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Aligning brain-based middle school reform with the California State Standards

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ALIGNING BRAIN-BASED MIDDLE SCHOOL REFORM

WITH THE CALIFORNIA STATE STANDARDS

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A Project

Presented to the

Faculty of

California State University,

San Bernardino

_____

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

in

Interdisciplinary Studies:

Integrative Studies Option in

Education

_____

by

John Ray Adams

June 2001

ALIGNING BRAIN-BASED MIDDLE SCHOOL REFFORM

WITH THE CALIFORNIA STATE STANDARDS
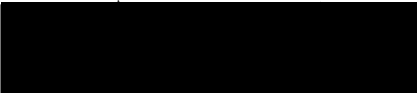
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A Project

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Approved by:

_____   6-12-01
Sam Crowell, Chair, Education   Date

Bob London, Education

ABSTRACT

This scholarly project is an in-service and plan for implementing the principles of brain-based learning into the middle school and aligning them with the California State Standards. Its main premise is that mankind is taking another developmental step in consciousness and that middle schools especially must adapt to meet the demands of a global interconnected society. By integrating thematic interdisciplinary instruction across the core disciplines of an intermediate school, the project provides a framework for generating more meaningful connected learning tailored to the needs of adolescents. Exploring the evolution of consciousness- both in individual development and the collective culture- and analyzing the history of American educational philosophies as well as applying brain-based educational research into the classroom, it synthesizes all three into a model for integrated middle school reform.

ACKNOWLEDGEMENTS

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CHAPTER ONE

BRAIN-BASED LEARNING IN
THE MIDDLE SCHOOLS

Introduction to the Project

This project was created in order to implement the

scientific principles of brain research in reforming middle

schools in a manner consistent with the California state

standards. Ultimately, it proposes that a school committed

to brain-based learning facilitates higher student

learning, achievement, and more meaning than the

traditional subject-based curriculum. Moreover it strives

to emphasize the need for educators to balance the "what

and how" of school function to a real world, global, even

universal perspective. The project travels down three

routes to support these claims.

First, it asks the question- where is humanity going

(as an interconnected global culture)? Here it delves into

the past and seeks to briefly clarify the historical

evolution of consciousness and the development of America's

school system to pinpoint education's present state of

affairs. In doing so it is argued that, society is at the

precipice of another developmental leap in consciousness.

Second, the project synthesizes the growing field of brain-

based learning and its implications for education in facilitating this next step in awareness. Third, it provides a five-year model for reforming middle schools that transcends and includes the traditional curriculum, creating an integrated project-based institution in which students are taught using interdisciplinary methodologies across the different disciplines in order to connect meaningful learning to their own life and real world situations. Therefore students in the middle school will begin blazing the trail towards becoming conscious co-creators of the world in which they live, both individually and collectively.

Purpose of the Project

As these trails are branded education stands at a fork in the road with many paths to follow. Intermediate schools truly are in the "middle" of this decision for it is where many life determining decisions are made by students and many foundations are made for them by teachers. Initially both have enthusiasm as they walk down a chosen path, but generally the pattern they follow is like that of a meandering trail in the forest where they often times find themselves lost. Some choose the old

reliable path that has been there for decades. The highway

sign has different wording yet often times it subtlety

reads "Back to the Basics," or "Survival Mode." Educators

often do not read their historical roadmaps and find

themselves on the same road to failure, upon which many

from the past have already journeyed. Sometimes the road

sign is a truly new and innovative one, but often teachers

and students, administrators, parents and policy makers

find the new path too time consuming and filled with much

unwanted "traffic" like the need for more money, more

training, more time, more to learn, and more bodies in each

classroom. Usually the path taken is an easier and cheaper

one and in the end is ineffective. Eventually for many it

is onto the off-ramp and back to old reliable, which leads

to more boredom and more failure for all.

Closing themselves off from the rest of "traffic,"

these middle schools park themselves at mid-level positions

in an old factory building ever churning out products class

after class, grade after grade. Some of these schools are

very sick and pull up to a hospital, which helps to

"redress the ills of social inequality" by diagnosing

individual student problems and providing a prescription

I.E.P. that "cures" the child (Schlectly, 1990). Often

times this diagnosis is used for all children but as everyone should realize- all roads do *not* lead to Rome. All too often it is a quick remedy that only works for a few, but is applied to the masses, thus rendered ineffective once again.

Recognizing this, this project provides a plan of action that is more than just a factory or hospital model. It will not solve all problems, but does lay a sensible open-ended infrastructure, designed upon the premise that whatever we create brings with it its own anomalies to be solved and those problems can be solved more effectively together as a team. It sees that all paths are striving towards the same goal- to educate people, but the roads traveled to get there so often are just ends in themselves. Education can and must do better. Schools must begin to lay the foundation for an educational transportation system that connects students to the future and equips them with their own ability to build vehicles capable of reaching their own destinations in this interconnected, information rich world.

To do this, middle schools must transcend and include the old curricular paths to success. Teachers, students, parents, and administrators must transform junior highs

into developmental enterprises, blending all of the newest findings on how people best learn with what already works. Schools must be given the flexibility and local control they need to address the specific needs of their students, while at the same time keeping the state and district standards as the cohesive asphalt that keeps the highways connected. Collaboratively working together teachers can make more connections for students in their learning, and in turn educators will make more connections for themselves. These teams of teachers will find themselves more excited about their jobs and they and their students will be much more engaged in the learning process, leading schools to be much more successful in their optimum goal-educating all students for lifelong success. The time for this change is now.

Scope of the Project

In order to change education, one must first persuade others to change their approach in the classroom. Sweeping change is virtually impossible and actually unhealthy. The project format and content understand this. What it does ask teachers and schools to do is to stretch themselves a little further every year in order create a brain

compatible, interdisciplinary school structure. The project is an in-service training middle school teachers about brain-based research and its practical implications in the classroom, but in a manner consistent with the California State Standards. The training provides an infrastructure for an interdisciplinary, team teaching middle school model, designed to connect student learning across the different disciplines and to the larger world of which they partake.

To do this, schools must give time and structure that is flexible enough for each school site. Designed around the California State Standards it guarantees any school willing to set itself up in this way will have greater achievement and student engagement. The premise is that if all teachers are teaching to the same state standards, and have high-level instruction and expectations, but are free to approach it in a manner most appropriate for their community, more meaningful learning will take place for students.

Significance of the Project

Indeed the time is right to overhaul secondary schools. Middle schools are the best place to begin,

because it is at this point in an individual's personal development, as indicated by the work of Piaget, that they move from the level of concrete operations to the logical stage of formal operations. Of course everyone is unique, developing at their own pace (one of the principles of brain-based learning), but between the ages of eleven to fifteen all children begin the journey into adolescence and later adulthood. During this time cognitive psychologists have indicated that inwardly children begin the transition into formal operations questioning the rules of society and the roles they play within that society. (See Figure 1.) Before this time, during the elementary years, children have been intensely indoctrinated into societal beliefs pretty much accepting things at face value. The movement from concrete operations to that of a higher state of consciousness (rational thought) reveals to them their own individuality, which is much more traumatic than discovering that Santa Claus was only a myth. It is here where students are creating their own self-image. For many it is exactly during these middle years of development that apathy towards their education develops because they seriously question the validity of the cold impersonal industrial model of education they have been forced into.

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┌─────────────────────────────────────────────────────────┐
│                    -Vision-logic                          │
│                      -Formal Operations (Ages 11-15)      │
│                        -Concrete Operations (Ages 7-11)   │
│ Middle Schoolers              -Concepts                   │
│ On their way to individualism    -Symbols                 │
│ and later connectedness which lie                         │
│ between Formal Operations and Concrete Operations.        │
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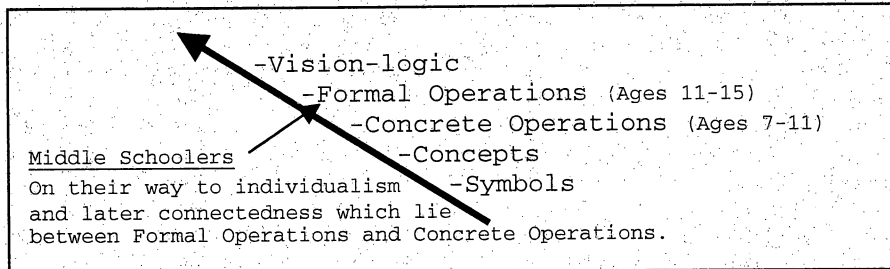
Figure 1. The Developmental Stages of

Consciousness. Beginning with the symbols stage

All people must pass through these same stages.

The move from concrete operations to formal

operations in a middle-schooler is that from a

group consciousness to an individual one.

If reform is to begin anywhere certainly it must come at

the middle school, for the effects of apathy and

disengagement resonate in the statistics of the high

schools they later attend.

William Glasser (1988a) estimates that nearly fifty

percent of students in high schools are achieving very

little if any success. A sweeping comprehensive ten-year

study of student achievement in high schools conducted by

Lawrence Steinburg in the 1980's and 1990's supports

Glasser's numbers. Forty percent of students contend they

are just going through the motions, one-third are not doing

homework on a regular basis, while the most time consuming

activity of adolescents is spent "hanging-out" with friends. Student dropouts in many areas in California are on the rise again. So what is the cause of all of this disengagement? Are students actually becoming less intelligent? Steinburg emphatically says no. Most research, he maintains, shows that cognitively students are actually smarter than in the past. "In concrete terms, although today's students appear less interested in school than they were in previous generations, they are no less smart" (Steinburg, 1996, p. 65).

To the disengaged student school is boring. Schools, according to Glasser (1988b), generally do a very poor job of giving students and teachers many of their essential needs, those being- survival and reproduction, love and acceptance, power, freedom, and fun. The failure to address these needs has led to student dropout rates that are on the rise again and for quite some time teachers have had the highest attrition rate of any profession. Translation- high student dropout and high teacher dropout occur because both of their needs are not being met. They therefore venture elsewhere to satisfy those needs. Glasser maintains that the problem is in the structure of schools themselves. Studies by Linda McNeil (1984) showed

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the correlation between low student engagement and lowered teacher expectations. Her study focused on student employment and lower teacher expectations, but it would be safe to say that no matter what the cause student disengagement often leads to lowered teacher expectations. Ironically, the more schools lowered their expectations, student work hours increased and disengagement rose, thus creating a vicious circle of meaninglessness to both teachers and students. (See Figure 2.) All of which leads to higher dropout rates among pupils and their teachers. In response, the state of California has recognized some aspects of this circle of disengagement, perhaps not by name, but nevertheless has pushed strenuously to increase the standards and expectations of our low achieving schools. Raising standards will raise student success, but not if the time, money, and resources are not allocated to equip teachers to do their jobs effectively. School districts must also make the necessary and proper reforms in order to raise student learning and achievement. It appears the state is very serious about raising expectations, but district reforms have done much to take an enormous step backwards in order to reach those goals.
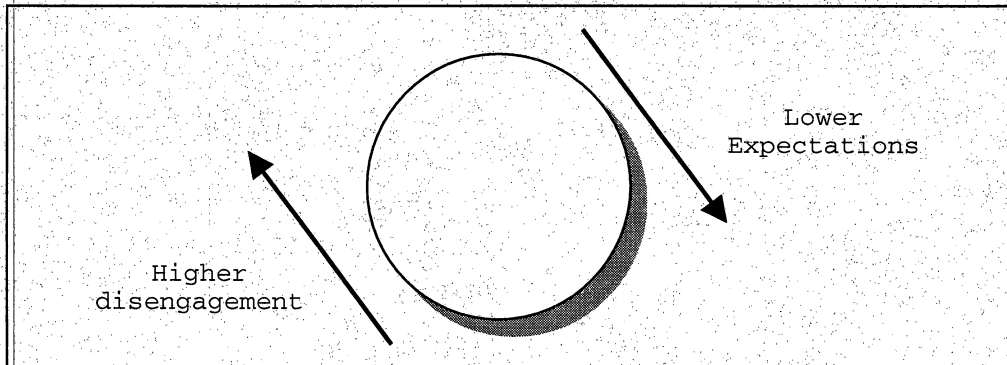
Figure 2. Vicious Circle of Disengagement. As
schools lower their expectations, student apathy
and disengagement rise.

So much emphasis has been placed on schools to
improve, but the only yardstick being used to measure
learner growth is standardized testing. With so much state
money being dangled in front of school districts to improve
scores many have mandated that much of their curriculum
focus on teaching to the test, in their efforts to raise
test scores. Unfortunately what these districts are doing
is teaching to short term memory, otherwise known as taxon
memory. This type of curriculum does not provide the rich
connections that students must make in order to become the
responsible, productive, problem-solvers the world needs
for the twenty first century.   It is not necessarily the
state's high standards or standardized tests that are the
problem, it is the method districts are using to attain

those goals that is placing students in dire straits.

Teaching to the test in moderation is good practice, but

the maniacal level to which it is being used in so many

schools is cold and impersonal, stripping away a person's

motivation to learn. So how do middle schools combat the

problem?

First, all must recognize that if real achievement is

to occur amongst our students we must first raise the level

of expectation. The vicious cycle of disengagement can be

reversed. With higher expectations naturally higher

achievement will follow. California has made strong steps

towards that goal. Second, schools must rid themselves of

the belief that a "back to the basics" movement practiced

by many district leaders will work. The same model has

been used for the last 50 years- higher standards, more

testing, more meaningless work for the students (as

perceived by adolescents)- has not worked. (See Figure 3.)

It is an illogical unscientific method. If businesses were

only getting fifty percent of their workers to be

productive they would go bankrupt. Third, we must replace

the boring, disengaging classroom, dominated by old-school

thinking, with engaging, connected, fostering ones that pay

special heed to the principles of interdisciplinary

Old model of reform	New model of reform
-Raise standards and/or expectations. -Districts create middle school reform based on factory model- a.k.a. "Back to the basics."	-Raise standards and expectations -Districts create middle school reform based on sound logical scientific studies and findings -i.e.-Team teaching, interdisciplinary approaches, integration
Results -Achievements is raised moderately if focus is on expectations -Lower self-esteem -More apathy develops	Results -Achievement is raised dramatically if focus is on standards -More engagement -Higher student esteem

Figure 3. Old School Reform Versus New School Reform. Note the only real difference between the two is dismissing the "back to the basics approach."

education and brain-based learning. That is the goal of this project- to bring brain-based instruction into the classroom. The following goals and objectives clarify what this project seeks to achieve:

Goal: To help students develop greater connections between their knowledge and the California state standards, the principles of brain-based learning and interdisciplinary curriculum will be incorporated into the middle school.

Objective 1:   To develop a school infrastructure of interdisciplinary teacher teams.

Title: Interdisciplinary teams

Strategy: (1) Teacher teams are designed with the same core of teachers in Language Arts, Mathematics, Science, History, and Physical Education, all having the same students for at least one year.

(2) Teachers in the four academic disciplines will have common preparation periods, while students are attending Physical Education classes.

(3) At least one day a month is designated as an in-service day for staff collaboration and curriculum design.

Measure: Before the school year begins the teams will be in place with a common preparation period and necessary in-service days as developed in the school schedule.

Objective 2: To design curricular approaches and learning environments consistent with brain-based learning.

Title: Staff development

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Strategy: (1) Provide a two-day in-service at the beginning of the year training staff about the principles of brain-based education, new teachers are given this training at the beginning of every new school year.

(2) Teacher teams collaboratively work together to create brain compatible environments and curriculum.

Measure: (1) Units and lessons created throughout the school year to be shared, reviewed, and critiqued by administration and staff during future in-services. Assessment and refinement will follow. At least one integrated unit per trimester will be created.

(2) During the first year a minimum of one experimental interdisciplinary team will work collaboratively together towards the integration of the brain-based philosophy in all classrooms.

(3) During the second year two to three more teams will use the interdisciplinary team model.

(4) By the third year all teams will use the new team model.

Objective 3: To align the state and/or district standards among each department to ensure that all students are learning the same material and are held accountable to learn it.

Title: Alignment of Standards

Strategy: (1) Each department will collaboratively align the standards on a trimester-to-trimester or semester-to-semester basis.

(2) Each department will design a trimester final exam or final project.

Measure: (1) Beginning in the first year, assessment of student learning will take place at the end of the trimester exams or projects.

(2) Every year departments are to assess and refine standards and final exams/projects, during in-service days.

Objective 4: To align the standards according to the individual needs of the students on each team.

Title: Deeper Team Connections

Strategy: Teacher teams align the standards to fit their student's needs to create deeper connections across different classes. This includes working with special education, English language, and GATE instructors to modify instruction and curriculum for individual pupil needs.

Measure: Teams are responsible for turning in an alignment plan as well as new lessons to administration and sharing with the staff for review, reflection, and refinement during in-service days.

Brain-compatible middle schools and classrooms are ones that are student-centered rather than teacher-centered. Teachers realize that motivation and achievement rise when the teacher acts as facilitator not as dominator. The teacher takes into account the needs of the students and provides them with the best possible opportunities to learn. Rather than separate "workstations" where knowledge is inputted on an assembly line creating fragmented unprepared citizens as their products, teachers in brain-compatible interdisciplinary schools work as creative developmental teams with a much more nurturing environment.

When focusing on the state standards as their foundation for what to teach and a brain-based integrated approach to teaching them, the dynamic process of a collaborative middle school will surpass the mediocrity of past school reform. With high standards, a challenging connected curriculum, and teachers committed to working together as a team middle schools can begin the slow and steady transition towards an engaged, exciting learning environment, that transcends and includes all that has come before it.

