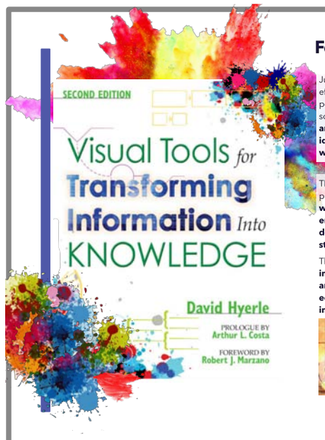



## Foreword & Prologue

Just as cartography increased the speed and efficiency with which new lands and new people could be identified and connected, so too do **visual tools escalate the speed and efficiency with which an individual can identify new knowledge and connect it to what is already known.**

THE BOOK draws from philosophical and psychological models of **how the mind works**, how **human intellectual capacities emerge** and grow over time, **how humans derive meaning**, and **how knowledge is structured**.

The intent is to provide educators with **insights into how interventions can be arranged and conditions organized so as to educe, enhance, and refine those human intellectual resources**.

## Information into Active Knowledge

Most high-quality brainstorming webs, graphic organizers, and conceptual mapping approaches are not simply isolated visual techniques.

These tools, now often referred to as **nonlinguistic representations** are (...) a new **foundation for rigorous learning**, **higher-order systems thinking**, **metacognition, and formative assessments** in classrooms.

Visual tools, in the best cases, are generated from a blank page by students for transforming text-based **content information** into **active knowledge** using **a rich integration of modalities–visual, spatial, verbal, and numerical**–to create conceptually rich models of their meaning.

Acts of transformation take students from the basic information found in texts to the highest orders of thinking seamlessly, from building concrete content facts and vocabulary directly to the **abstract conceptual understandings** that are the basis for learning knowledge in every discipline.

We make and store images and pictures of incoming information in our brain, and now our new technologies–mostly visual–are merely reinforcing the visual dominance of the brain.

High-quality visual tools are basically used for surfacing dynamic schemas, graphic representations that externalize in blueprint form the conceptual knowledge structures bound within the architecture of the brain.

The traditional linear strings of words students see in textbooks and hear from teachers in dominantly linear-auditory classrooms do not even come close to approximating the complex visual-verbal-spatial patterning of what is going on in their heads.

***"Visual tools are a natural bridge between the brain and mind and high intellectual performance on tasks requiring more than linear processing."***

**Knowledge workers** – need the tools for learning how to construct meaningful knowledge from information, not merely regurgitate information.

***"Visual tools are the means to the outcome of facilitating content-specific acquisition of information through higher-order thinking through visual representations."***

Few tools provide a concrete means to **transform unprocessed information into useful patterns of knowledge** that are at once usable and easily communicated to others. And few tools, once mastered, can help learners manage the unknown overflow of information for a lifespan.

**High-quality "knowledge tools"** are desperately in demand with students' access to new technologies and communication tools. (...) How are all students right now processing and filtering the vast amounts of information they confront through endless media outlets?

## The Mapping Metaphor

We are teaching to a generation of digital natives: Web-based, dynamic, visual-spatial-verbal media-savvy futurists who see and can visually represent the world in a much more connected way than we show it in classrooms. (...) Our children don't feel lost on the Web because they are **comfortable with networks of ambiguous information and unstable knowledge**, but I believe that many feel lost in classrooms around the country because knowledge is perceived as primarily static and linear.

We live not only by the idea of text books and the spoken word but also that information is valid only when substantiated in linear text blocks and strings of sentence.

When visual tools are presented alongside text or used by learners to find the patterns embedded in the wall of text, then **the rich foundational structures of knowledge is unveiled**. Now, at the beginning of the 21st century, we know that the linear representation of information, concepts, and knowledge does not reflect how our brains work.

Most thinking processes, content information and knowledge, and emotions are held in nonlinear associations.

***"Educators who were trained and retrained in the auditory-verbal teaching techniques of the late 20th century enter the integrated visual-spatial-verbal-auditory literacy of the 21st century."***

What we want to do is add visual tools in an interplay with text and thus also bring forth an additional metaphor for how knowledge is represented.

***"Student ownership of visual tools based on thinking skills is a key to high conceptual performance."***

There is **cognitive dissonance** between the highly constrained linear presentation of information in classrooms as text blocks and the multidimensional mapping of mental models that the brain-mind naturally performs when processing and crafting information into knowledge.

