Frank Herbert.

"Education is no substitute for intelligence. That elusive quality is defined only in part by puzzle solving ability. It is in the creation of new puzzles reflecting what your senses report that you round out the definition."

Selected Bibliography (to think outside the box of a language of thinking)

Akbar, A. (1998). ***Know thy self.*** **Tallahassee, Florida: Mind Productions and Associates.**

A vital counterpoint to the Anglo Saxon values dominating much of psychological thought and Western society, this book offers a three-fold cord for liberation of African American people. The author argues that African Americans must define the self in positive terms, create a legacy of competence (images of African Americans who are or have been achieving), and develop a shared vision of our possibilities, individually and collectively.

Andrews, D. ((2000). What brain research has to tell educators: Mandates and metaphors. ED412 073

A review of recent research from the neuropsychology field vis a vis educational applications, this author argues that brain research be best viewed for themes, metaphors and mandates for educators. He warns that specific classroom application from brain research are unsound, but metaphors such as active learning develops the brain offer rich applications for instruction and assessment.

Blythe, T. (1998). ***The teaching for understanding guide.*** **San Francisco. Jossey-Bass.**

A practical entry into the teaching for understanding framework emerging from research and practice at Harvard University Project Zero Research Center and classrooms around the world, this guidebook instructs readers in each of the components to the framework.

Capra, F. (1982). ***Turning point: Science, society and the rising culture.*** **New York: Bantam Books.**

Extending Thomas Kuhn's word paradigm, this book argues that now paradigm refers to the sum of beliefs and values of a whole civilization. More so, as the argument goes, a new paradigm is emerging to replace the Newtonian one that has dominated Western Thought for at least 400 years. This ecological paradigm offers new insights and perspectives about human life on Earth.

_____, Steindl-Rast, D. and Matus, T. (1992). ***Belonging to the universe: Explorations on the frontiers of science and spirituality.*** **New York: Harper San Francisco.**

Among the first books in the world to cite defining characteristics of a new paradigm in science and spirituality, this book explains the ecological paradigm in more detail.

_____. (1996). ***The web of life.*** **New York: Anchor books.**

A theory of complexity to explain the interconnections in life that seemed to be separate from the perspective of the Newtonian paradigm, this book begins a whole new way of seeing across many fields including the development of a nonlinear model for literacy and a program to provide a context for developing literacy—the thinking classrooms.

_____. (2002). ***The hidden connections: Integrating the biological, cognitive, and social dimensions of life into a science of sustainability.*** **New York: Doubleday.**

This book extends the theory of complexity born from an ecological paradigm to an explanation of macro global problems from economy to ecology. A major synthesis of the authors previous works, the particular theory of complexity presented connects ideas about the nature of life, mind and consciousness, and social reality into a coherent whole. Then the author applies the whole theory to an examination of global economy and other profound issues.

Duranti,

Fluellen, J. (1996) Developing mindful learners model: A 21st century ecological approach. ED403020
One of the first published efforts to connect Ellen Langer's mindfulness theory, Howard Gardner's multiple intelligences theory, and Capra's ecological paradigm.

_____. (2002). Teaching for Understanding: The next 100 years. Paper presented at the 24th International Education and Ethnography Forum at University of Pennsylvania. ED467 519
Exploring a three layered view of teaching for understanding, the author connects Howard Gardner's MI approach, Harvard University Project Zero Research Center's teaching for understanding framework, and Piaget's reflecting abstraction model as a theoretical explanation of what it means to understand. The paper ends with best, worst, and probable scenarios about how teaching for understanding might fare in our nation's schools over the next 100 years.

_____. (2005a) Convergence

_____. (2005b) Creating a Culture of Thinking Project Plan for McKinley High School

_____. (2005c) Creating a Culture of Thinking in DCPS (A proposal for the District of Columbia Public School System)

Frome,

Gardner, H. (1983). *Frames of mind: Multiple intelligences theory.* U.S.A.: Basic Books.
Intended originally for psychologists, this theory argues that children and adults around the world have seven intelligences, each with a set of core abilities and each relatively autonomous. Defining intelligence as the ability to solve problems or fashion intellectual products of value to others, the theory suggests that each person is at promise in each intelligence; each can be increased with teaching, coaching, and experiences.