Limitations

For the purpose of this study, the following limitations were made:

a) Students were of middle grade age.

b) Many teachers are not willing to work in an interdisciplinary brain-compatible school, thus will not incorporate brain-based curriculum into their classrooms.

c) Many outer non-cognitive factors, which lead to student disengagement and apathy, are not addressed.

d) Only schools with teams and common preparation periods can successfully implement the program.

Definitions of Terms

For this project, the following definitions apply:

a)   Axons are the pathways between nerve cells that carry signals from neuron to neuron.

b)   Brain-based learning is a logical scientific philosophy dedicated to unlocking the potential of the human brain to learn.

c)   Consciousness is different developmental levels, which the mind has attained and accepted. It generally refers to the level one is currently engaged in.

d)   Constructivism is a postmodern term developed by cognitive psychologists, which states that each individual constructs their own reality based on their beliefs and experiences.

e)   Dendrites are grown when the brain learns something, their function being memory. The more one grows, based on interactions with people and the environment, the more one can remember.

f)   Downshifting, according to Leslie Hart (1983), occurs when the humans feel threatened, bored, even tired. When the brain perceives threat the blood flow shifts to the central limbic system and reptilian brain stem, in charge of emotions and the more automatic functions

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of the body, severely limiting an individual to use the higher functions of their brain.

g) Ken Wilber's four quadrants state that all things develop in holarchies (whole-parts), inwardly and outwardly, individually and collectively.

h) Glial cells are brain cells that nourish and protect neurons.

i) Holistic teaching means that an instructor(s) teaches to the whole person paying special attention to the inner and outer needs of their students.

j) Inquiry-based learning gives students freedom to learn about a particular topic of their choice in order that they may follow their own curiosities. Generally students are more intrinsically motivated when they pursue something they are interested in.

k) Integrated means to form, coordinate, or blend in a functioning or unified whole.

l) Modernism is a term used to describe the empirical scientific movements and beliefs developed during the Age of Enlightenment, with specific emphasis on the material world as the only real world.

m) Myelination is a genetically predetermined process in which insulating fat is laid down around axons. This

myelin sheath allows faster and clearer communication between neurons.

n) Neurons are nerve cells in the brain whose main function is to send signals back and forth to each other.

o) Thomas Kuhn describes a paradigm shift culturally, explaining that scientific communities shift to another school of thought in solving the anomalies of their respective fields.

p) Postmodernism is a scientific and philosophic movement that gives credence to the inner levels of consciousness in each individual.

q) Right brain/left brain functions are too numerous to articulate, but the basic function of the left side is that of language, analysis, and seeing things from part to whole. The right side deals more with intuition, creativity, and identifies things from whole to part. In a healthy brain both work together as a single system.

r) Spatial memory is known as long-term memory. Information is easy to recall because neurons have grown many dendrites.

s) <u>Taxon memory</u> is generally referred to as short-term memory in which few dendrites are grown making recall difficult unless rehearsed repeatedly.

t) <u>Thematic teaching</u> is a means of organizing curriculum around large ideas or themes.

u) Howard Gardner's <u>theory of multiple intelligences</u> states that all humans have varying intelligences, which are developed in differing degrees among all individuals. Currently there are eight.

v) <u>Triune brain theory</u>, developed by P.D. MacLean, contends that the brain evolved into three united sections- the R-complex or reptilian brain stem, the limbic system, and the neocortex.

CHAPTER TWO

LITERATURE REVIEW

Where is Humanity Going?

Alvin Toffler (1970) in his now famous work Future

Shock asked this very question- where is humanity going?

He proposed that schools must emphasize teaching to this

very important question, for in the future lies the great

mystery. In essence schools should have students actively

participating in creating the future, for if there is one

thing individuals need in this fast-paced ever-changing

world it is learning how to become active co-creators of

the communities and the world in which they live. In

asking where are we going, an educator should harken back

to 1860 when a similar question was raised by Herbert

Spencer in his essay *What Knowledge is of Most Worth?*

Typical of the modernist belief in empirical rationality,

his article advocated for the sciences in the curriculum.

The empirical sciences today, while important, cannot serve

as the single model in shoring up education's current

crisis. Presently his question should read- where is

humanity going as an interconnected global culture, and

what knowledge and skills are of most worth in creating the

future?   One approach to answering this is for educators
to explore the evolution of human consciousness,
education's evolution, and brain research in order to
effectively structure school reform to fit student needs
for the ever-changing future.

Towards Conscious Evolution

In order to create the future one must be able to
adapt to the current problems of today's world. Adaptation
is the foundation of all evolutionary theories.
Biologically all species have evolved, but the one thing
that has differentiated human evolution from the rest of
the species on Earth is that humans are conscious of
themselves. As Robert Ornstein (1991) writes, "Evolution,
once strictly biological, can become, in us, conscious"
(p.77). Biologically, humans have adapted slowly, from
generation to generation, but the intense rate of change
has now thrust upon mankind the need to adapt much more
quickly than in the past. With the self-realization that
we can now destroy ourselves with pollution, nuclear war,
or many other destructive methods, "there is no time for
the glacially slow processes of evolution to produce the
changes needed to prepare us [for the future]" (Ibid p.

266). The solution then is the development of a global

consciousness. He further writes,

> There will be no further biological evolution without
>
> conscious evolution. We have to take command of our
>
> evolution now and begin a massive program for
>
> conscious changes in the way we think, the way we
>
> relate to others, the way we identify with the rest of
>
> humanity. The pace of change is far too great for us
>
> to try to adapt unconsciously. We have to take our
>
> very evolution into our own hands and do for ourselves
>
> what biological evolution has done for all life: adapt
>
> to an unprecedented new world (Ibid, p. 267).

Never before have humans had to face such complexity and

change. It has taken millions of years for humans to

evolve to their current state, but is there a blueprint for

this new "conscious evolution?" There are many

suggestions, but none as far reaching as Wilber's

quadrants.

The Four Corners of the World

Ken Wilber's quadrants (seen in Figure 4) take a

balanced view of evolution by focusing on its four major

areas- inner individual development and inner collective

belief systems, as well as the outer individual

characteristics and outer collective characteristics of

society.   All four of these quadrants are hierarchic stages

of the inner and outer evolution of life.   To change any
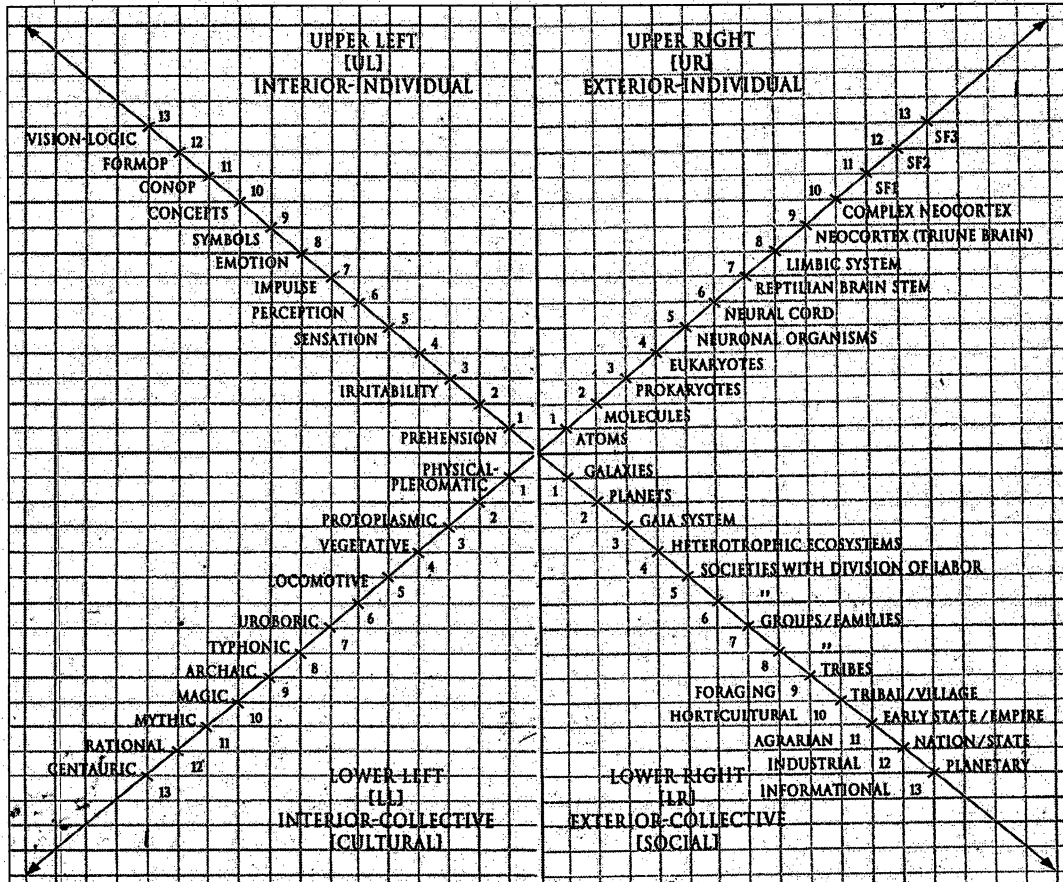
Figure 4.   The Four Quadrants.   Note.   From A Brief

History of Everything (ii-iii), K. Wilber, Boston:

Shambhala (1996).

system all four areas must be taken into account otherwise

the change or adaptation will be unbalanced.   Put another

way the four quadrants give credence to both objective and

subjective schools of thought. (See Figure 5.) The two

right hand areas, the Upper Right and Lower Right, are

hierarchies, what Wilber refers to as holarchies (whole-

parts), of the objective or outwardly observable levels of

evolutionary development. Conversely the two left hand

quadrants are subjective or the "inside" processes of the

Inner Subjective Individual -Thoughts, Dreams -Images -What the mind sees on the inside	**Outer Objective Individual** -Behaviors -Matter -Observable things on the outside
Inner Subjective Collective -Group and cultural belief systems -Religion, morals, values, etc.	**Outer Objective Collective** -Societal structures -Governments, -technical systems, etc.

Figure 5. The Four Quadrants II. A brief explanation
of what each quadrant represents. The left inner
quadrants are subjective and are "felt" or seen from
within, while the right outer quadrants represent the
objective observable world.

thoughts, and belief systems of the two right hand

quadrants. The right hand quadrants represent outer while

the left hand quadrants represent inner. The two lower

quadrants are collective representing inner cultural

beliefs and outer societal systems, while the two upper

quadrants represent individual organisms like inner dreams

and outer behaviors.

Each quadrant both stands alone and is part of the

others. The Lower Right is the hierarchy of social group

evolution like families, tribes, and nations. The Upper

Right displays individual exterior or behavioral

development, like the limbic system or triune brain. But

the Lower Left is a collective hierarchy of worldviews that

cultures have shared. The Upper Left section is the inner

thought processes that the mind develops. All are separate

parts, but they work as a whole. To further understand the

quadrants one must first be indoctrinated in the patterns

of evolution.

Evolution from a lower state to a higher one means

that the higher must transcend, but include its

predecessor. For instance, looking in the Upper Left

quadrant a molecule transcends, is greater than, an atom.

But the molecule still includes the atoms; they are just

working in unison creating something greater, the molecule.

Looking in the same quadrant, low life forms like

prokaryotes transcend and include molecules, which in turn

transcend and include atoms, and on and on the evolutionary

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cycle goes. As life evolves into higher and higher states it "creates greater depth [meaning, or importance] but less span" (Wilber, 1996, p. 26). Also in agreement with these key patterns of evolution are Crowell, Caine and Caine (1998) who concluded that there are four "principles of connectedness" that unite all things together (pp. 69-72). They are:

1) Everything is a part and a whole simultaneously. For example, atoms are part of molecules, but are whole in themselves, thus they are part/wholes or what Arthur Koestler coins holons (whole/parts). "Each element is a *whole* that is simultaneously a *part* of another whole" (Wilber, 1998, p. 67).

2) The whole is contained in every part. DNA is the perfect example of this. Scientists have found that the entire blueprint of an organism can be found in just one strand of DNA. Likewise, the potential for an oak tree is in a seed, just as the potential for an adult resides in an infant.

3) The whole is greater than the sum of its parts, meaning the greater depth that something has the more worth it has. Again, humans have greater worth

than do vegetables, because they have greater depth

than a carrot does.

4) <u>Inner and outer reflect each other</u>. Applying this

to our inner thought processes, one can see that

creativity when acted upon causes an outer

manifestation of that thought; therefore inner

thought is reflected in its outer manifestation and

vice-versa.

In all four areas, these basic principles always hold true.

But to fully understand the four quadrants principle four

must be analyzed more closely.

The underlying premise of principle four is that inner

and outer reflect each other. Examining the quadrants, one

will find that Wilber calls the Upper Left area the

Interior-Individual. This has to do with the different

inner developmental stages of people. Educators can easily

recognize Jean Piaget's work in this quadrant, especially

when looking at levels eleven and twelve- concrete

operations and formal operations. The quadrant represents

the inner consciousness of the individual, like thought

processes. The Upper Right area is the Exterior-

Individual, which represents the outer behavioral

characteristics of an individual. When comparing the Upper

Right quadrant to the Upper Left at level eight, an organism that has an outer limbic system is capable of inner emotion. Both have to be in place in any organism for this to occur. Conversely, if a young child has developed to the level of concrete operations the only reason it is possible is because of their complex neocortex (Wilber, 1996). Inner and outer reflect each other.

Further examining the quadrants, the Lower Left represents the collective inner stages of cultural development. This quadrant signifies the beliefs, morals, and ideas people have collectively passed down from generation to generation in order to maintain their survival. The Lower Right quadrant is the outer physical reflection of the Lower Left. For example, if past early human families in the Lower Right had only developed as high as level seven, then their inner group consciousness, in the Lower Left, is characterized by Wilber as Uroboric. Uroboric meaning that "Dawn Man...began his career *immersed* in the subconscious realms of nature and body, of vegetable and animal, and initially 'experienced' himself as indistinguishable from the world that had already evolved to that point" (Wilber, 1981, p. 26). Early man thought much like an ego-centered infant, unable to separate its

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own emotional environment from the one outside of it. This "infant self treat[ed] the world as an *extension of itself*" (Wilber, 1996, p. 163).

The two lower quadrants correspond to the two higher quadrants as well. Using the previous example, an *average* Neanderthal lived in a family or group of families (lower right), were Uroboric- not distinguishing themselves from the environment (lower left), individually they were very impulsive, without the ability to plan, understand concepts, or use symbols (upper left), and had only developed, or used a reptilian brain stem (upper right). Using another example, in our *average* present day consciousness, of individual formal operations, one has a highly developed complex neocortex. Culturally, people are logical and rational with an outer society that has developed an industrial economy and lifestyle.

Towards Global

The "evolutionary drive to produce greater depth is synonymous with the drive to overcome egocentrism, to find wider and deeper wholes, to unfold greater and greater unions" (Ibid, 1996, p. 180). To understand the development of consciousness in individuals is to understand the movement away from selfishness. Millions of years of

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anthropological evidence clearly shows cultural worldviews as moving away from egocentrism to that of a socio-centric view and currently to a world-centric paradigm. According to Wilber there is a strong link between the historical growth of consciousness and the developmental stages of a child.

From the development of groups and families, levels seven and eight in the Lower Right, humans slowly evolved into foraging hunter-gatherer tribes, separating themselves from animals by further developing the limbic system in the brain. Slowly they began to separate their emotions from the rest of the world, just like a present day toddler would. Later more advanced tribes practicing horticultural techniques were able to do so because they predominantly began to use their neocortex. Individuals in these tribes now had the capability of creating symbols (Upper Left) and a more advanced verbal language, teaching them to their offspring.

From there these tribes developed the capacity to understand concepts. Although primitive, this was a major step in consciousness. "Where a symbol represents a single object, a concept represents an entire class of objects" (Ibid, p. 168). Mankind truly had developed a mental

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picture of who they were and what the world was. "The self [was] now not just a bundle of sensations and impulses and emotions, it [was] also a set of symbols and concepts," in which one could differentiate itself from its lower capacities (Ibid, p. 169). They had a truly animistic magical worldview (Lower Left), in which they believed they could manipulate people and objects using spells or "voodoo dolls." In essence these people thought they could manipulate the world to do what they wanted. Children go through the very same stage, what Piaget calls pre-conventional, in which "the child populates its world with objects that have mental characteristics" (Ibid, p. 173). They see themselves as separate, but still feel that if they do certain things like cry they can influence someone to do what they want. Any parent understands that they are not in charge of their lives, their children are. These magical characteristics worked for thousands of years, but like the child, humans began to understand that ordering the world around did not work all of the time. Next came what many agree was the greatest step taken in history- the birth of modern agrarian civilization.

As humans created the early empires like those of the Nile, Yellow, and Tigris and Euphrates Rivers, and later

those of the Swahili, the Greeks, or the Aztec, they had

learned how to farm using agrarian (agricultural)

techniques, demonstrating an inner step up to the level of

concrete operations. These higher states of consciousness,

developed first in individuals, then to those they were

able to teach, caused humans to create the tools needed in

order to adapt to the "new" world in which they lived.

Eventually the average level of consciousness in that

society rose. As humans evolved into a more highly

organized pattern (greater depth), they were able to solve

the limitations of their current consciousness, thus "at

each level of development [their] world look[ed] different

because the world [was] different" (Ibid, p.64). This

worldview can best be characterized as mythic (lower left)

or "God pleasing." They no longer believed they could

manipulate the world through magic, but they did believe

they could bargain with the Gods to do it for them.