The gulf between our students' technical expertise and their mental fluency is one of the barriers we must transcend ***(..)*** we cannot go back to a time when information was so neatly packaged in books resting on library shelves.

**Mapmapping**

Visual tools offer a **bird's-eye view of patterns, interrelationships, and interdependencies**. They provide **guides for making our way** in books full of text (...) Visual tools **generate and unveil mental models of interrelationships** developed by learners, along with the unique patterning capacity of each learner's mind.

**Maps are much like paintings**: they are drawn from a certain perspective and thus have limitations. Each map is made in the eye of the beholder, with the instruments at hand, and within the intellectual and philosophical paradigm of its maker.

Seeing is **one modality** for perceiving(..) Visual perceptions balance with auditory and kinesthetic access to knowing. Visual tools for mental mapping need to be integrated with other representational and language systems for reflecting different kinds of intelligences.

## Using Visual Tools

The term tool conveys the essential quality of these visuals: they are **dynamic** and **constructive**.

Many **valuable graphic representations** are used primarily for **storing, graphing, or displaying information**, often after much of the thinking about a problem has been completed (matrix diagrams, tables, basic charts, axis diagrams, bar graphs, and pie diagrams). They are often used a displays for information and **not specifically as constructive tools.**

The meaning of the term **tool** as used here comes from the philosophical and psychological **stance of constructivism**, which is based on several metaphors. A central one: building knowledge, much like a carpenter building a house with materials such as wood, nails, concrete, and glass.

So, too, a student entering the classroom **needs a "tool belt"** of sorts, filled with a variety of visual tools that are well defined, developmentally appropriate, and flexibly used to construct meanings.

**Theory-embedded** tools explicitly embodies, in its development, definition, and use, one or several processes

**Software-specific**: Some visual tools are delivered only through software programs, such as Inspiration( r) Software, OmniGraffle( r), and STELLA Software.

**Comprehensive visual models**: Some approaches such as Concept Mapping, Mind Mapping, Thinking Maps, and "Teaching with Unit Visual Frameworks" have evolved into powerful and comprehensive visual models that require professional development.

Historically, the most commonly used term for visual tools has been either **semantic maps** or, more recently, **graphic organizers**.

**Graphic Organizers:** *"Words on paper, arranged to represent an individual's understanding or the relationship between words. Whereas* **conventions or** *sentence structure make most writing linear in form, graphic organizers take their form from the presumed structure of relationships among ideas."*

**Semantic maps** the term has been used predominantly for describing brainstorming webs for writing process and language arts instruction.

**Visual tools are neither contents nor processes but offer a third way: the form of contents and processes combined.** They are tools of the learner's trade for concretely transforming information into active knowledge structures.

**Visual tools** are not, in and of themselves, **skills or strategies**, in the same way that one does not say that a hammer, saw, or screwdriver is a carpentry "skill." (..) it takes a skillful thinker to create a multidirectional feedback flow chart of an ecosystem. Thus, **visual tools are instruments used skillfully and strategically to construct content knowledge.**

**The change after using visual tools:**
**(1)** students have a concrete way of seeing the key relationships built into the task
**(2)** as students use the tool, teachers are able to assess their view of the pattern (without visual tools, a teacher is often dependent on direct questioning)
**(3)** discussion and dialogue is supported with visual representation of ideas.

**Constructing knowledge in cooperative groups** - a brief summary of the implications for using visual tools in an interactive, inclusive classroom that constantly shifts among individual, paired, cooperative, and whole-class learning structures.

**Invididual Sharing** - students have the means to convey the holism of their thinking to peers rather than rely exclusively on linear speech or writing. For students who are not strong at verbalizing their ideas, visual tools **become the platform from which they can more fully express their thinking.** Visual tools also provide an emotionally and intellectually "safe haven" for every student–across all ability levels for a certain task–to generate and show their thinking.

**Negotiating Meanings** - visual tools allow to negotiate meanings and not merely mimic existing knowledge. They are vehicle for deepening and expressing individual views of how information is connected, for sharing multiple perspectives and opinions, and for rigorously discussing different cultural perceptions and frames of reference. (...) It is much easier for a peer group, or a single dominant voice, to dismiss alternative points that are stated in a few sentences than to dismiss a display of interconnected ideas supporting a

**Staying Focused** - talk is cheap. Visual tools give students alternative, concrete structures for focusing and persevering in long work sessions and for working together with information as they form a final product.