_____.(1999a). *Intelligence reframed: Multiple intelligences for the 21st century.* New York: Basic Books.
Revisiting multiple intelligences theory, the author argues that naturalistic intelligence meets his original eight criteria for a given intelligeIn addition, he argues that existential intelligence (the capacity to pose or ponder questions about ultimate realities such as God, love, human purpose etc.) did not fully qualify to become the ninth intelligence.

_____. (1999b). MI approach. In C. Reigeluth (Ed.) *Instructional-design theories and models: A new paradigm of instructional* theory. Mahwah, New Jersey: Lawrence Erlbaum Associates, Publishers.
An application of multiple intelligences to create a simple, yet powerful method for helping students to understand disciplines more deeply, the MI approach stands tall among new paradigm instructional design theories because it rests on a landmark theory not just a collection of studies.

_____. (1998). Melding traditional and progressive perspectives. In M. S. Wiske (Ed.), Teaching for understanding: Linking research with practice (pp 345-350).
Taking a performance view of understanding instead of schema perspective, the author argues that understanding might best be understood as a transfer of knowledge from one situation to a situation for which that knowledge is appropriate.

_____(2004). *Changing minds: The art and science of changing our own minds and other people's minds.* Boston, Massachusetts: Harvard Business School Press.
Applying psychological ideas to the world of business, this book offers a new change theory. The author argues that leaders must consider several specific steps in order to

change the minds of others or one's own mind. The steps are as follows: present content and desired content, size of audience, type of audience, directness of change, levers of change, and ethical dimension.

Grills, C. T. (2004). African psychology. *Black psychology.* (R. L. Jones ed.) Hampton, VA: Cobb and Henry Publishers.
Providing a conceptual framework for the tenets of African Psychology, this chapter in a landmark book, lays a foundation for further reading in the field. In particular, it suggests a new paradigm for viewing wellness—one completing an Anglo Saxon view.

Hickman, M.

Langer, E. (1989). *Mindfulness.* Reading, Massachusetts: Addison Wesley Publishing Company.
Based on over 50 empirical studies, this book synthesizes the authors research into a theory of mindfulness. Key findings of the studies were these: mindful people welcome new information, create new categories for the information, hold more than one perspective, see life as a process, and can reframe situations.

_____. (1997). *The power of mindful learning.* Reading, Massachusetts: Addison Wesley Publishing Company.
Extending mindfulness theory to the school systems of the nation, this book illustrates ways of teaching children to learn more mindfully. Along the way the author challenges many long held beliefs of educators, thus, helping them to become more mindful as well.

Naisbitt, J. (1983). *Megatrends.* New York: Warner Books.
In addition to introducing the term Megatrends to the world and providing a new way of understanding the future (one based on content analysis and identification of deep trends sweeping the nation), the author introduces the idea that 21st century basic skills are thinking, learning, and creating. These are the new foundations upon which to base developing literacy.

National Institute for Literacy. (2001). *Put reading first: The research building blocks for teaching children to read.* USA: United States Department of Education.
A summary of a landmark work involving a synthesis of the findings from over 100,000, this book outlines the five pillars for developing early literacy: phonemic awareness, phonics, vocabulary, fluency, and comprehension. Students need a level of mastery in each of these as they learn to read and continue with them as they read to learn. Each pillar exemplifies literacy at work from the inside out—understanding interacting with creating works.

Perkins, D. (1986). ***Knowledge as design.*** **Hillsdale, New Jersey: Lawrence Erlbaum Associates.**
A simple, yet powerful method for metacognition, knowledge as design serves as a tool of reflection for students of all ability levels and ages. This book details ways in which a human made object or idea can be discussed in terms of purpose, structure, model case, and argument (explanatory, evaluative, deep explanatory). In addition, this method for critical and creative thinking invites learners to go beyond the four features and invent one's own design when the occasion demands.

_____.(1995). ***Outsmarting IQ: The emerging science of learnable intelligence.*** **New York: The Free Press.**
Often overshadowed by the more popular multiple intelligences theory, this book presents a new theory of intelligence, namely, learnable intelligence. The author connects three kinds of intelligences: the traditional IQ, experiential intelligence, and reflective intelligence. The author argues that while native intelligence represented in IQ scores once seemed to be immutable, it can change significantly as the learner gains experience in a domain and practices strategies for reflection.

Perkins, D. (1998). What is understanding? In ***Teaching for understanding: Linking research with practice*****. Martha Stone Wiske, editor. Jossey-Bass Inc. San Francisco.**
Presenting a new perspective in the cognitive development view of understanding, the author argues that schemas do not go far enough to capture understanding. From a performance view of understanding, a learner must create an intellectual product to show that understanding and build new understanding.