Instead of pursuing their own selfish interests, they

conformed to the interests of the group. Beginning with

the ages of six to seven in children, they too undergo this

transformation. Like the individual minds of the

Early/state Empire, he or she learns the rules and roles of

the society they live in. The child forms mental *rules* and

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takes on mental *roles* by taking "*the role of other*"

(Wilber, 1996, p. 174).   With children the same law

applies to them presently as it did with adults in a mythic

society- conform or face ridicule. Eventually though

between the ages of eleven to fifteen, the child begins the

shift to formal operations or rationality, bringing with it

rebellion and revolution.

Revolution marked the sixteenth, seventeenth, and

eighteenth centuries of the western world as rational

beliefs challenged the aristocratic status quo during the

Scientific Revolution, Protestant Reformation, and

Enlightenment. The outer industrial world of today, the

nation-state, was begun, principally by the development of

formal-logical operations (rationality). Again principle

four shows itself, today's outer world is reflected in

humanity's inner belief systems. But this Age of Reason

brought with it an Age of Revolution carrying gunfire and

war, because the cultural leaders, which humanity lived

under, were not willing to give up their power.

Adolescence, as any parent or teacher will tell you, is

marked by this age of rebellion. Children begin to rebel

against the system, exercising their newfound rational

power. Adolescents experience "inward visions [that] dance

in the head, and for the first time they are not coming from external nature, nor from a mythic god, nor from a conventional other, but in some strange and miraculous way, they come from a voice within" (Ibid, p. 186). As the depth of humanity increases in both the enlightened individual and the adolescent, consciousness awakens. This is the pattern or direction of evolution, and "because the universe has direction, we ourselves have direction" (Ibid, p. 42). So what is the next step?

Many in the world are taking another step in consciousness from Rational/Formal Operations towards what Wilber describes as the Vision-logic/Centauric stage. They are beginning to recognize that all things are connected, that everything works in a system. It is a synthesis of mind and body. One at this stage no longer sees themselves as separate from the rest of the world, but begin to see their connectedness to it. This separateness is the function of the ego, but the vision-logic stage moves beyond rational selfish interests, to greater more encompassing holistic global interests. Interests not just of fellow man, but of nature as well. But often times holistic proponents subtlety reduce inner thought processes into their outer counterparts, thus imploding their

arguments from within (Wilber, 1995, p.121). If a
spiritual advisor says only the inner realms are truth,
their argument collapses, because they do not give credence
to the outer realms of being. Likewise, if a scientist
views the mind as matter only they then contradict
themselves. Inner thoughts like images have a much
different reality than do outer electrical waves carrying
those thoughts, but both are inextricably tied to each
other. In order for one to develop this vision-logic
consciousness, individuals must recognize that body, mind,
world, and spirit are one, inseparable from each other, and
they must consciously work towards developing this new
relationship. True holistic consciousness recognizes that
one must balance the subjective world and the objective
world treating both as real. To transcend the rational-
industrial worldview, individuals and society must do two
things:

1) Be open to modes of consciousness that move beyond
   mere rationality

2) Embed them [society] in modes of techno-economic
   structures that move beyond industrialization
   (Wilber, 1996, p. 70)

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Clearly the world has begun to make this jump. The
Internet is a great example of an outer system that can
facilitate the rising vision-logic consciousness. The
information age has made it much easier to communicate, but
in order for it to properly foster a rise in mankind's
worldview society must be equally interested in working to
develop their inner selves. Using schools as an example,
an administrator should not demand computers and the
Internet in the classroom without first changing the
paradigm of the school culture. Otherwise the computers
would be useless (as far as moving towards vision-logic).
Schools have to recognize that to use the computer
effectively teachers must change their school of thought
and their approach to lesson planning in order to properly
utilize the Internet. Doing this they will have to change
from a teacher-centered classroom to a student-centered
one, in which the teacher becomes a facilitator. "The
ultimate goal is the development of self-directed learners"
(McKenzie, 1998, p. 6). Teachers would design lessons
that move beyond surface knowledge and into meaningful
knowledge (Caine and Caine, 1994, p. 7). To do this the
teachers would have to develop strong analytical and

questioning skills in their students, not just to use the Internet, but to develop powerful inner reasoning as well.

The need to develop this vision-logic consciousness is the crisis that all aspects of society feel, including schools. One of the reasons schools have not really made any substantial reforms that work is because they do not recognize this rising level of consciousness, so they have not developed the proper infrastructure to help facilitate such a change. It is impossible for evolution to mature if the belief systems and infrastructure of schools do not change to match those of a vision-logic world. For years this new developing consciousness has been challenging schools to change, but they still have their foundations firmly entrenched in the outer behavioral industrial paradigm, and they aren't willing to adapt yet.

How Did Education Arrive Here?

Clearly our nation is still testing and adapting the ideals of the Declaration of Independence, the Constitution, and the Bill of Rights, laid forth by the founding fathers over 200 years ago. From the nation's inception education was seen as a guardian protecting democracy from an ignorant "mobocracy." As Barber (1993)

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states, "the logic of democracy begins with public

education, proceeds to informed citizenship, and comes to

fruition in the securing of rights and liberties" (p. 44).

Thomas Jefferson envisioned an educational system of social

mobility whose purpose it was to create a "national

aristocracy of talent" (Perkinson, 1977, p. 9). After the

election of Andrew Jackson, the nation's first "western"

president in 1828, the country had already crossed the

Appalachian Mountains guaranteeing new landholders equal

citizenship. This group saw education as the aristocratic

enemy, so they transformed it to fit their beliefs. The

promise of social mobility was inherent in that belief;

Perkinson (1977) explains, one "saw the schools as an

equalizer, rather than a selector" (p. 11). Amazingly that

idealistic belief still permeates America's school of

thought, and rightly so. It demonstrates the strong value

that Americans place on it as a panacea for social

mobility, equality and a cure for societies ills. But the

1870's saw the implementation of industry's corporate

managerial model for school reform, creating a fundamental

flaw. As Sclechty (1993) writes,

>   A problem that has persisted for more than a
>
>   century…is that Americans have insisted on taking what

is fundamentally a European system of education- one

that accepts social-class effects as legitimate,

acceptable explanations for variance in performance-

and have tried to make this system achieve educational

ends that reject social class as a legitimate "cause"

of variance in performance (p. 6).

The American dream of social mobility, Schlecty and

countless others maintain, is mired in an old

infrastructure unwilling to transcend it predecessor.   Only

by looking back at educations growth can one recognize how

schools developed in such a fashion.

Education's Evolution

The Community Center.   Beginning in the 1830's the

school became a community center, often in the local town

church.   (See Figure 6.)   With so many immigrants coming to

America, the focus was in socializing them into the norms

of the country.   They were generally designed to promote a

literate citizenry for a Republican government, and were

infused with the teachings of Protestant morality

(Schlecty, 1990).   Horace Mann's three R's, reading,

writing and arithmetic, were the traditional "Essentialist"

doctrine practiced in one-room schoolhouses, dominated by

the teacher and "traditional" curriculum.   Essentialism has

exposed itself again and again in schools, most profoundly

influenced in the twentieth century by William Bagley,

especially during and after World War II, in

which he argued for a core curriculum of the "basics." The

1983 report, A Nation at Risk, was thoroughly embedded in

Essentialist beliefs. It called for more core

requirements, a longer school day, a longer academic year,

and more challenging textbooks. Soon thereafter it

generated a strong rise in the standards and achievement

movement still felt today (Shaw, 1995 p. 3).

The Factory. With the Industrial Revolution gathering

intense momentum in the 1870's schools were modeled after

factories and scientism, again seen in Figure 6 so vital to

American prosperity. Their purpose was to select, sort,

and Americanize the "new immigrants" from southern and

eastern Europe, as well as the newly freed slaves. School

leadership and decision-making, were carried out by

scientific managerial experts. "It was a conception of

leadership adapted to the consolidation of power in large

and centralized organizations, whether steel mills, large

department stores…or city school systems" (Tyack and

Hansot, 1982, p9). There was not equality, but hierarchy

"justified by the twin notions of equality of opportunity and meritocracy: if all had equality of initial access to

Components	1830-Present	1870-Present	1890-Present	1985-Present
Image of School/ Educational Philosophy	*A Community Center* Essentialism	*The Factory* Behaviorism	*The Hospital* Progressivism	*Global market* Brain-based
Purpose of Schooling	To promote republican/ Protestant morality and civic literacy.	To select, sort and Americanize.	To redress ills created by social inequality and to remediate deficiencies.	To develop the capacity to work on and with knowledge and information.
Primary Function of School	Socialization into the norms and values of the culture.	Labeling in accordance with known standards.	Diagnosis and prescription.	Production of knowledge work that engages the young.
Role of the Curriculum	Lore to be passed to neophytes. Focus on Greek and Roman culture, English liter- ature, and Protestant religion.	An assembly line, down which children go, differentiated by family background and measured in terms of ability to do work.	A treatment to be prescribed; for example the individual educational plans developed in response to diagnostic testing.	Raw material (knowledge) on which students work.
Role of the Student	Neophytes to be inducted into the group and taught the ways of the community.	Products to be molded.	Patients or clients to be served.	Customers for knowledge work.
Role of the Teacher	Members of a sacred profes- sion; in but not of the community.	Technicians and/or assembly-line workers.	Service-delivery professionals similar to physicians.	Leaders and inventors.
Role of the Principal	Chief priests/ polite strangers.	First-line supervisors; shop foremen.	Mid-level bureaucrats/ managers.	Leaders of leaders/ executives.
Focus of the Metaphor	*Culture*	*Work*	*Child*	**Real** *work that is valued by the* **culture**.

Figure 6. Framing Metaphors for Education. These metaphors for schooling help to explain educations evolution from the early nineteenth century to the present. Note. From Schools for the Twenty-First

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Century (pp. 5-8), by Phillip Schlecty, 1990, San

Francisco: Jossey-Bass Inc.

schools, then the doctrine of meritocracy- that the best

made it to the top- assured the justice of hierarchy"

(Ibid, pp. 12-13). Certainly this stratified segregated

system was something an African-American knew all too well.

The enormous influence of the assembly line can easily be

seen in the grade-to-grade orientation of all schools, and

especially in the middle and secondary schools where

students are moved from period-to-period, by a very strict

and orderly bell schedule.

Because the factories of the late 1800's dealt

predominantly with the shipping and creation of material

goods, inherent in the factory school model was the

modernist idea of scientific empiricism, which deals

largely with the "hard sciences-" geology, biology,

astronomy, chemistry- all of which are the domains of

objective empirical science. It is a very cold objective

view when applied to people. These sciences take what

Wilber (1998) terms a "monological" approach, taken from

the word monologue, or talking to one's self. Meaning

these sciences don't have to engage in discussion with what

they are studying, because a rock does not talk back to who
ever is observing it (p. 36). Behaviorism, led by Ivan
Pavlov, John Watson, and B.F. Skinner, is an example of
this monological approach, for it only observes outside, or
external phenomena. It dominated the industrial school
(Shaw, 1995). The assertive discipline model of the 1970's
was modeled after Skinner and behaviorism. This system is
still firmly entrenched in the modern school.

The Hospital. By the turn of the century, the
Populist and Progressive movements revolted against the
monological structure seeking to cure the ills of social
inequality, caused by the ever-changing Industrial Age. In
this "hospital" schools and teachers were seen very much
like physicians diagnosing and prescribing treatments for
the care of the individual child (Schlecty, 1990). The
Progressives, led by men like the indomitable educator John
Dewey, and the pioneering psychologist Carl Jung, sought to
make education more relevant to the needs and interests of
students and a democratic nation. Jung preached a method
of teaching that taught to individuation, "the process of
individuals developing themselves to their fullest
potential" (Beamish, 1995, p. 9). Dewey professed a strong

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belief in the scientific method and proposed a five step

method for solving student or school problems:

1) Become aware of the problem;

2) define it;

3) propose various hypotheses to solve it;

4) examine the consequences of each hypothesis in the

   light of previous experience; and

5) test the most likely solution (Shaw, 1995, p. 5).

Inner Individual Subjective Dialogical Claude Piaget Carl Jung *Developmental Psychology* *The soft sciences*	**Outer Individual Objective** Monological B.F. Skinner James Watt *Physics, Empiricism* *The hard sciences*
Inner Collective Subjective Dialogical Thomas Kuhn Jean Gebser *Anthropology*	**Outer Collective Objective** Monological Karl Marx Auguste Comte *Sociology* *Chaos Theory* *Systems Theory*

Figure 7. Dialogical and Monological

Thinkers. The four quadrants with

some examples of monological and

dialogical thinkers, ideas, and

their disciplines.

The Progressives, while still based strongly in the
sciences, were founded more upon the "softer" psychological
areas, or "dialogical" sciences. (See Figure 7.) In order
for the higher mental sciences to work one must engage in
subjective dialogue with another (Wilber, 1998, p.37).
Dewey's Laboratory School in Chicago was founded upon this
very idea. Teachers were encouraged to work together,
sharing with each other their experiences
and findings. So to, were students, because for Dewey,
effective citizenship meant that people of a particular
community must have shared experiences, "and communication
is the way in which they come to possess things in common"
(Dewey, 1916, p. 2).

Unfortunately, due to World War II and the Cold War,
the Progressive movement waned in the 1940's and 1950's
giving rise to the Essentialist doctrine once again. It
was especially intensified with the Soviet launching of
Sputnik into space, but it was the Baby Boomer Generation
that ultimately caused the movement back to traditional
education, because Americans were not prepared to build, or
for that matter pay, for thousands of new schools for the
seventy million babies born during this generation. So it
was education at the lowest possible cost (Glenn, 1995).

The Courtroom. The sixties and seventies once again

saw the rise of Progressivism, particularly in the

political arena and the courtroom. Civil rights advocates

"no longer were…willing, if they ever were, to let school

managers make all the key decisions" (Tyack and Hansot,

1982, p. 20). This was as much a movement against

Essentialism as it was a movement towards equality. All

Americans, the poor and underserved, African-Americans and

Hispanic Americans, feminists and Native Americans, called

for sweeping political changes in schools to guarantee

inclusiveness and integration. In response to the

incredible pressures thrown down on them, schools were

forcefully asked to deliver the American dream. When

teachers could not deliver, they in response began to

unionize. They had become scapegoats for the social

inequalities created by a segregated nation. By the mid

seventies, "when educators [had] announced that social

problems were too much to handle, their adamant and

sophisticated critics construed such declarations as alibis

to cover ineptitude and irresponsibility" (Perkinson, 1977,

p. 226). And here began the huge accountability movement

in schools of standards, frameworks, and testing.

The Market-Oriented School. The accountability

movements of the 1970's and 1980's, was transformed once

again into a Progressive one, this time under the guise of

multi-culturalism, corporate needs, and meaning-centered

education. Curriculum was designed in which students did

knowledge work that was meaningful to them in many

different contexts, learning "things that were socially and

culturally valued" (Schlecty, 1990). It was a movement

away from the rigid and structured formal tests and towards

the authentic assessment of student work. To quote W.

Edwards Deming, the American in charge of rebuilding the

Japanese economy after World War II, "No one, child or

other, can enjoy learning if he must be constantly

concerned about grading and gold stars for his performance,

or about rating on the job. Our educational system would

be improved immeasurably by abolishment of grading and

forced ranking" (Glasser, 1988a, p. 73). This new movement

in schools was characterized by Glasser as a shift from

"boss-management", with its roots tied to old industrial

America, to one that practices "lead-management," tied to

the management of modern global corporations. Principals,

in what he dubs a "Quality school," are to lead by example

not boss by example; in turn teachers are to do the same in

their classrooms convincing students that their approach is new and better. Ultimately, the goal is for students to do quality work that they are proud of. Modeled after Deming, there are six conditions that must be met for a "Quality School" to work:

1) There must be a warm supportive classroom environment.

2) Students should be asked to do only useful work.

3) Students are always asked to do the best they can do.

4) Students are asked to evaluate their own work and improve it.

5) Quality work always feels good.

6) Quality work is never destructive (Ibid, pp. 18-20).

This movement of the eighties and nineties garnered massive strength among teachers and was the largest most balanced approach towards education to date. Yet it was not practiced by all, therefore it did not provide the achievement results that all sought. Often times the reforms focused too much on inner self-esteem and very little on real success. The backlash was intense. With national movements like Education 2000, spearheaded by George Bush, the pendulum swung back towards accountability

and standards in the late 1990's. That is where education presently rests.

To sum up, education in the nineteenth and twentieth centuries has essentially been debating between two different schools of thought- Essentialism/Behaviorism and Progressivism/Equalitarianism. The former was designed to insure certain basic "American" beliefs, and was based upon the monological sciences and late nineteenth century corporations, molding its citizenry for the work force. It focuses on the core values needed to "Americanize" the masses in order to insure an orderly, effective and educated Republic. The latter advocates the use of the scientific method to cure the social ills that plague society, but is dialogical. Curriculum and instruction is modeled like a hospital conversing with their patients, diagnosing and prescribing treatments to better educate students for an active role in American democracy. The Market-oriented school was the first nationwide effort to combine both of these movements and in many ways move beyond them. Industry versus the hospital, both schools of thought are now firmly embedded in schools, with a current national emphasis on standards and accountability. Virtually all teachers see the need to bridge the gap

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between these two schools of thought. More importantly, though, to make the next developmental leap in consciousness, schools must transcend, but include the monological and dialogical. They must be set up to foster trans-logical thought, going beyond, but including rationality.