**Rich Group Presentations** oral presentation supported by such visuals means that a classroom discussion or dialogue may be richer.

**Group Self-Assessment** - as different groups present their constructed views of knowledge, students and teachers alike are able to compare alternative structures that have been created and thus evaluate with greater depth not only the product of learning but also the otherwise hidden processes and forms of knowing.

Are educators interested in giving students their own tools for critically analyzing accepted "truths" and for constructing new knowledge? Teachers who use visual tools are explicitly showing the relationships that they deem essential for learning.

## Summary Definition of Visual Tools

**Visual tools** are **nonlinguistic symbol systems** used by learners, teachers, and leaders for graphically linking mental and emotional associations to create and communicate rich patterns of thinking.

These visual forms are also **metacognitive tools** for self-assessment in each content area and for interdisciplinary learning that may unite linguistic, numerical, and scientific languages together on the same page.

Categories of visual tools:

Visual tools are used for personal, collaborative, and social communication, negotiation of meaning, and networking of ideas.

Visual languages ultimately may be used for **uniting diverse and distant learning communities** as people in schools, communities, and businesses and in different countries **seek to understand each other through seeing each others' thinking and perceptions through multiple frames of reference.**

**Nonlinguistic representations are essential vehicles for improving students' learning.** Researchers from over 75 years of cognitive studies and the neurosciences identify **fundamental cognitive patterns as the foundation to student learning**.

*„When we look forward to the decades of the 21st century, we realize that* ***explicitly supporting students in their capacities to think and problem solve independently and collaboratively across content areas, languages, and cultures may be the linchpin to an evolution in how they transform information into meaningful knowledge."***

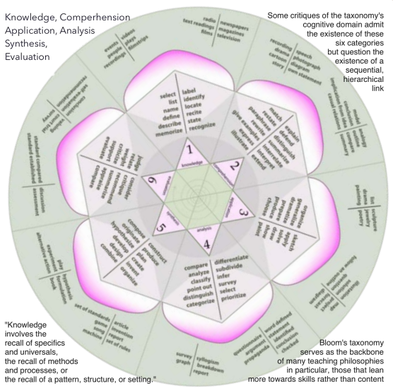
### Brainstorming Webs
for fostering creativity and open mindedness

### Graphic Organizers
for fostering analytical content and process specific learning

### Conceptual mapping
for fostering cognitive development and critical thinking

### Bloom's taxonomy

Knowledge, Comperhension
Application, Analysis
Synthesis,
Evaluation



Some critiques of the taxonomy's cognitive domain admit the existence of these six categories but op ostition the existence of a sequential, hierarchical link

"Knowledge involves the recall of specifics and universals, the recall of methods and processes, or the recall of a pattern, structure, or setting."

Bloom's taxonomy serves as the backbone of many teaching philosophies in particular, those that lean more towards skills rather than content

## Brainstorming Webs
**for fostering creativity and open mindedness**

Brainstorming webs and colorful graphic representations of many kinds derive from **a synthesis of creative drawings and language** (..) Colorful, pictorial, often idiosyncratic and collaborative, rich in detail, and complex in the interconnections of symbols and meaning.

There may be general guidelines for creating brainstorming webs in groups and for classroom use, the overarching vision is for these visual tools to become idiosyncratic, highly generative, and creative representations of thinking. (...) **Drawing** is the key to webs of creativity, and once this door is opened, mental fluency is facilitated.

The **lack of common graphic structures** can also make this form of visual tool problematic for classroom communication.

First visual brainstorming session was initiated by Alex Osborn in 1930. He later wrote a text outlining rules for the group process, which included making no judgments, welcoming "wildness," eliciting quantity, and seeking improvement

We **really have not yet become fluent tool users in this new information age, as were hunters fluent with the bow**, farmers with the plow, and line workers in shaping metal. **We now attempt to shape information into knowledge as we once so fluently transformed a rocky field into furrowed crops** and ore into folded metal. We now **need to become much more fluent with mapping tools for our thinking, so that we can transform information into knowledge.**

In this new century, **the technological worlds of school, work, and work-at-home overlap to require a different set of tools – mental knowledge tools**

As a postindustrial society, we have not yet adapted to "information" work, much as workers in the past century attempted to adapt to factory work.

Becoming literate does not mean that our human thinking capacities are fully adapted or that we have become expert at generating high-quality knowledge from information.