Perkins, D. and Unger, C. (1999). Teaching and learning for understanding. In C. Reigeluth (Ed.) ***Instructional-design theories and models: A new paradigm of instructional theory.*** **Mahwah, New Jersey: Lawrence Erlbaum Associates, Publishers.**
Presenting Harvard University Project Zero research center's teaching for understanding framework as a new paradigm instructional design theory, the authors argue that effecting teaching includes a sound method of planning—one that connects generative topics, throughlines, understanding goals, understanding performances, and ongoing assessments.

Perrone, V. (1998). Why do we need a pedagogy of understanding? In ***Teaching for understanding: Linking research with practice.*** **Martha Stone Wiske, editor. Jossey-Bass Inc. San Francisco.**
Providing historical context for improving education in the United States, the author argues that few schools teach for power and consequence. Most students do not get the kind of education that leads to literate citizens capable of solving or posing complex problems with created works.

Piaget, J. (1977). ***Studies in reflecting abstraction.*** **Philadelphia: Taylor and Francis Group.**
Providing a theoretical explanation of what it means to understand, the author presents a series of studies leading to the invention of a model—the reflecting abstraction model. Beginning with empirical abstraction the model suggests a spiraling succession of understanding at increasingly complex levels. Thus, empirical abstraction, reflecting abstraction, reflected abstraction, and meta-abstraction all explain a performance view of understanding in learners of all ages.

Reigeluth, C. Ed. (1999). ***Instructional-design theories and models: A new paradigm of instructional theory.*** **Mahwah, New Jersey: Lawrence Erlbaum Associates, Publishers.**

A compendium of approaches to teaching and learning, this book offers a range of methods to suit most classrooms in the nation.

Richgels, D. (2004). Theory and research into practice: Paying attention to language. Reading Research Quarterly 22 (4) 470-477

A review of recent research on language with applications to classrooms, the author presents two categories: formal aspects of language and nonformal aspects. Thus, on the one hand, the author connects research on phonology, morphology, semantics, and syntax. On the other hand, the author explains the role of Haliday's seven functions of language, conversations in language development, and the role of written language in development.

Rossi, P. H. , Lipsey, M. W., and Freeman, H. E. (2004). ***Evaluation: A systematic approach.*** **Thousand Oaks, California: Sage Publications.**

A comprehensive introduction to the evaluation research field, the author argues that evaluation is both an art and a science. In an age of accountability of social programs, it is imperative to conduct sound evaluations at the level of needs assessment, program process, program outcomes, program effectiveness, and program efficiency.

Stilger, J. and Hiebert, J. (1999). ***The teaching gap. (Best ideas from the world's teachers for improving education in the Classroom).*** **New York: The Free Press.**

Summarizing one of the most comprehensive research projects ever conducted of the TIMMS international assessment, the authors argue that one of the most important findings is that teacher method relates highly with student achievement. Method is the heart of the invention or reinvention of the thinking classroom.

Stoyles, J. and Sagan, D. (2002). ***Up from dragons: The evolution of human intelligence.*** **New York: McGraw Hill.**

In plain English, the authors review brain research on the one hand, and evolution theory of human cognitive development of the other. Provides historical context for creating cultures of thinking.

Watzlawick, P., Weakland, J., and Fisch, R. (1974). ***Change: Principles of problem formation and problem resolution.*** **New York: W. W. Norton Company.**

An early systems theory view of change with timeless value, the authors suggest two kinds of change. First order change happens when the parts are moved around and, perhaps changed, but the whole remains the same. This is expressed in the proverb "the more things change, the more they remain the same." Second order change happens when the entire whole changes. Provides a theoretical view of the change required of our nation's schools—from Industrial Society systems to Information Society systems.

Wiske, M. (1998). What is teaching for understanding? In M. S. Wiske ***Teaching for understanding: Linking research with practice*****. San Francisco: Jossey Bass.**

Providing a somewhat theoretical view of Harvard University Project Zero Research Center's teaching for understanding framework, the author includes applications to curricula frameworks.

Volk, T. (1995). ***Metapatterns: across time and space.*** **New York: Columbia University Press.**
Exploring how a fundamental human shape such as the sphere connects geometric objects and ideas, the author presents an array of novel ways to answer Gregory Bateson's timeless question: "What is the pattern which connects all the living creatures?"