Towards Synthesis

As Malcolm Knowles suggests, schools "must become able not only to transform our institutions in response to changing situations and requirements; we must invent and develop institutions that are 'learning systems,' that is to say, systems capable of bringing about their own continuing transformation" (Dickinson, 1996, p. 3). The old industrial-essentialist model allows for slow steady change, the hospital-progressive model fosters much faster change. What Knowles speaks of, though, is a vision based on the premise that life is ever evolving and moving forward. Schools must be able to transcend both models to quickly and effectively meet the needs of its children. "Such a vision must recognize the rights of others and eschews the concept 'one best' or 'one right' way….[it] strives for an eclectic yet local integration of

subject/object, mind/body, curriculum/person,

teacher/student, us/others" (A Post-modern Perspective on

Curriculum, p. 61). It allows for a synthesis of inner and

outer, individual and collective.

Brain Basics

Brain research is both interior development and

exterior function. Both sides of this incredibly broad

field generally give credence to one another, although

there is still some division between the outer objectivists,

what John Eccles called "materialists", and inner

subjectivists, like psychiatrists, but the field generally

gives merit to each other for the brain is the most complex

organ on Earth. In order for brain research to be usable

for educators, one must see this field as a whole, not in

its separate components.

The Triune Brain. P.D. MacLean posited his Triune

brain theory based on the evolution of the brain (Caine and

Caine, 1994, p. 57). It is set up into three separate

parts working in unison with each other- the automated

reptilian brain stem or R-complex, the emotional limbic

system, and the creative neocortex. (See Figure 8.) The

R-complex, or reptilian brain stem, was the first part of

the brain that evolved and is in charge of the more

automatic functions of the body, like heartbeat and
breathing, but also controls such traits as territorial
habits, nesting behaviors, ritualistic displays, even
mating habits. Virtually all higher species have a brain
stem. The limbic system was the second "brain" to develop
and is formed of two parts, the amygdala and hippocampus.
It is in charge of the affective domain, but is also tied
to our locale, or long-term memory. The last section to
develop- the neo-cortex, which is composed of about five-
sixths of the human brain-, is divided into two hemispheres
the right and left side. The neo-cortex is the creative,
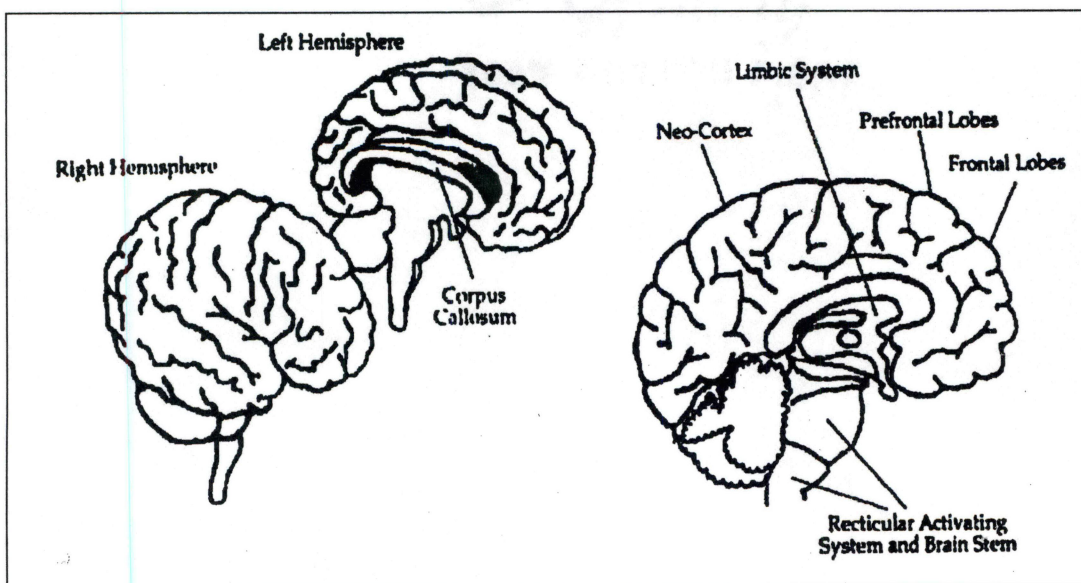
Figure 8. The Triune Brain. Shown with other major
sections of the human brain.

planning, conceptual, thinking part of the brain. Most associate it with rationality and logical thought. Even though they are separate layers of the brain they all work together in very complex ways. For instance the cortex often times embellishes the R-complex by using perfumes or performing plastic surgery to attract a mate, or creating ritual games or events, especially those tied to cyclical events like New Years. (Caine and Caine, 1994, pp. 57-64).

Cellular Communication. At a cellular level the brain consists of neurons (nerve cells), in charge of sending signals back and forth between each other, and glial cells, whose job it is to maintain and nourish the neurons. (See Figure 9.) When learning something neurons grow dendrites, branch-like growths added to the cell body of neurons which add more memory. The brain can't grow new neurons, but one can grow new connections or dendrites. The more engaging an event is the more dendrites are grown. Between neurons are axons, the "highways" that carry messages from nerve cell to nerve cell. When the cell body of a neuron determines that the message should be passed on, a signal is sent down the axon and over to the dendrites of other cells. Areas in the brain that have a myelin sheath around axons transmit messages much faster and clearer. A myelin sheath

is a layer of insulating fat laid down around axons, usually in genetically, but not always, pre-determined patterns. Myelination occurs up until about the age of 48 (Beamish, 1995). All of those inner pictures seen in the mind's eye are stored and travel in this way.

In more detail Patricia Wolfe explains this process:

Each nerve cell acts like a relay station, receiving signals from other cells, processing the signals, and sending them on to other cells across tiny gaps called synapses. Nerve cells don't actually touch. They produce chemicals called neurotransmitters- *neuro* meaning mind, *transmit* meaning send. The
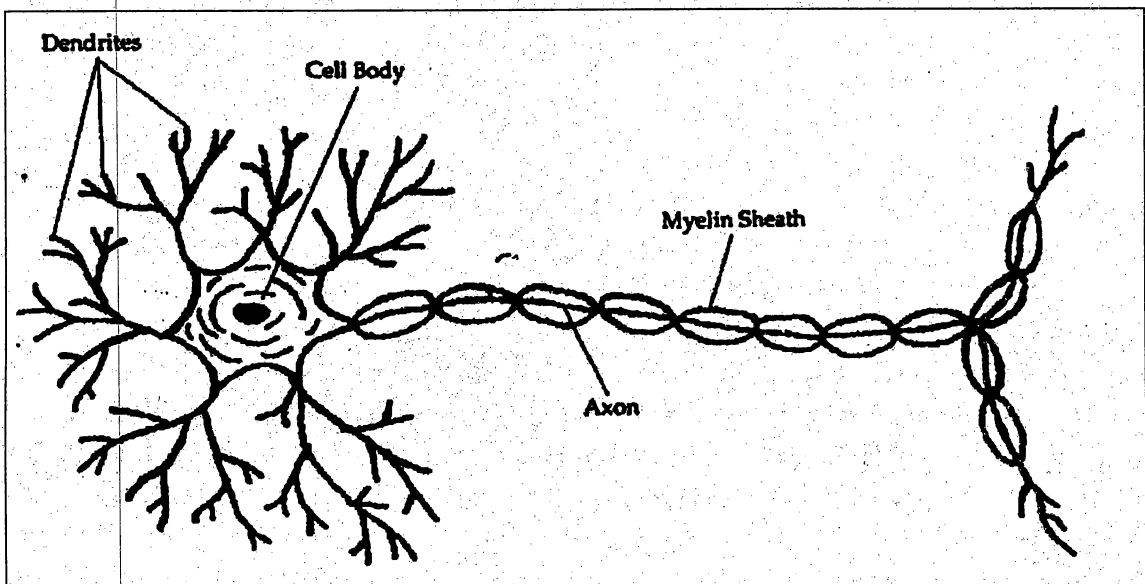
Figure 9. Diagram of a Typical Neuron.

neurotransmitter is produced in the cell body

terminals and stored in little sacks down in the axon

terminals. When a neuron fires, an electrical impulse

moves down the axon and stimulates those little sacks

of chemicals to move to the surface, break open, and

spew their contents out into the gap between the axon

terminal and the dendrite of a neighboring cell. The

dendrites have little receptor sites, welcome sites,

designed specifically for a particular

neurotransmitter. It could be serotonin, dopamine, or

any of 60 to 100 neurotransmitters and neuromodulators

that the brain produces (D'Arcangelo, 1998, p. 2).

"Neurons which are not stimulated in [this process] tend to

whither away and become unusable" (Van Tassell, 1998, p.

1). Of optimistic note, though, is the idea of plasticity,

discovered by Marion Cleeves Diamonds and other

researchers, in which they discovered that "rats living in

[an] enriched environment had developed a thicker cortex

than those rats living in [an] impoverished environment.

Their cortex had grown as a result of interacting with

other rats and with objects to explore and climb upon"

(D'Arcangelo, 1998, p. 1). In other words they had grown

more dendrites in response to the richer, fuller

environment they were placed in. It applies to humans as well. It is what Perkins (1998) defines as experiential intelligence. Since the brain can grow more and more, humans have unlimited potential to grow consciously as well.

The Twelve Principles of Brain-based Learning

Caine and Caine (1994) believe very strongly that four assumptions about schooling must be laid to rest. They have emphasized strongly that the factory model is no longer an appropriate model for the organization and operation of schools, and that stimulus response theory, behaviorism, does not work. Furthermore they add that schools do not respond adequately, and are out of touch with the needs of this generation. Lastly, they maintain that most current approaches to education are inappropriate because they are mechanistic. Teaming with Crowell (1998) to combat these troublesome assumptions, they synthesized brain research into twelve principles, so that educators could more effectively apply this growing field of research into their classrooms allowing for a more effective learning atmosphere. Their twelve principles of brain-based learning (See Figure 10) are based on the fields of neuroscience, physiology, optimal performance studies,

neuropsychology, stress management, psychology, and more.
This next section deals with these principles in detail.

```
The Twelve Principles of Brain-based Learning

1. The brain is a complex adaptive system.
2. The brain is a social brain.
3. The search for meaning is innate
4. The search for meaning occurs through patterning.
5. Emotions are critical to patterning.
6. Every brain simultaneously perceives and creates
   parts and wholes.
7. Learning involves focused attention and peripheral
   perception.
8. Learning always involves conscious and unconscious
   processes.
9. We have at least two ways of organizing memory.
10. Learning is developmental.
11. Complex learning is enhanced by challenge and
    inhibited by threat.
12. Every brain is uniquely organized.
```

Figure 10. The Twelve Principles of Brain-based
Learning. An explanation of each is expounded upon in
detail in the following text.

The Brain is a Complex Adaptive System

The brain functions "simultaneously on many levels and in
many different ways" (Crowell, Caine and Caine, 1998, p.
7). It is a multifaceted parallel processor and cannot be
viewed in its separate dimensions. One example of this is

the different parts of the triune brain, working together to make sense of the world. This extends to the body as well because learning engages the entire physiology. "Thoughts emotions, imagination, predispositions, and physiology operate interactively as the entire system interacts with and exchanges information with its environment" (Ibid, p. 7). Brains are adaptive in that they simplify "everything that happens, to make sense out of an enormous amount of shifting and chaotic external and internal information and to adapt to the world *sufficiently well* to survive" (Ornstein, 1991, p. 165). It has plasticity and is therefore malleable, adapting to the world in which it lives.

Healy (1998) states there are several principles demonstrating this malleability:

> First, repeated experiences cause synaptic differences if they comprise a significant part of a child's mental life….Secondly, animal research and common sense converge on the notion that a brain which is actively involved and curious is likely to develop stronger connections than one which is merely a passive recipient of learning….Third, there appear to be critical, or at least 'sensitive' periods in the

course of development when certain neuron groups

become particularly amenable to stimulation (p.1).

Educators must recognize the complex nature of the brain

and stop making plans and reforms that are inconsistent

with its multi-faceted abilities to adapt and learn.

The Brain is a Social Brain

Naturally the brain strives for acceptance and

relationships with others. Classrooms should be set up

allowing for this dialogical need. Wilber's Lower

quadrants address this very influence in everyone's lives.

The social and cultural lessons of language and love, myths

and stories, are all passed on from generation to

generation. McClelland found that helping the group

actually boosts the immune system (Ornstein, 1991, p. 273).

As Dewey (1916) so eloquently states,

> a society which makes provision for participation in
>
> its good of all its members on equal terms and which
>
> secures flexible readjustment of its institutions
>
> through interaction of the different forms of
>
> associated life is in so far democratic. Such a
>
> society must have a type of education, which gives
>
> individuals a personal interest in social
>
> relationships and control, and the habits of mind,

which secure social changes without introducing

disorder (p. 5, chap. 7).

In other words schools that help to develop healthy

social relationships are good for democracy.

The Search for Meaning is Innate

"The search for meaning is survival oriented and

basic to the human brain" (Caine and Caine, 1994, p. 89).

The brain constantly works to make sense of the world. As

Maslow found, from the basic physiological needs of

survival to safety and belongingness, all the way up to

self-actualization and self-transcendence, the drive for

meaning envelops all. Glasser (1988) describes these self-

needs as love, power, freedom, fun, and survival. "The

brain needs and automatically registers the familiar while

simultaneously searching for and responding to novel

stimuli" (Caine and Caine, 1994, p. 89). Ornstein (1991)

writes, "Our experiences, percepts, memories are not of the

world directly but are own creation, a dream of the world,"

creating meaning as each individual sees fit (p. 160).

While classrooms should provide for "stability and

familiarity" teachers should design lessons that are

engaging and exciting, ones that allow for more student

choice and are relevant to the needs of their cliental, for

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every classroom consists of many people all with multiple "dreams" or realities.

The Search for Meaning Occurs Through Patterning

The brain seeks to find meaning through the patterns that it discerns. "Patterning includes innate and acquired schematic maps and categories" (Crowell, Caine and Caine, 1998, p.8). Line, color, beats, rhythm, pacing- all are patterns that the brain picks up on. An individual strives for the most useful information. When in an unchanging situation, like a constant noise, the brain will no
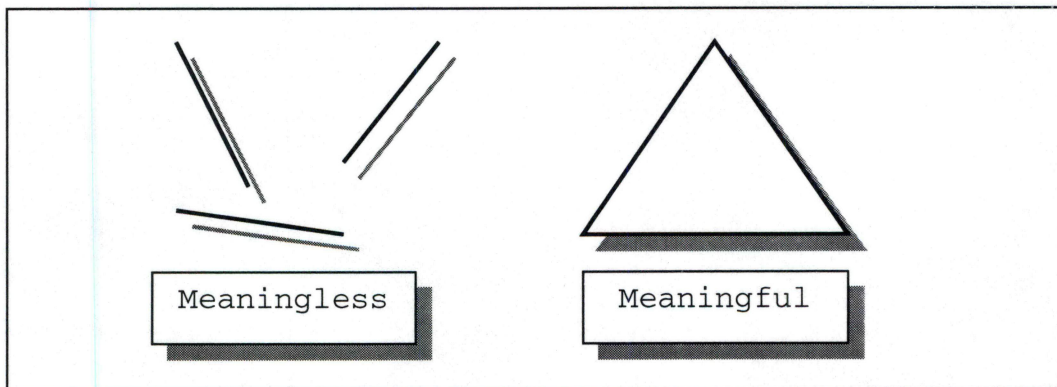
Figure 11. Meaningless Information versus Meaningful Patterning. Meaningless information is often confusing and unconnected. Meaningful patterning helps students see the connections to other relevant information that they have experienced.

longer consciously respond to it anymore. If meaningless

information is imposed on it (see Figure 11), like isolated

pieces of information unrelated to a student's prior

knowledge, "the brain resists learning it" (Caine and

Caine, 1994, p. 89).

Here the strong methods of thematic, integrated, and

interdisciplinary teaching come to the fore, where strong

connections across the different disciplines are infused in

all classes. Of course, there is no magical formula for

how much integration should take place among all classes,

but one of the most significant factors to keep in mind

whenever it is being employed as a learning strategy is,

It is far more important that the curriculum be

relevant and significant to the learner and that the

activities and ideas naturally involve

interdisciplinary and cross-disciplinary thinking and

questioning, than that every subject area be forced

into the integrated curriculum (Martinello and Cook,

1994, p. 52).

The key to designing curriculum is to present information

in a way that is meaningful to students, and giving them a

chance to formulate their own patterns of understanding.

Emotions are Critical to Patterning

The cognitive and affective domains of the brain work very closely with one another so that "what we learn is influenced and organized by emotions and mind sets based on expectancy, personal biases and prejudices, degree of self-esteem, and the need for social interaction" (Caine and Caine, 1994, p. 90). Emotions are the chief organizing system of the mind, so much so that one becomes more connected to their memories if they have a positive emotional experience. In a classroom that has a relaxed compassionate environment a "student's brain can secrete special neurotransmitters. These special neurotransmitters can increase learning rates up to 400% of normal" (Beamish, 1995, p. 32). Therefore teachers need to develop a sincere relationship with their students based on trust and effective communication.