The **visual-spatial-verbal-numerical** information **may be richly integrated on a single page**.

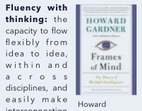
Since 1970, a range of brainstorming techniques called webbing, clustering, semantic mapping, mindscaping, and Mind Mapping have become more popular in many schools (...) generating from a central point on a page to the outward perimeters to **fully capture a concept**, much like a spider spinning a web to trap flies.

Most of these techniques inspire a **unique blend of intellectual curiosity and artistic expression** that contributes to the construction of knowledge.

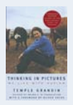
They are used to **develop students' fluency with thinking**. Fluent nonlinear, organic, open-ended thinking is a critical dimension of learning, as critical as fluency with speaking and writing, which are both primarily represented in linear forms.

When associations become more grounded by the individual and are put into visual form, there is an **added capacity for seeing the ideas holistically**, making more associations, reorganizing concepts and **details as images**, and then **communicating these ideas as images to others**.

**Fluency with thinking:** the capacity to flow flexibly from idea to idea, within and across disciplines, and easily make interconnections. The capacity to sustain open inquiry over time, pursue alternative points of view,



Howard Gardner's theory of multiple intelligences **(MI)** These 'intelligences' are basically seven: linguistic, musical, logical-mathematical, spatial, bodily-kinesthetic and personal. This approach challenges the widely accepted IQ scores as focusing in one of the multiple intelligences, logical-mathematical.



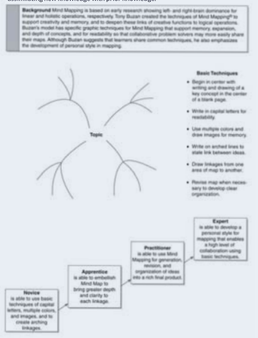
Brainstorming webs are **natural bridges between the neural networking of the brain and the conscious mapping** by the mind. Webs are a bridge between the "radiant" capacities of our thinking and the typical linear form of representing knowledge in classrooms.

### Clustering, Mindscaping Mind Mapping,
as a process of moving from generation to organization to transformation of ideas into active knowledge.

**Radiant Thinking** (from 'to radiate,' meaning 'to spread or move in directions, or from a given centre') refers to associative thought processes that proceed from or connect to a central point.

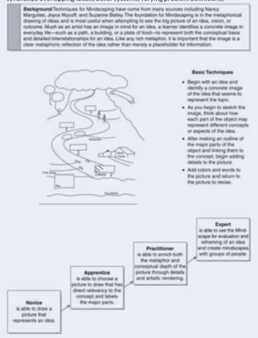
## Mind Maping

A Mind Map always radiates from a central image. (..) Preceding from a key concept in the center promote creative generation of ideas without blinders. This big-picture web helps construct and see both the forest and the trees, thus assimilating new knowledge with prior knowledge.



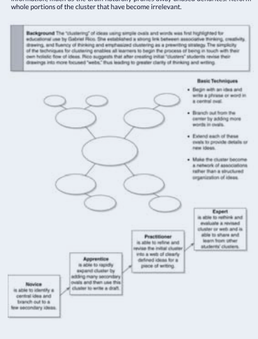

## Mindscaping

Landscapes of inner terrain, maps with no central image.. More than one word on a line, and other 'rebellious inventions'. Use of visual metaphor to makes concrete the interdependencies of a complex organism. It provides a way to synthesize overlapping ideals, belief systems, varying problem definitions,




## Clustering

A starting point for developing mental fluency in visual form. (..) First cluster may evolve into a graphic that is overburdened with information. When a cluster becomes unmanageable revise it into a more organized cluster by pruning bits of information, much as the brain naturally prunes away unused dendrites. Reform whole portions of the cluster that have become irrelevant.



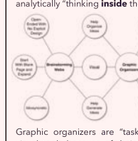

## Graphic Organizers
**representing concepts or knowledge**

A graphic organizer is a **visual representation of concepts, knowledge, or information that can incorporate both text and pictures**. The true value of such organizers is in the mind seeing visual patterns and relationships and deriving new insights from the patterning of the information.

Graphic organizers are a **type of visual tool often designed for the purposes of analytically structuring and displaying information**.

The general processes of **organizing information** require that learners go well beyond the retention of isolated bits of information. Students must have the know-how to analytically construct interrelationships so they can evaluate knowledge. This process takes mental energy, perseverance, and much more: it also takes the support of focused linear and nonlinear organizational tools that reflect different content-specific patterns of knowledge and conceptual structures.

**Organizers vs Brainstorming webs**
Unlike brainstorming webs, which facilitate creatively "thinking **outside** the box," most graphic organizers are often structured to support students in analytically "thinking **inside** the box."



Graphic organizers are "task-specific" visual tools because of their focus on using a single graphic that is clearly designed to help to achieve a certain objective, outcome, or standard. **(..)** Whereas brainstorming webs are commonly understood to be based on **associative logic**, most graphic organizers are often derived from formalized processes. These organizers build students' abilities to consciously **"chunk" information.**

The visual structure is intended to reveal a whole view of the process and, importantly, an end point.

**Structuring** also provides some visual "guidelines," much like a safety rope learners can hang on to–and **a structure to hang on to information**–rather than impulsively jumping outside the problem to what Benjamin Bloom called **"one-shot thinking."**

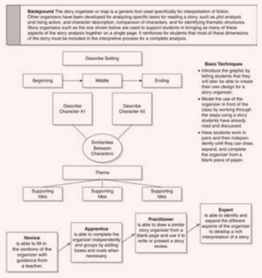
**Chunking** It Is only through **the chunking of information** that we can get hold of infinitesimal and infinite actions of the brain, the stream of consciousness. Active chunking of information onto a page is much like constructing a constellation from a sky full of stars.

Preformed graphics have been successful because they match the capacity and needs of the brain to pattern information, to move the information from short-to long-term memory, and to make the information more meaningful.

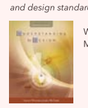
Graphic organizers act much like training wheels for a child learning to ride a bike–useful in the beginning but downright clumsy and embarrassingly extraneous in a very short time. (..) When students become fluent with using preformed graphic organizers, they want to begin to control their own patterns of information

## Story Organizer

static tools focused on a particular structure of information or flow of questions. This advanced organizer actually acts as a tool for advanced planning, as a focus during reading, and as a reflective and writing plan for after reading.



James Bellanca collected two dozen of these graphics in **Cooperative Think Tank, I and II**. He shows in very explicit terms how to develop process organizers. He models the dynamism of the tool linked with interactive classroom thinking.



Wiggins & McTighe, 1998, p. 180)

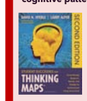
The **graphic design templates** (..) are tools for learning a process, and process tools for deeper understanding:

*Why do we refer to the template, design standards, and corresponding design tools as "intelligent"? Just as a physical tool (e.g., telescope, automobile, or hearing aid) extends human capabilities, an* ***intelligent tool enhances performance on cognitive tasks****, such as the design of learning units. For example, an effective graphic organizer, such as a story map, helps students internalize the elements of a story in ways that enhance their reading and writing of stories. Likewise, by routinely using the template and design tools, it is likely that users will* ***develop a mental template*** *of the key ideas presented in this book: the logic of backward design, thinking like an assessor, the facets of understanding, … and design standards.*

## Thinking Maps
**A synthesis language of Visual Tools**

*How wide range of visual tools could be synthesized, coordinated, and offered to students in a practical and meaningful way so that they could ultimately take control of their own patterns of thinking?*

Thinking Maps - a common visual language of **visual-verbal-spatial cognitive patterning tools**.



The effectiveness of Thinking Maps has been established through the scientifically based research. Over a dozen authors (..) presented the documented results of Thinking Maps implementation in the book **Student Successes With Thinking Maps: School-Based Research.**

The direct facilitation of fundamental cognitive skills and habits of mind supports student learning at every level of Bloom's taxonomy. (..)
It is central to **coach these cognitive skills explicitly**, mediate students' thinking, and ask reflective questions of students so they would become metacognitive, self-assessing, independent learners.

The **foundational thinking process** (well known to all cognitive psychologists and educators)

Uptown's theoretical work describing 6 fundamental skills: **describing, classifying, part-whole spatial reasoning, sequencing**, and **analogous thinking. (..)** We can explicitly teach children cognitive skills simultaneously with content knowledge and basic skills and that this combination is the key to learning.

Upton's definitions of these cognitive processes and his capacity to reveal how these skills work independently and interdependently. These ways of thinking were at the center of every level of complex thinking from early childhood through adult learning. These cognitive skills work at every level of complexity, and they never go away.