Every Brain Simultaneously Perceives and Creates Parts and Wholes

There is a difference between the right hemisphere of the brain and the left hemisphere. Generally, the right side sees things from whole to part and the left side puts things in order from part to whole. Summarizing this distinction, Ornstein (1997) writes:

The right side doesn't (mystically) somehow perceive

things whole, but seems to be specialized for the

large elements of perception, the overall shapes of

objects, the word shape, the information contained in

the size, sounds, and intonation of words strung

together. These convey emphases and much of the

subtext and contextual meaning. It handles the large

movements of the limbs, and the larger emotional

reactions such as anger and disgust. And the left

side handles the small, precise links that carry the

smaller, more precise meanings and movements. It's

this specialization that contributes to one side being

good for the analysis of the small elements versus the

synthesis or holistic vision (p. 175).

In a healthy person both sides of the brain interact

across the corpus callosum in all activities. Most

important for educators to remember is "that the brain

reduces information into parts while perceiving

holistically" (Crowell, Caine and Caine, 1998, p. 9).

Educators spend "far too little effort *connecting what*

is learned to the experience of the learner" (Ornstein,

1997, p. 171). The curriculum dominates left-brain methods

of instruction, focusing on unrelated parts without

relating to the larger perspective. Many left hemisphere functions of the prefrontal lobes in the cortex like planning ahead and being on time are "myelinated in only about 50% of the population" (Beamish, p. 26). The other 50% have more right hemispheric myelination. It is not until later, between the ages of seventeen and twenty four, that this section becomes insulated. When comparing to Steinburg's statistic of forty to fifty percent student disengagement in the classroom, one can see the clear correlation between the two. Teachers should always relate what they are teaching to a larger, real life, even global perspective to activate the strengths of all students.

Learning Involves Focused Attention and Peripheral Perception

Attention to classroom environment is essential, for the brain takes in not only what is focused on, but also many other aspects of the environment it is in. The mind may be focused on the teacher, but the mood of the room alters the emotions, and the different modes of thinking we have. Music, art, candles, incense, lighting, color- all must be taken into account when designing a classroom and a school. "Even the unconscious signals that reveal our inner beliefs have a powerful impact on students" (Crowell,

Caine and Caine, 1998, p.9). Teachers must have a

legitimate caring, loving relationship with their students.

As with anyone else people can see through a fake. "There

is a level at which students respond to teachers who hold

the students in contempt, no matter how bright their smiles

and how open they claim to be" (Caine and Caine, 1994, p.

145). Classroom management, passion for teaching, and

attitude of the teacher are extremely important to develop,

recognize, and monitor on a consistent basis.

Learning Always Involves Conscious and Unconscious
Processes

The brain learns much more than what is consciously

understood. Many times we unconsciously interpret what is

inside of us. Even the smallest accidental event shifts

the minds thinking, although one might not be aware of it.

Subliminal stimuli affect the mind's perception of mood and

memory. Most peripheral information that is received by

the brain comes in below the learner's awareness, thus the

mind interacts with it unconsciously. According to Caine

and Caine (1994) one must become involved in active

processing in order to decipher what is personally

meaningful to them. Students engaged in reflection,

contemplation, and creative elaboration go beyond

unconnected surface knowledge and are encouraged to explore

meaningful knowledge. (See Figure 12.)

Perkins (1998) has found that humans have three broad

forms of intelligence. The first, neural intelligence is a
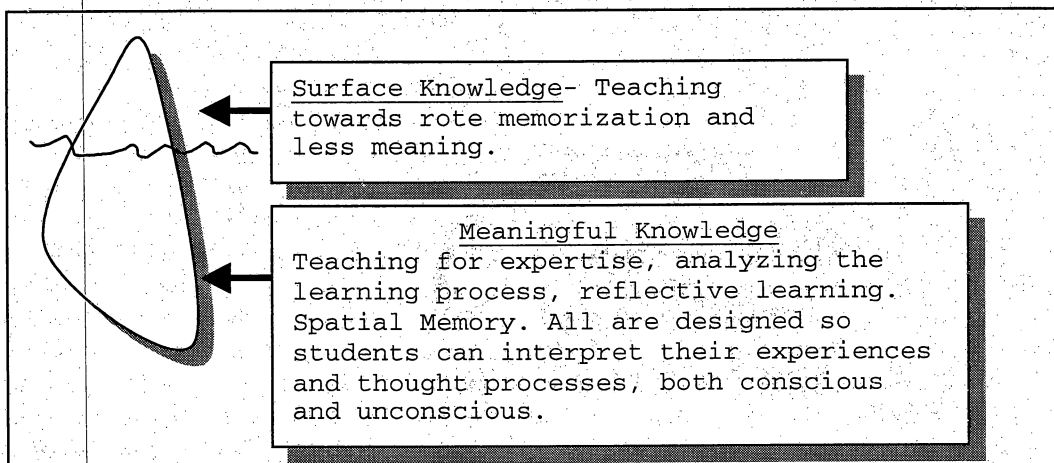
Figure 12. The Glacier. Lessons should be

designed allowing students to explore deep,

meaningful knowledge. Largely unconscious beliefs,

moods and memories often are discovered during

contemplative or reflective activities.

product of the "hard-wired" nervous system and is

genetically determined. Most I.Q. tests are designed to

test this intelligence. The second intelligence,

experiential, comes from one's endeavors in life and takes

years for the individual to build. The third and most

learnable of the three is reflective intelligence. He

describes the mind as a contemplative tool, always working

to "*pattern, repattern, and depattern* thinking" (Perkins,

1998, p. 2). Reflective intelligence should be stressed

the most, so that students can actively process their

experiences and learning approaches, making it meaningful

to them, helping to illuminate the fuzzy edges of

unconscious thought.

We Have at Least Two Ways of Organizing Memory

O'Keefe and Nadel (1978) suggest that the brain has

two different "systems" that are not entirely separate,

much like right brain/left brain interaction. (See Figure

13.) Taxon systems, what Caine and Caine describe as

"route" learning, are responsible for recalling relatively

unrelated information. These systems have few paths or

routes to travel for memory recall, because very few

connections (dendrites) have been grown. Spatial memory,

or the locale system, is map learning, where the mind has

many paths,

like a roadmap, to follow in order to retrieve memory.

This system does not need repetition or rehearsal like the

taxon memory, recall occurs instantly. If something is

rehearsed enough, like multiplication tables or the

alphabet, it eventually will become part of the locale

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system.   Spatial memory is tied very closely to emotions.

Where positive experiences are much more pronounced and

easily recognizable to memory, the mind often purposely

forgets negative or painful ones. Taxon memories are

motivated largely by extrinsic rewards and punishment,

while spatial memory is intrinsically motivated, always

learning for it is ever curious.

If Primary Emphasis Is On:

Prespecified "Correct" Outcomes
Behavioral or Performance Objectives/Testing
Question- What do I have to do?

Rewards
Grades Based on Specified Performance and Criteria
Question- What do I get?

External Motivation
Why Is Student Taking Class?
Question- Do I have to take this class to graduate?

Primarily Used for Memorizing Information

TAXON SYSTEMS

OVERLAP

If Primary Emphasis Is On:

Outcomes Open Ended
Emphasis on Process and Discovery

Intrinsic Motivation
Question- How do I find out what I want to know?
        How can I learn more?

Sense of Purpose/Sense of Meaningfulness
Question- Does this make sense and relate to what I know?

LOCALE SYSTEM

Primarily used for Creative Project and Higher-Order Thinking Skills, Such as Analysis, Synthesis, and Discovering Unique Outcomes

Figure 13. Taxon and Locale Memory Systems.

Note. From Caine R.N. and G.Caine. (1994). Making

Connections. Menlo Park, CA: Addison-Wesely.

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While one may think memories are recorded exactly as

an experience occurs they are "not photographic, they do

not store individual events; rather, they can be lumped

together, erased, or altered by later experiences"

(Ornstein, 1991, p. 184). Both taxon and spatial memory

memories work together to chunk small information into

larger wholes. In essence meaningless and meaningful

memory have two distinct methods of storing information.

Teachers must move beyond rote memorization techniques and

fully immerse students in engaging, meaningful, and

connected learning situations.

Learning is Developmental

As Piaget once wrote, "To understand is to discover,

or reconstruct by rediscovery, and such conditions must be

complied with if in the future individuals are to be formed

who are capable of production and creativity, not simply

repetition" (Martinello and Cook, 1994, p. 1). Piaget's

developmental stages might be better understood as

discovery stages. In analyzing evolution and Wilber's

quadrants, these developmental stages were touched on

briefly. All individuals must move through the same

developmental steps in consciousness, but the mind does not

magically leap from stage to stage. It moves slowly in

layers, adding more, and eventually discovering a larger

perspective of life. Wilber describes this in his ladder,

climber, view model. He describes that as a child or an

adult climbs up the rungs of the developmental ladder,

their view of the world becomes greater. It discovers a

larger whole with greater connections. At each rung of the

ladder the climber takes a one-two-three process. First

the individual identifies with the new level of awareness

and becomes one with that level. Later, it differentiates

itself from its new level, transcending it. Lastly, the
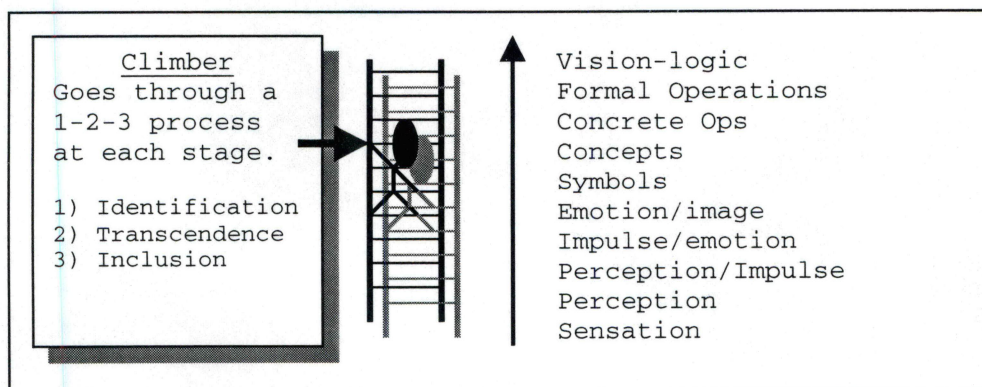
Figure 14. Ladder, Climber, View. Traversing the

stages of development the climber grows and

develops (climbs the ladder). As he climbs his

perspective of the world increases or becomes

larger. Note. From A Brief History of Everything

(p. 144), by K. Wilber, 1996, Boston: Shambhala.

self identifies with the next higher level and integrates it. It transcends, but includes its previous levels of awareness. Individually or collectively, no one and no group can skip any of these stages (Wilber, 1996).

That is why the educational system is so vital to America's youth, for if it were non-existent or dysfunctional, a culture could very well descend downward, rather than transcend upward. Wilber maintains that it is a very great danger to have a society with too large a separation between these levels of consciousness, for it is very difficult to communicate at these different levels. If half the culture is at a vision-logic stage and half are at concrete operations, it would be virtually impossible for the lower level to understand the higher one. Only through education can a society hope to raise all of its people to the same level of consciousness.

Complex Learning is Enhanced by Challenge and Inhibited by Threat

Students learn best when they are placed in a relaxing, comfortable environment, that challenges them. But when in a hostile environment like a disengaging, threatening even boring environment learning is

constricted. Leslie Hart (1983) refers to this as downshifting. Developed over millions of years this automatic response evolved for survival. For instance, if a lion attacks, one runs. They do not contemplate on what to do- they act on instinct. The same holds true today. Physiologically the blood flow in the brain "downshifts," much like an automobile, to the middle part of the brain- the limbic system and reptilian brain stem, the part of the Triune brain which controls emotions and the more automatic functions of the body. Since most of the blood is carrying oxygen and nutrients to this "fight or flight" section of the brain, dendrites cannot be grown nearly as quickly because the function of these two "brains" is not higher cognitive thought. The higher levels of thinking in Bloom's taxonomy cannot function optimally, therefore an engaging and trusting teacher and classroom environment is paramount to successful learning.

Every Brain is Uniquely Organized

Although all people go through the same developmental stages and have the same basic features, everyone does it in their own way and all are unique. The physical structure of each individual brain is as unique as someone's facial features or fingerprints, thus inner

cognitive activity varies among each person as well. Gardener's (1993) theory of multiple intelligences testifies to this fact by proposing that everyone has at least seven different kinds of intelligence and that they are uniquely developed in each individual. Teaching should be geared to allow for auditory, visual, and kinesthetic experiences. Students must be given more challenging choices in their educational careers. School reform should be shaped around this individuality so that they mirror the complexity found in the real world.

Applying it in the Classroom

In order to get the most from these principles, one must consciously work to develop the ability to see the interconnectedness of the world. Brain-based learning cannot be viewed in its disconnected parts, but rather in its greater linked wholes. Remember that the whole is greater than the sum of its parts. In applying this research in the classroom teachers should always be monitoring their behavior and their classroom environment, challenging their students with work that is related to their reality, and connecting it to the world outside of school in a way that is meaningful for all involved. To do

this, Crowell, Caine and Caine (1998) emphasize that

teachers should design their lessons around four key

components.

1) Design units and lessons around the idea of

   Orchestrated Immersion in which students are fully

   immersed in their learning. Lessons should be

   designed around models of thematic, integrated,

   interdisciplinary, inquiry-based, and project-based

   teaching. Lessons should teach to individuation

   and meaningful knowledge. It is a classroom that

   is student-centered, not teacher-centered.

2) Classrooms should have an environment of Relaxed

   Alertness in which teachers create warm caring

   environments that encourage students to take risks.

   In this type of setting downshifting is less likely

   to occur.

3) Social Relationships must be developed in the

   classroom. Here students engage in cooperative

   learning and interactive discussions, because the

   dissemination of knowledge is passed on culturally.

   Once again, social communication skills are vital

   to a healthy democracy.

4) Students are consistently given assignments in
which they actively engage in processing the
knowledge they are learning. Active Processing pauses for
reflection and contemplation, time to develop deep
meaningful knowledge, not the unconnected surface knowledge
that quickly slips from memory and fosters little growth.
Effective outer change, though, will not occur if teachers

Elements Of Orchestration	Brain-based Classrooms (Student-centered) Orientation Three Teachers	Traditional Classrooms (Teacher-centered) Orientation One Teachers
Class structure/ Lesson design	Dynamic/Integrated/Thematic/ Interdisciplinary/ Cooperative Learning/ Teaching to Individuation	Teacher directed/often disengaging/Individual assignments/Textbook or worksheet driven
Standards/Outcomes	Authentic assessment/Focus is on using information in a variety of contexts and disciplines	Testing for short term-taxon memory
Discipline/Classroom Management	Individual responsibility/ Student assigned roles/ Choice Theory- teaches that all behavior is of one's choice, not an outside force	Teacher dominated/ Power struggles in the Classrooms

Figure 15. Comparative Teaching Models. If education
is to change teachers must change their paradigm,
shifting from a teacher dominated classroom to one
that is more student-centered and brain-compatible.
Note. From Making Connections (p.133), by R. N. Caine
and G. Caine, Menlo Park, CA: Addison-Wesely.

do not shift their inner assumptions and beliefs regarding education. They must be committed to becoming "Orientation Three" thinkers. (See Figure 15.) Where Orientation One is thinking in fragmented, separated parts, Orientation Two thinkers see some clear connections, yet they are still restricted by their own mental boundaries. Wilber would say that they are stuck in formal operations. Orientation Three teachers are those who make unlimited relationships and have a sense of wholeness about them. "It is this conscious grasp of interconnectedness that is at the heart of the capacity to integrate the curriculum and work with complex experience" (Crowell, Caine and Caine, 1998, p. 133). From there teachers and students become conscious co-creators of the world, connecting inner and outer- a synthesis of mind, body, and spirit.

CHAPTER THREE

METHODOLOGY

General Design

If school reform is to truly work, educators must see reform as an evolutionary step to its next higher level. As the world has evolved from its primordial slumber, one truth has always held true, species evolve in ways that transcend what already exists, but include that which came before it. To transcend and include past efforts for school reform, middle schools must go beyond programs, policies, and models that have come before it, yet at the same time, use what has worked already. The design of this reform model attempts to do this. It's goal- to educate all students for lifelong success. This five-step plan for raising standards and achievement creates a middle school infused with a team consciousness with an interdisciplinary, integrated, brain compatible curriculum to raise student development and success. The following is a brief summary of the plan.

Step One- The First Year: Infrastructure

Some of this step is already in place in many middle schools. Really it is a pre-requisite that must be in

place before any further steps can be taken. First, the school should be divided into teams in which a group of students have the same core of teachers in Language Arts, Math, Science, Physical Education, and History. While students are in P.E. teachers in the other four core disciplines should have common prep periods in order to communicate and work together.

Step Two- The First Year: Aligning the Standards

There must be a weeklong training before the school year begins indoctrinating teachers into interdisciplinary and brain-based methodologies and teachers should set goals and objectives for the school year. At least one or two in-service days a month must be set aside for further training and work. In departments schools should align the state and/or district standards of each department on a trimester-by-trimester or semester-by-semester basis. Working as team departments decide when to teach the standards and give suggestions on how to teach them. Furthermore each department should create either final exams or final projects as end of the trimester assessments of student learning. Lastly, one experimental team, not a department, must volunteer to incorporate and follow the guidelines of Step Three- Interdisciplinary Instruction.