Each **cognitive pattern** within the model of Thinking Maps **is grounded explicitly by the visual rectangular "frame" of reference.**

*"Every child born into this world, for example, comes to learn how to sequence the day, categorize ideas and objects around them, break down objects whole to parts and assemble them parts to whole, survive by causal reasoning, and reason by analogy."*

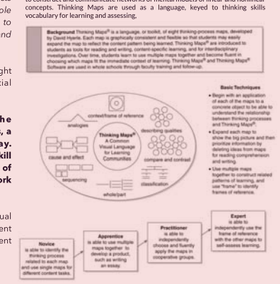
Key to understanding each of the eight cognitive processes is the essential interdependence among them.

**Awareness by students of the interdependency of thinking skills is, a missing link in classrooms today. Thinking is reduced to isolated skill development rather than a complex of cognitive processes that must work together.**

Thinking Maps as a language of visual tools are one route for unifying content and process instruction and assessment of products.

### Thinking Maps

Thinking Maps embodies the creative quality of brainstorming webs, the organizing and consistent visual structure of graphic organizers, and the deep processing capacity and dynamic configurations found in conceptual maps. At any time, learners can access this thinking language—on paper or through software—to construct and communicate networks of mental models of linear and nonlinear concepts. Thinking Maps are used as a language, keyed to thinking skills vocabulary for learning and assessing.




## Conceptual Maps
**Knowledge representation tool**

- There is a third tool that joins these creative webs and analytical organizers. This third type of visual tool–what I call conceptual maps–is in many ways an outgrowth and synthesis of brainstorming webs and graphic organizers. **Conceptual maps (..) simultaneously supporting thinking "inside and outside the box."** They ask us to question what is influencing the creation of the graphic and the actual design as it unfolds on the page or computer screen.

Conceptual maps focus explicitly on different forms of concept development and reflection such as listening with empathy, thinking about thinking or metacognition, consciously applying past knowledge to new situations

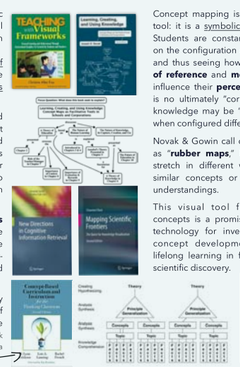
Empathic understanding–as a reciprocal process–engages not only a selfless recapitulation of another's thinking and feeling but a deeper sense of linkage and interpretation between the mental model in one's mind and the map being expressed by another within the multiple frames of reference influencing these maps.

**"banking" system of learning** & static "intelligence" shaped an educational paradigm before mid-1980s, when "thinking" became popular in schools. Previously teachers deposited pieces of concepts, like pieces of silver, in discrete chunks, and students made withdrawals through quizzes and tests.

Pedagogy is often framed by social and scientific paradigms of the past and not emerging ideas and theories. And education has often been perceived as transmitting existing knowledge rather than transforming information into knowledge and providing students with the tools for these transformations.

An **emphasis on thinking processes and conceptual learning** led to a wide array of thinking skills programs in the 1980s, gave rise to a focus on higher-order questioning, and opened doorways to a **constructivist view.**

Conceptual maps, are dynamically created schematic mental models of concepts (..) where visual tools are more necessary than ever. (Lynn Erickson's book Concept-Based Curriculum and Instruction is a good up-to-date reference for this field)

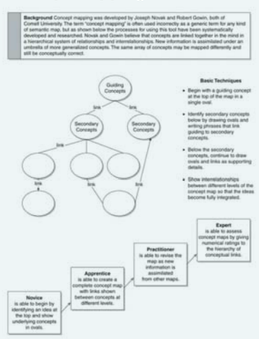



Concept mapping is more than a tool: it is a symbolic language (..) Students are constantly reflecting on the configuration of their maps, and thus seeing how their **frames of reference** and **mental models** influence their **perceptions**. There is no ultimately "correct" map, as knowledge may be "correct" even when configured differently.

Novak & Gowin call concept maps as "**rubber maps**," because they stretch in different ways to hold similar concepts or to find new understandings.

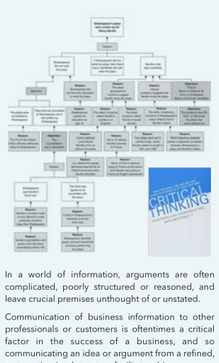
This visual tool for mapping concepts is a promising tool and technology for investigation and concept development, and for lifelong learning in fields such as scientific discovery.