Step Three- The Second Year: Interdisciplinary Instruction

Here a few more teams, based on individual school discretion, are given time again before the school year to connect the standards across all classrooms. These teams would follow in the footsteps of the first experimental team from step two and would be required to create at least one interdisciplinary unit per year in order to connect student learning across all of their classes. Departments would be given time to strengthen and assess the previous years work for the rest of the school and new teachers must receive the previous years training.

Step Four- The Third Year: Deeper Team Connections

This is the year in which all teams make the leap to interdisciplinary teaching, based upon the guidelines of step two. The other teams, already participating would be required to create trimester long connections, designing one unit per trimester, but would be allowed to adjust the department alignment of the standards to fit their needs, as long as they are still teaching the same standards. Again the previous years work would be refined.

Step Five- The Fourth Year: School Project Alignment

At this stage each team would be held to the requirements of step four, but would be free to be as

creative as possible. Once again teams and departments would refine the standards and new teachers would be trained. At this point the school aligns the interdisciplinary trimester projects so that no child mistakenly learns from the same units twice in different grades. At all times it remains conscious to transcend and include that which came before it recognizing and repairing flaws in their previous years work.

Project Evaluation Survey Questions

In order to evaluate the project a survey was designed. The responses to this survey can be found in Appendix C. For the following six statements two evaluators, a male administrator schooled in the concepts of brain-based learning and interdisciplinary teaching, and a female teacher who received a master's degree in interdisciplinary education, were asked to rank the project regarding its effectiveness and feasibility by circling numbers one through five and providing comments and opinions for each of the following questions.

(1) Disagree very strongly   (2) Somewhat disagree
(3) Agree   (4) Very much agree   (5) Agree very strongly

1. The project is understandable.

   1 2 3 4 5

2. An integrated, brain-based, interdisciplinary plan is a

desirable model for middle school reform.

   1 2 3 4 5

3.The project is feasible.

   1 2 3 4 5

4. This is a workable plan for professional development.

   1 2 3 4 5

5. The project is flexible enough to suit the

local needs of all middle schools?

   1 2 3 4 5

6. What would you add or delete to make this project

stronger?

CHAPTER FOUR

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

Summary

Throughout the entirety of this project there are three main themes pulsing within its pages. Reference has been made to Wilber's four quadrants and Crowell, Caine and Caine's Principles of Connectedness, which stated that inner and outer reflect each other. In looking through the evolution of human consciousness and of education's past, the project is consistent with that pattern of development and it clearly states that middle school reform should transcend and include that which came before it. Lastly, the project emphasizes the need, especially for middle schools, to organize themselves in a way that better helps the development of a vision-logic consciousness in individuals.

Since inner and outer reflect each other, time should be spent in classrooms not only on outer behavioral objectives, but considerably more time should be devoted to the inner development of the child. Time for reflection and contemplation, that is time set aside for more meaningful connected education is essential to developing

well-rounded children. In recognizing the evolution of American schools one can see that schools have gone through four major shifts, all of which have transcended and included their predecessors. From the community center of the 1830's and the factory model of the late nineteenth to early twentieth centuries, to the Progressive hospital of Dewey and the global marketplace of today all present to educators a pattern which suggests that mankind is shifting to a much higher organization, a planetary one, what Wilber calls a vision-logic consciousness. That vision-logic consciousness is seen everywhere and schools should likewise be set up in a pattern that integrates and synthesizes itself into this more efficient mind-body-spirit (subjective and objective) consciousness.

Therefore middle schools should be set up in interdisciplinary teams in which teachers teach the same themes across the disciplines and students are taught not just to rote memorization, but to be creative and innovative, triggering locale memory. Teachers should be trained to teach in a way that is more consistent with the brain-based principles, for these principles provide a framework for how the brain learns best. Schools should shed themselves free of older models that clearly do not

teach to how the brain learns best. Their classrooms

should be full of what Crowell, Caine and Caine (1998) call

Orchestrated Immersion, Active Processing, Relaxed

Alertness, and Social Relationships to optimize the

potential in every student to learn. Yet all of these

changes must occur within the bounds of the California

State Standards, even though rooted in Essentialist

beliefs, because if education is to change it must do so in

a way, which goes beyond mere Essentialism, but also seeks

to include it.

Conclusion

If education is to change for the better, it must

remove its blinders and open up to the myriad possibilities

that a fully integrated brain compatible school can

deliver. Collaboration, cooperation, connections- all are

metaphors symbolic of the growing consciousness towards a

global awareness currently evolving in the world.

Education must adapt to this growing consciousness to solve

the problems mankind has created for itself. Thomas Kuhn

once stated that when the paradigm of a community of

professionals can no longer solve the anomalies of their

particular scientific field they are faced with a crisis

(Kuhn, 1962). Education is fully immersed in this stage. The old patterns of thinking will no longer suffice to solve education's current situation. It cannot descend backwards for solutions. Only a new paradigm, one that transcends and includes its predecessors will bring the proper answers. False assumptions must be cast aside, particularly those of the cold and callous factory model and behaviorism as appropriate for education. Educators must first be open to a higher vision if they intend on changing the institutions in which they work.

That vision openly recognizes that mind, body, and spirit are one. It sees that the duality between the objective physical world and the subjective inner worlds must be meshed into what Crowell (1998) describes as dynamic unity. Dynamic in that a complex connected community of educators working towards a common goal become a much more powerful unity than if they remained isolated islands of classrooms. It is here where fusion across the disciplines allows for meaningful learning and active processing occurs. A connected school plays an integral part in the developing child, assisting them as they climb the ladder of consciousness and guiding them in their

search towards a balanced, holistic, vision-logic awareness.

Judging from the responses of the evaluators, this middle school plan makes a strong attempt to do this. Their responses indicated that it is well organized and is both a feasible and flexible one. Already many of the ideas are currently being used in individual classrooms, but very rarely are they being employed on a school-wide scale. Those who use interdisciplinary teams and brain-based methods know that they are effective and can be implemented in all middle schools. Teachers must simply become conscious of how to employ brain-based learning strategies in the classroom working as a team of educators to integrate these methodologies into the middle school.

Recommendations

No change is unhealthy and too much change in too short a time is certainly unhealthy as well. Just as the design plan implements slow but steady alterations year by year, so to should school districts implement these changes. Taking one or two schools at a time districts should slowly implement the plan over the years testing it every step of the way with full support. The plan is

solid, but only if implemented correctly. Certainly schools are encouraged to make changes and add to the program, but it is highly recommended that none of the steps are skipped. Lastly, the project only provides a blueprint for training teachers about brain-based learning, interdisciplinary teaching, and middle school reform that moves forward, not backward. It gives a plan for how to change, but it does not provide specific lessons and units to be used in middle schools. Further research and development of specific curriculum is essential for developing units and lessons that are consistent with the design plan for reform. In other words this project provides a plan for how to change, but not what to change.

APPENDIX A:

ALIGNING BRAIN-BASED

MIDDLE SCHOOL REFORM WITH

THE CALIFORNINA STATE STANDARDS

Connections

Aligning Brain-based Middle School Reform with the California State Standards

By
John Ray Adams

Aligning Brain-based Middle School Reform
with the California State Standards

Schedule of Events

Day One

- ❑ Donuts, drinks and discussions

- ❑ What is brain-based learning?
    - ❑ The Four Quadrants and the Principles of Connectedness
    - ❑ Brain setup
    - ❑ Downshifting- How to gear up our classrooms to maximize student learning.
        - ❑ Coping with stress

Break

- ❑ Left Brain, Right Brain, School Brain, Street Brain

- ❑ Our memory- Taxon vs. Spatial Memory
    - ❑ Surface Knowledge or Meaningful Knowledge?
    - ❑ The question is the answer

Lunch

- ❑ The inner developmental stages
    - ❑ Towards Vision-logic
    - ❑ Connections- Integrated Thematic instruction

- ❑ Activity- Designing Team lessons
    - ❑ Staff reflection and ordered sharing

Day Two

- Donuts, drinks and discussions
- Review of day one

How have we gotten here?

- School as metaphor- The community, the factory, the hospital, and the workplace

- The Twelve Principles of Brain-based learning
  - Comparative Teaching Models
  - Towards Vision-logic

- Theory into Practice- The Levy Video

Break

- How do we move to an interdisciplinary model?
- Overview of the design plan
- Department Meetings- Aligning the Standards

Lunch

- Department Meetings- Aligning the Standards
- Staff reflection and ordered sharing

Vicious Cycle of Disengagement

Teacher
Expectations

Student
Disengagement
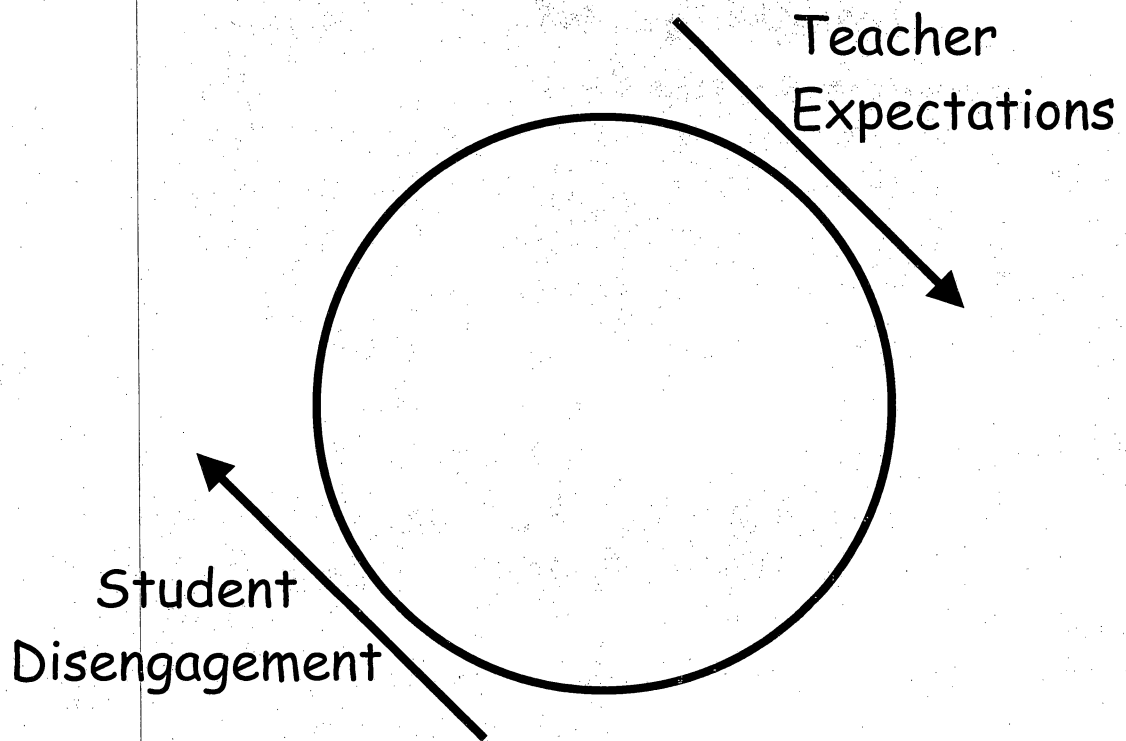
The Four Quadrants

-adapted from the work of Ken Wilber

What is brain-based learning all about?*

Inner Individual	Outer Individual
-Thoughts, beliefs, and emotions	-Electro-magnetic waves
-Developmental Stages	-Alpha/Beta Waves
-In the zone, spiritual experiences	-Neurons, dendrites
-Fear, Inhibition, Threat	-Adrenaline, Endorphins
-Our perception of how we learn and reasons for how we teach	-Downshifting/Triune Brain
	-What's physically occurring in the brain and body

I | It

We | It

Inner Collective	Outer Collective
-Cultural beliefs	-Social systems
-Language development	-Socio-economic status
-Morals, values belief systems	-Statistics
-School of thought	-Groups, clubs, institutions one belongs to
-Teaching strategies	-Standards
-Our approach to education	-what we teach

*Brain-based learning is a balanced scientific philosophy committed to unlocking the potential of people to learn

The Principles of Connectedness

1. Everything is a part and a whole simultaneously.

2. The whole is contained in every part.

3. The whole is greater than the sum of its parts.

4. Inner and outer reflect each other.

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Brain set up and its functions

A. Our brain has two types of cells:

1. Glial cells- "Feeder cells" whose main job is to feed and take care of neurons.

2. Neurons-"Nerve cells" which grow tentacle-like branches called dendrites.

B. Connectors:

1. Dendrites are grown when we learn something, AKA memories, the more dendrites we grow the more we remember. Engaged, exciting learning fosters the growth of more dendrites.

2. Axons- Are the highways that connect nerve cells together. Messages are sent from nerve cell to nerve cell along these connectors.

3. Myelination- Insulating fat laid down around axons in genetically predetermined patterns. In axons that have a myelin sheath around them communication between neurons is faster and clearer.

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Brain Setup- The Triune Brain

The brain is set up into three major sections- the neocortex, the limbic system, and the brain stem. The top part of the brain, the neocortex, is fairly new in evolutionary time, thought to be about a hundred thousands or so years old. Its only function is learning. The middle and lower parts of the brain, the limbic system and the reptilian brain stem, are much older and primitive, similar to the brains of lower organisms on the planet. They control the emotions and the more automatic functions of the brain like maintaining heartbeat, breathing, healing, and thousands of endless tasks. The brain stem is the liaison between the body and the mind, sending billions of signals back and forth. All three parts of the brain are separate, but they do work together. For instance the limbic system and brain stem are in charge of healing, yet we know that a positive attitude and focusing one's energy on what's injured actions that are controlled by the cortex, can greatly assist in the healing process. The same holds true in the classroom.

Downshifting, the Limbic System, and the Reptilian Brain

Over millions of years our brains have evolved for one purpose- survival. The limbic system and reptilian brain are prime examples of that. Not only do they control the automatic functions of the body, they also respond to dangers in our environment. When fear and threat is perceived, like a lion ready to attack, we do not think about what to do, these systems automatically take precedence. Your mind does not wait to think about fleeing or fighting, it just does it. As a species we could not have survived those early "caveman" years had we taken three or four seconds to respond to danger. Instead the brain says, "Run, Forrest, Run!" You would not be reading this paper if that was the case. Physiologically what occurs is the blood flow in the brain shifts down to the limbic system- at that particular time survival is the only thing that you care about. The mind needs the oxygen and nutrients that the blood carries to react as quickly as possible to the situation. It has to provide hormones, like adrenaline, signals to nerves, and increase heart rate and breathing. This is known as "downshifting." Taking the blood flow from the top of the brain causes less dendrites to be grown, because they don't have the "food" to feed their growth. This is why our brain often times forgets what pain it felt shortly after a dangerous situation. Even during a painful situation the brain shuts down our ability to feel as much pain so we can cope with it.

In the classroom the same thing often occurs. Downshifting occurs not only when we feel threatened, but when we feel bored as well. Our cortex is designed to adapt to new situations and incorporate immediate events into our memories. Classes that have the same routine all of the time tend to promote downshifting

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because the brain sees no use to learning the same thing over and over. Generally, a good teacher can spot downshifting when they see drool escaping from the side of the mouth of their students and onto their desks. Even if something is new, teaching it in the same manner for too long can cause our brain to downshift, leaving our more primitive limbic system to take over. Our brain, what an S.O.B. (Same Old Brain). All of this supposed development and we still are doing the same thing we did thousands of years ago.

In order to curb this teachers must balance routine (too much change can also be perceived as a threat) with "mixing it up". Teachers need to be conscious of their attitude, classroom management, environment, safety, and passion for what they do in order for students to effectively learn at their highest levels. If not, downshifting occurs and learning is minimal.
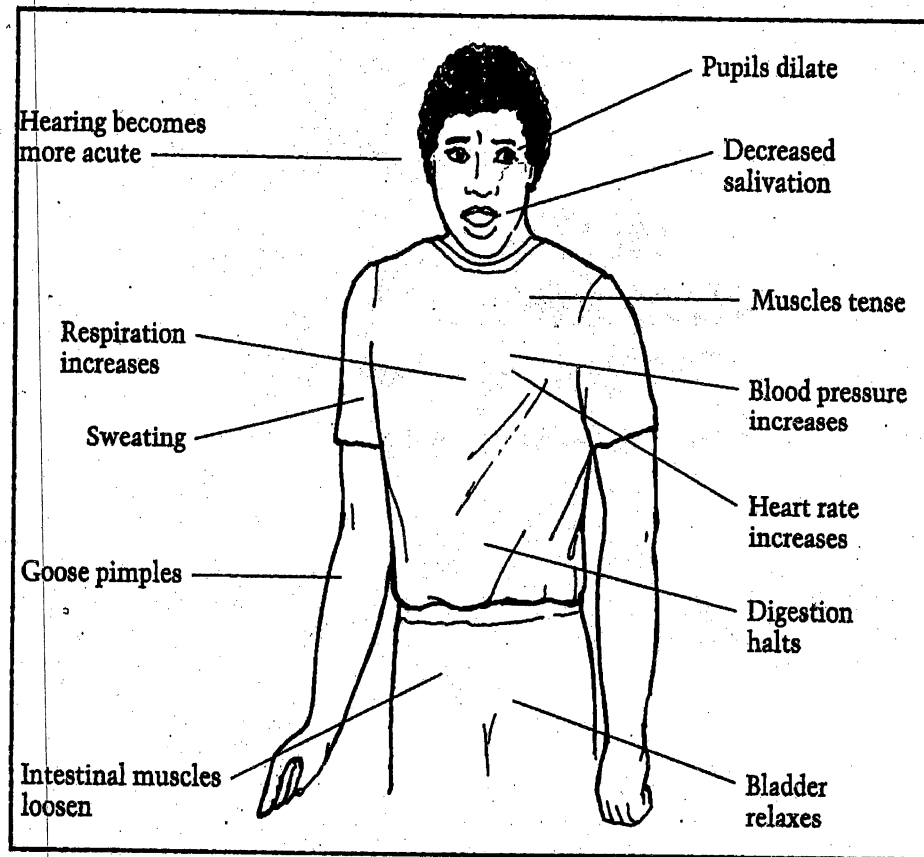
*Note. From *Fostering Emotional Well-Being In the Classroom* (p. 88),
Page R.M. and T.S. Page, Boston: Jones and Bartlett, 2000.

Downshifting Causes Stress

Downshifting and stress are interrelated. To reduce stress and anxiety teachers should educate their students about stress. The following chart shows some stress indicators. These should be taught to students so they can recognize stressors in their environment.

Situations that induce downshifting	Elements to counter downshifting
Pre-specified "correct" outcomes have been established by the teacher.	Outcomes should be open-ended with several solutions possible.
Personal meaning limited.	Personal meaning should be maximized.
Rewards and punishments are externally controlled and relatively immediate.	Emphasis should be on intrinsic motivation.
Restrictive timelines are given.	Tasks should have relatively open-ended timelines.
Work to be done is relatively unfamiliar with little support available.	Tasks should be manageable and supported.

Stress indicators: Encourage students to talk about stress. They should be alert to the reactions their body has to downshifting.

Short attention span　　　　Upset Stomach
Mood swings　　　　　　　Dry throat and mouth
Irritability　　　　　　　　Shortness of breath
Restlessness　　　　　　　Depression
Nervous behavior　　　　　Difficulty sleeping
Grinding teeth　　　　　　Tiredness
Headaches　　　　　　　　Eating problems
Tense neck muscles　　　　Crying episodes

What teachers can do to create a less stressful classroom

Create a mood of **Relaxed Alertness**. Some key components are:

Create a warm engaging classroom environment.

- ❑ What you put on your walls- Artwork, Color (Relaxing if possible). Bare walls immediately trigger downshifting.

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- Play relaxing music, light incense or spray some other pleasing smell.
- While most teachers do not have control of it school districts should pay close attention to lighting. Previous studies have shown that schools with incandescent lights, while more expensive, have higher attendance than those with fluorescent bulbs.
- Every time they enter your room they are reminded of the mood of the room.

Teacher Behavior

- Talk to them about yourself and your personal life. So many times we put up walls between our kids and our personal lives. Your kids must like you, to do that they must get to know and trust you.
- Speak in a calm tone of voice.
- Listen to and genuinely respect individual feelings.
- Some talking in the room should be allowed and is positive.
- Give them some freedom within appropriate boundaries.
- Constantly monitor your attitude and behavior.

Assignments and Grading-

- Coordinate with your team members so as not to overwhelm students with homework
- Give them choices in homework, projects, and classwork.
- Individuate assignments based on student needs (if possible).
- Give them meaningful assignments that they feel they benefit from.
- Be objective in grading work. Rubrics are excellent so they know exactly what's expected.
- Try to grade activities that you wouldn't normally give grades for, like discussions.
- Meet with them to go over a grade every few weeks, help them to develop a plan of action to do their best.
- Some failure is normal and acceptable, let them know its how we grow.

Taking Tests-

- If at all possible try to use authentic assessment whenever you can. It's less stressful, and more meaningful to students.
- Don't give too many tests in the same period of time. Two spaced out during a week is appropriate. Finals week can be an absolute killer for some people.

❑ Before giving a test go over its purpose and what's to be covered.

Coping with stress

The following techniques can help students to deal with stress in their lives, but they must be taught to them. With so many standards to teach we forget the more important things in life like self-maintenance and personal well being.

Reflective journals. Journals are excellent, not only to learn and develop writing skills, but for encouraging students to explore their inner thought processes, and they are assignments that are generally stress free. With regards to stress journals can:

❑ Encourage them to analyze their home situations.
❑ Give them topics about their feelings and reactions to stressors.
❑ Teach them how to avoid stressors.
❑ Helps them to cope with stressors.
❑ Give them feedback by the teacher.

Emphasize rest and sleep. This is the number one cause of stress in people. In our fast-paced ever changing world we forget that one-fourth to one-third of our time is spent in dreamland.

Switch brains. Have them recognize these patterns of thinking and change their thinking patterns:

❑ All or nothing- "Why should I try if I can't finish it anyway?"
❑ Jumping to conclusions- "I know she did it."
❑ Over generalizing- Watch for words like "always, never, all, or none."
❑ Labeling others and themselves- "He's an idiot."
❑ Helpless- "The world won't go on if…"

Use Humor. Laughing at ourselves, but not at others.

Time management skills.
• Schools should provide daily, weekly, even yearly planners for homework.
    ❑ Homework should be done at certain scheduled times, as well as other activities.

Relaxation techniques

- ❑ Exercise
- ❑ Progressive Muscular Relaxation
- ❑ Visualization
- ❑ Breathing techniques
- ❑ Electromagnetic energy focusing
- ❑ Mood enhancers- Music, humor, etc.

Right Brain/Left Brain Dominance Questionnaire

Directions: First, read the sentence. Then ask yourself how it applies to you. Put the letter that describes your feeling best on the line next to the sentence.

A. Most of the time   *B. Often*   *C. Sometimes*   *D. Once in a while*   *E. Hardly ever*

_____1. Reading is something that I really like to do.
_____2. I can't sit in one place for too long without feeling uncomfortable.
_____3. When reading in a textbook I always read the titles of the chapters and look at
      the pictures first, so I can get a general idea of what the chapter are about.
_____4. I'm good at memorizing vocabulary or putting things in chronological order, like
      history.
_____5. Division, multiplication and basic math are fairly easy for me.
_____6. When I look into a crowd of people I see the entire group rather individual faces.
_____7. I'm a good writer.
_____8. I often like to dance or go crazy sometimes.
_____9. I find that I am always looking at a clock or want to know the time.
_____10. I get very emotional a lot.
_____11. I am a good speller.
_____12. I can do many things at the same time.
_____13. My folder is very organized.
_____14. I like to hum songs, sing them aloud, or even make them up in my head.
_____15. I have good balance and consider myself to be a good athlete.
_____16. I am an organized person.
_____17. I am very good at turning things in on time and being punctual.
_____18. I'm a really good problem solver.
_____19. I like a teacher who is very structured and like it when they go step by step.
_____20. I have a really good idea of what's occurring around me at all times.
_____21. I follow directions very well.
_____22. If something bores me I have a hard time concentrating for too long.
_____23. Movies like mystery or suspense ones, which constantly keep me guessing, are
      very interesting to me.
_____24. I like to do things spontaneously, without much planning.
_____25. I rarely look at the individual details of when I first look at something.
_____26. I am good at following instructions.
_____27. Higher level math is difficult for me to understand, like pre-algebra.
_____28. When I write an essay I always start with a pre-writing activity, like
      brainstorming, then make sure I have an introduction, body, and conclusion.
_____29. Getting my ideas onto paper is difficult for me.
_____30. People say I am a good listener.
_____31. When doing a research project I will get an encyclopedia to get a general idea of
      what it is I am studying, before I read a book or something
      more detailed.
_____32. I'm a very rational unemotional person.
_____33. I consider myself to be very "book smart" or "school smart."
_____34. I think I am a very "street-smart" person.

Learning Preferences Checklist

First, read the sentence. Then ask yourself how it applies to you. Put the letter that describes your feelings best on the line next to the sentence.

A. Most Of The Time   B. Often   C. Sometimes   D. Once In A While   E. Hardly Ever

_____1. If I write something down, I can remember it better.

_____2. When I read, I read aloud or I listen to the words in my head.

_____3. I understand things better when I talk about them.

_____4. I prefer to begin things before I read or listen to the directions.

_____5. When someone is talking or I'm reading, I can "see" pictures in my head.

_____6. Music playing in the background helps me to study better.

_____7. While I'm studying I need lots of breaks.

_____8. I think better while I'm moving around; studying at a desk is not my preference.

_____9. I write notes on what I read and hear

_____10. I stay focused better on what a person is saying when I *look* at them.

_____11. When there is a background is a background noise while a person is talking, I don't understand what they are saying.

_____12. It's easier for me to have someone tell me how to do something than for me to read the directions myself.

_____13. I would rather hear a lecture or a tape than read a textbook.

_____14. I describe things I can't remember by using my hands a lot or by using words like "what-cha-ma-call-it" or "thing-a-mig-jig".

_____15. Even if I'm looking down or looking out the window, I have no problems following the speaker.

_____16. I can concentrate and get more work done if I'm alone or in a quiet place.

_____17. I find that it's very easy for me to understand maps, charts and graphs.

_____18. I like to look at the ending of a book or article when I begin reading.

_____19. It's easier for me to remember the names of people than what they look like.

_____20. If I study out loud with someone, I will remember things better.

_____21. Even if I take notes, I hardly ever go back to read them.

_____22. The radio bothers me when I'm trying to concentrate on reading or writing.

_____23. It's very hard for me to visualize or see pictures of things in my head.

_____24. When I talk to myself through my homework assignments, it helps me get the work done.

_____25. Even though my desk and folder are messy, I know where everything is.

_____26. I can "see" the page with the right answer on it when I'm taking a test or quiz.

_____27. I can never remember the punch line or how the story goes in a joke to tell it later.

_____28. Before I do something new, first, I listen to information on it, then I read about it, and last, I do it.

_____29. Before I begin something new, I like to finish other tasks first.

_____30. I find myself moving my lips to read and using my fingers to count.

_____31. I do not like to proofread my work.

_____32. When I want to remember something new like a friend's phone number, it helps me to make a picture of it in my head.

_____33. I would rather do an extra credit report on tape instead of writing it.

_____34. I find myself daydreaming in class.

_____35. Instead of writing a report for extra credit, I prefer to do a project.

_____36. If I don't write down my great ideas right away, I'm more likely to forget them.

Suggestions for Auditory Learners

You will learn better when information comes through your ears. You need to hear it. Lecture situations will probably work well for you. You may not learn as well just reading from a book. Try some of these suggestions and create some more that will work for you.

❏ Try studying with a buddy so you can talk out loud and hear the information.

❏ Recite out loud the thing you want to remember (quotes, lists, dates, etc.).

❏ Ask your teachers if you can turn in a tape or give an oral report instead of written work.

❏ Make tape cassettes of classroom lectures, or read class notes onto a tape. Summarizing is especially good. Try to listen to the tape three times in preparing for a test.

❏ Before reading a chapter, look at all the pictures, headings, and talk out loud and say what you think this chapter will be about.

❏ Write vocabulary words in color on index cards with short definitions on the back. Review them frequently by reading the words aloud and saying the definition. Check the back to see if you were right.

❏ Before beginning an assignment, set a specific study goal and say it out loud. Example, "First, I will read my history chapter."

❏ Read aloud whenever possible. In a quiet library, try "hearing the words in your head" as you read. Your brain needs to hear the words as your eyes read them.

❏ When doing complicated math problems, use graph paper (or use regular lined paper sideways) to help with aligning the problems.

❏ Use color and graphic symbols to highlight main ideas in your notes, textbooks, handouts, etc.

Suggestions for Visual-Spatial Learners

You will learn better when you read or see the information. Learning from a lecture may not be as easy. Try some of these suggestions and create some more that will work for you.

☐ Write things down because you remember them better that way (quotes, lists, dates, etc.)

☐ Look at the person while they are talking. It may help you stay focused.

☐ It's usually better to work in a quiet place. However, many visual learners do math with music playing in the background.

☐ Ask a teacher to explain something if you don't understand the point being made. Simply say, "Would you please repeat that?"

☐ Most visual learners study better by themselves.

☐ Take lots of notes. Leave extra space if some details were missed. Borrow a dependable student or teacher's notes.

☐ Copy your notes over. Re-writing helps recall of memory

☐ Use color to highlight main ideas in your notes, textbooks, handouts, etc.

☐ Before reading an assignment set a specific study goal and write it down. Post it in front of you. Example "From 7:00-7:30 I will read the first chapter."

☐ Preview the chapter _BEFORE_ reading it by first looking at all the pictures, section headings, etc.

☐ Select a seat furthest from the door and windows that faces the front of the class, if possible.

☐ Write vocabulary words on colored index cards with short definitions on the back. Look through them frequently, write out the definitions again, and check yourself.

Suggestions for Kinesthetic Learners

Your learning preference means that you learn best by doing, moving, or with hands-on experiences. Getting information from a textbook (visually) or a lecture (auditory) is just not as easy for you. Try some suggestions and create some more that will work for you.

- ❑ To memorize, pace or walk around while reciting to yourself or looking at a list or index card.

- ❑ When reading a textbook chapter, first look at the pictures, then read the summary or end-of -the chapter questions, then look over the section headings and bold-faced words. Get a "feel" for the whole chapter by reading the end selections first, and then work your way to the front of the chapter. This is working whole-to-part.

- ❑ If you need to fidget when in class, cross your legs and bounce and jiggle the foot that is off the floor. Experiment with other ways of moving; just being sure you're not making noise or disturbing others. Try squeezing a tennis ball or a nerf ball.

- ❑ You may not study best at a desk, so when you're at home, try studying while lying on your stomach or back. Also try studying with some music in the background.

- ❑ If you have a stationary bicycle, try reading while pedaling.

- ❑ Use a bright piece of construction paper in your favorite color as a desk blotter. This is called color grounding. It will help to focus your attention. Also, try reading through a color transparency. Experiment with different colors and different ways of using colors.

- ❑ When studying, take breaks as frequently as you need. Just be sure to get right back to the task. A reasonable schedule is 20-30 minutes of study and 5 minutes of break. (TV watching and telephone talking should not be done during break time!)

- ❑ When trying to memorize information, try closing your eyes and writing the information in the air or on a desk or carpet with your finger. Picture the words in your head as you do this. If possible, hear them too. Later, when trying to recall this information, close your eyes and see it with your " mind's eye" and "hear" it in your head.

Taxon Memory   vs.   Spatial Memory
"Route Learning" vs.   "Map Learning"

Taxon Memory
- When learning, the brain grows only a few "routes" thereby making memory recall more difficult.
- Short-term memory

Characteristics of Taxon Learning:

- Bored, unengaged students
- Routine bores the student
- No connections are made to the world outside of the classroom.

Spatial Memory
- When learning, the brain grows many "routes," like a road map, making memory retrieval easier.
- Long-term memory

Characteristics of Spatial Learning:

- Excited, Engaged learners
- Teachers "mix-it-up" in the classroom.
- Connections are made to other classes and the outside world.

Taxon and Locale Memory

If Primary Emphasis Is On:

Prespecified "Correct" Outcomes
Behavioral or Performance Objectives/Testing
Question- What do I have to do?

Rewards
Grades Based on Specified Performance and Criteria
Question- What do I get?

External Motivation
Why Is Student Taking Class?
Question- Do I have to take this class to graduate?

Primarily Used for Memorizing Information

| TAXON SYSTEMS |

OVERLAP

If Primary Emphasis Is On:

Outcomes Open Ended
Emphasis on Process and Discovery

Intrinsic Motivation
Question- How do I find out what I want to know?
    How can I learn more?

Sense of Purpose/Sense of Meaningfulness
Question- Does this make sense and relate to what I know?

Primarily used for Creative Project and Higher-Order Thinking Skills, Such as Analysis, Synthesis, and Discovering Unique Outcomes

| LOCALE SYSTEM |

Note. From Caine R.N. and G.Caine. (1994). Making Connections. Menlo Park, CA: Addison-Wesely.

Brain-based principle #8- **We have at least two ways of organizing memory.**

Route Learning- *Taxon systems* are very separated. When something is learned through these systems neurons grow very few dendrites, thus the brain has only developed a few *"routes"* to recall memory. Teaching strategies here are based on rote memorization like repetition, routine and extrinsic rewards. "Use it or lose it" applies here.

Map Learning- *The Locale system* stores information in spatial memory. The brain uses this system when something is intrinsically motivating to someone. They are curious and driven by novelty. Here many dendrites are grown so the brain has many "routes" to connect information together. This system is inexhaustible. When something is learned here the brain never forgets it.

Taxon and Locale Memory

If Primary Emphasis Is On:

Prespecified "Correct" Outcomes
Behavioral or Performance Objectives/Testing
Question- What do I have to do?