## Concept Mapping




**The argument mapping** guides and scaffolds effective argumentation and helps with the development of reasoning skills. It provides the means for thinkers to locate, systematically structure, evaluate, and clearly communicate arguments. It was developed from the need for students and thinkers in business and the law to both develop and critique arguments through dynamic, structured conceptual mapping.

The success has been quantified and demonstrated by the California Critical Thinking Skills Test (**CCTST**) (an International assessment standard designed to demonstrate reasoning and critical thinking). (..) The statistical gains of critical thinking skills for the first year of university is typically **0.2-0.3** standard deviations, whereas the Rationale method at the University of Melbourne has achieved **0.7-0.85** standard deviations.



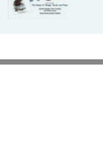

In a world of information, arguments are often complicated, poorly structured or reasoned, and leave crucial premises unthought of or unstated.

Communication of business information to other professionals or customers is oftentimes a critical factor in the success of a business, and so communicating an idea or argument from a refined, systematic, visual structure facilitates this process.

**The conncection cycles**
The use of feedback loops and systems approaches results in a diagram of interconnections that is a graphic grammar for revealing interdependent relationships.

The key to understanding knowledge from a systems approach is recognizing feedbacks in a system.

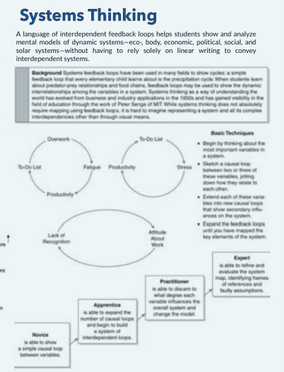
Shifting student's thinking from hierarchies and linear thinking to a **systems dynamics approach**.



Complete unit design - downloadable book The Shape of Change : www.cleachange.org/cleproducts/shapeofchange_lessons.asp

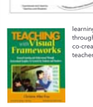
## Systems Thinking

A language of interdependent feedback loops helps students show and analyze mental models of dynamic systems—eco-, body, economic, political, social, and solar systems—without having to rely solely on linear writing to convey interdependent systems.




## Unit Visual Frameworks
**Integration of Visual Representations**

The visual tools presented **focus directly on facilitating conceptual understandings of either the micro or macro elements** of a unit of study. What would happen if the use of visual tools became **the overarching medium** through which, in collaboration, students and teachers created an evolving visual representation of whole units of study as well as the micro level of the parts of the unit.



learning and achievement through instructional graphics co-created by students and teachers.

**Unit**. A UVF organizes a whole unit of study from its beginning to end. A unit is defined as a progression of learning experiences that work together to ensure deep learning of clear targets.

**Visual**. Students and teacher codevelop an ongoing class wall display (or other format where wall space is scarce) including a core visual with illustrations and text. They also make portable versions of the core visual for individual use.

**Framework**. The UVF provides and maintains a clear focus on instructional targets, so that students and teachers have ongoing awareness of what they are learning, relative to what they will be held accountable for, as they pursue multiple teaching and learning experiences.

UVFs are "**organic**" – evolving from the unit's concrete learning experiences–while also focusing to a high degree on the content and concepts that are the center of the unit. **The teacher is the facilitator and mediator** of the students' individual and group work, as well as of the students' development of drafts of the evolving group graphic on the wall. **Students adapt the class UVF by developing their individual "portable" UVFs to ensure personal meaning**, and through them they can expand their ideas on their own. **(..)**
Student and teachers are accessing information from many of the same sources that any good teacher would bring forward, and **what the UVFs do is unite the unit in a range of visual ways so that all the learning can be synthesized meaningfully.**

**The cogeneration of knowledge** among students and teachers when creating UVFs shows a **qualitative shift toward learning at the higher end of Bloom's taxonomy** and to a level of **systematic reflection on patterns of thinking** (metacognition) rarely evident in classrooms.

The UVF processes and product enable teachers and students to **step back** from and look more closely at not just what knowledge they have acquired but **how they have synthesized their understandings.** While students may move toward another product or visual representation, such as an essay, report, or oral presentation, **the UVF acts as a resource for any further application or assessment.**

By introducing and modeling the **use of multiple visual tools as a grounding for learning**, students will not see and act on the world of concepts through one lens. They will see the world across a range of conceptual structures and thus be adaptive to content learning requiring a differentiated range of thinking patterns.