Rewards
Grades Based on Specified Performance and Criteria
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Primarily Used for Memorizing Information

OVERLAP

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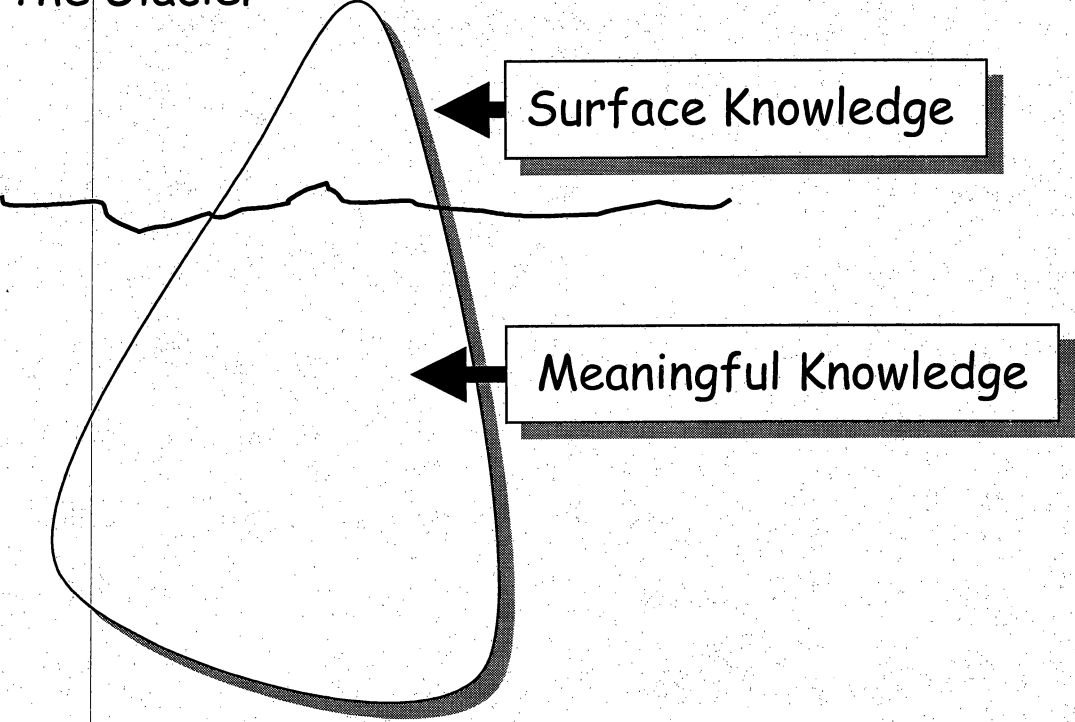**Sense of Purpose/Sense of Meaningfulness**
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TAXON SYSTEMS

LOCALE SYSTEM

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Teaching As if the *World* Mattered

The Glacier

Surface Knowledge

Meaningful Knowledge

The Question is the Answer

Being a connected person also means being a good problem solver. Students must be trained to question everything. It is the perfect time for them since they are going through adolescence and the age of rebellion. Problem solving skills are not just for math teachers, it is something that all teachers need to teach. It is the metacurriculum that we so often skip. Instead of teaching to taxon memory systems, we should teach to the creative spatial memory. To do this one needs only develop strong questioning skills in their students.

1. <u>How to do it</u>. As Drs. Jamie Mckenzie and Hilarie Bryce Davis contend questioning should begin with any new unit being studied. It's a questioning brainstorm. This is similar to a K-W-L chart only the focus is on asking questions

   For example, if starting a unit on the Civil War begin by asking:

   "What questions should we ask about the Civil War?"

   ❏ Always pay close attention to the four rules of brainstorming:

      a. All contributions are accepted with no judgment.
      b. The goal is a large number of ideas or questions.
      c. Building on other people's ideas is encouraged.
      d. Far out, unusual ideas are encouraged.

   ❏ You the teacher are a model and must ask them tantalizing questions, like:

Good stimulating questions	"What would have happened if Lincoln was shot in the first month of the war? Why did Lincoln only free the slaves in the rebel states? How did it feel to be a woman in the path of Sherman's army?"
Typical information questions	"Which states joined the Confederacy? What were the six main causes of the war? What happened at Shiloh? Who was the Union commander at Shiloh? When did the war end?"

2. <u>Create a taxonomy of questions</u>. McKenzie and Bryce Davis contend that students take more ownership of their questioning skills if the class makes their own taxonomy of questions, ranking them from highest to lowest. Share with them Bloom's taxonomy and have them create their own class sets.

   ❏ Sample categories may be: "Fact Questions, or Why Questions, or Imagine Questions."

3. <u>Questioning homework</u>. If you have them read an assignment, have them create questions for the next day's discussion. Ask them to:

- ❑ Write three comparison questions about the material read.
- ❑ Find the most interesting question left unanswered by the reading.
- ❑ Identify the question the author was trying to answer.
- ❑ Write a question that will demand at least ten minutes of thought to answer.
- ❑ Find a question that has no answer, or two thousand answers or an infinite number of answers.
- ❑ Ask a question that is the child of a bigger question that they can then ask the rest of the class to identify.

Ask them to identify the most important and the least important questions in class. If homework is skill oriented have them jot down three questions that bothered them or stimulated or intrigued them.

Just always remember the question is the answer.

Ideas here were taken directly from McKenzie, J. A. and H. B. Davis. (1999). Filling the Toolbox. <u>From Now On The Educational Technology Journal</u> [On-line]. Available: www.fno.org/toolbox.html

I encourage you to visit it. It is a truly excellent website.

Teaching to the Developmental Stages

9 \ -Vision-Logic (Connected world-self)
  8 \ -Formal operations (Separate self)
    7 \ -Concrete operations (Rule/Role)
      6 \ -Concepts
        5 \ -Symbols
          4 \ -Emotion
            3 \ -Impulse
              2 \ -Perception
                1 \ -Sensation
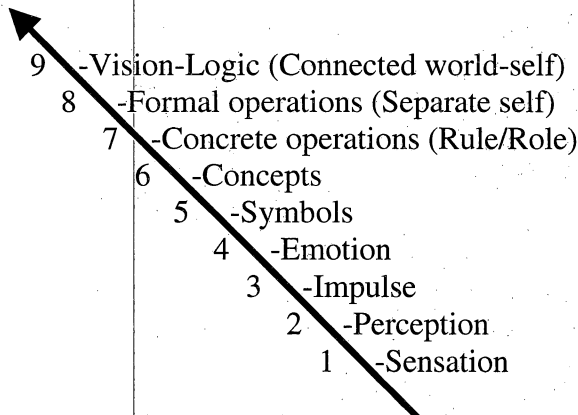
You may recognize the developmental stages from Claude Piaget. No human can make a leap from say level 4 Emotions to level 7 Concrete Operations. Each individual must firmly embed him or herself at each new level, and then move on to the next one. As we move through these stages we transcend and include the levels of consciousness we were previously at. These lower levels generally become unconscious to us unless we focus on them.

Middle schoolers in general begin the move from Concrete operations (ages 7-11) to Formal operations (ages 11-15), also known as logic or rationality. Concrete operations are a very social time. Children tend to learn the *rules* of society and practice the social *roles* they are expected to adhere to. In formal operat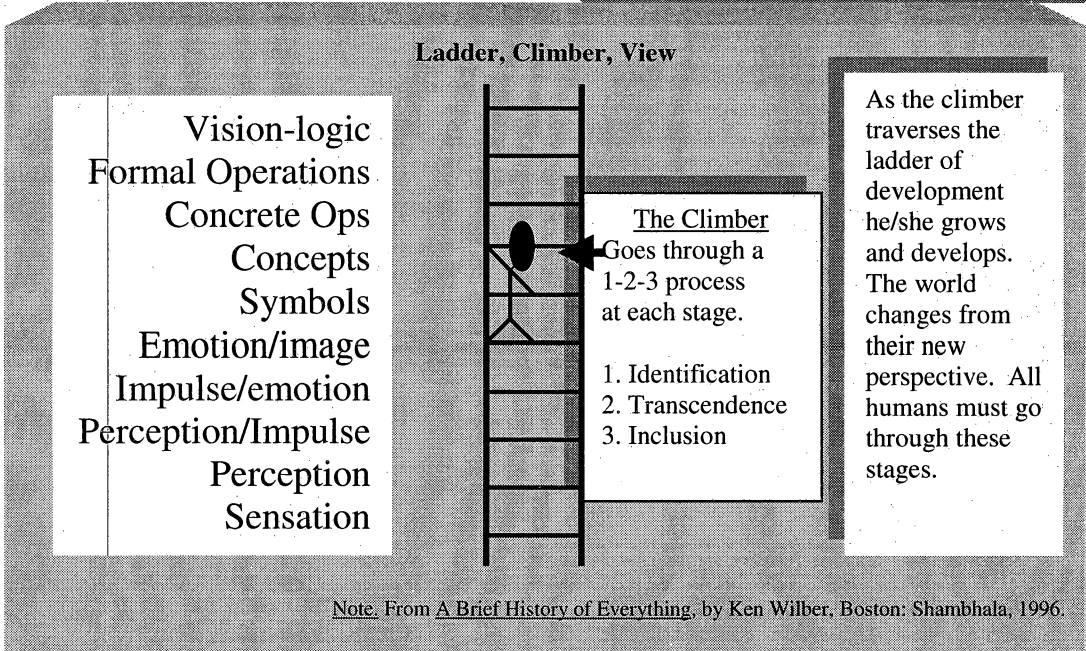ions adolescents have recognized their separate self. They begin to challenge the rules of the world and the roles they play in it. Teachers should be aware of this and give challenging assignments, have discussions, and design lessons encouraging them to explore their newfound individuality within the context of the framework standards.

Many people have begun the next level of development, backed by abundant research, what Ken Wilber calls the Vision-logic stage. It is a global "connectedness" consciousness, in which people see the unending relations of everything in the world. Teachers should try to make as many connections across the disciplines as possible. Here interdisciplinary teaching is a must.

As a general rule of thumb we use the 25-50-25 model of development.

❑ 25% of our thinking and actions occurs at our current level of awareness.
❑ 50% of our thinking and actions is at our previous level.
❑ 25% of our thinking and actions comes from our lower levels of consciousness, stages we already went through.

Ladder, Climber, View

Vision-logic
Formal Operations
Concrete Ops
Concepts
Symbols
Emotion/image
Impulse/emotion
Perception/Impulse
Perception
Sensation

The Climber
Goes through a
1-2-3 process
at each stage.

1. Identification
2. Transcendence
3. Inclusion

As the climber traverses the ladder of development he/she grows and develops. The world changes from their new perspective. All humans must go through these stages.

Note. From A Brief History of Everything, by Ken Wilber, Boston: Shambhala, 1996.

Developmental Stages

9   -Vision-Logic

8   -Formal operations

7   -Concrete operations

6   -Concepts

5   -Symbols

4   -Emotion

Impulse- 3

Perception- 2

Sensation- 1
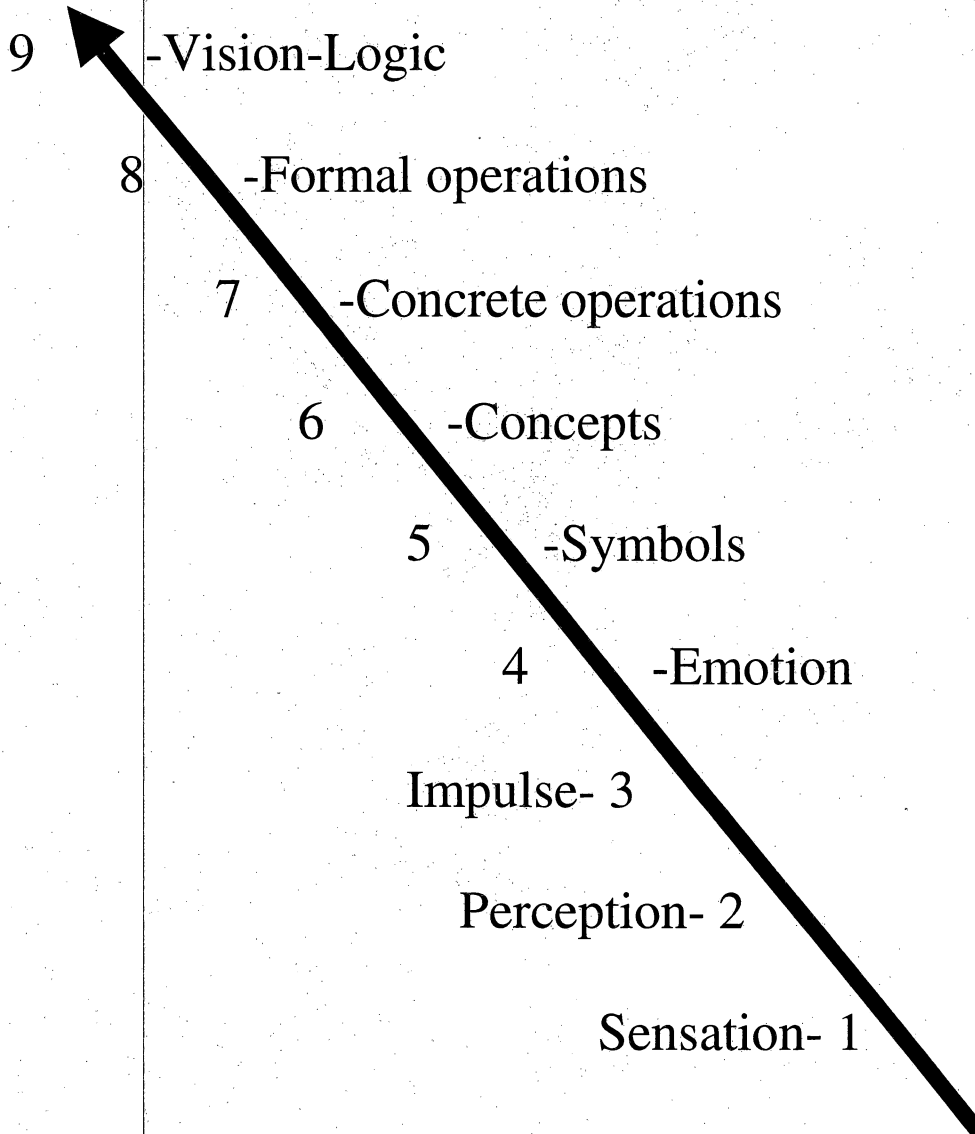
Note. From A Brief History of Everything, by Ken Wilber, Boston: Shambhala, 1996.

Teaching to the Developmental Stages

Ladder, Climber, View

Vision-logic
Formal Operations
Concrete Ops
Concepts
Symbols
Emotion/image
Impulse/emotion
Perception/Impulse
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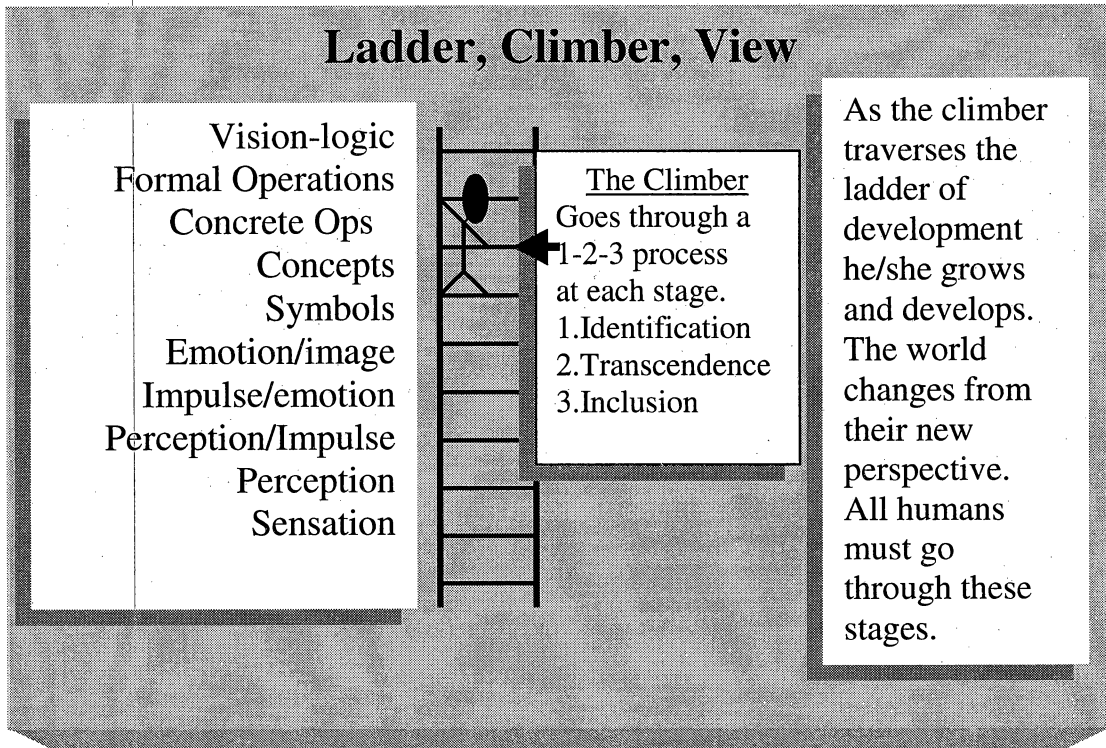
Note. From A Brief History of Everything, by Ken Wilber, Boston: Shambhala, 1996.

How can we teach to the developmental stages in a way consistent with the movement towards global Vision-logic?

Make Connections

Through:
Integrated curriculum
Interdisciplinary teaching strategies
Thematic instruction
Help them to organize and pattern information for use in multiple contexts.

Brain-based principle #3:
The search for meaning is innate.

Brain-based principle #4:
The search for meaning occurs through patterning.
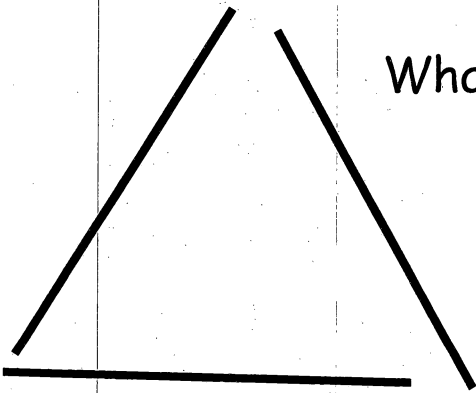
What is the figure to the left?
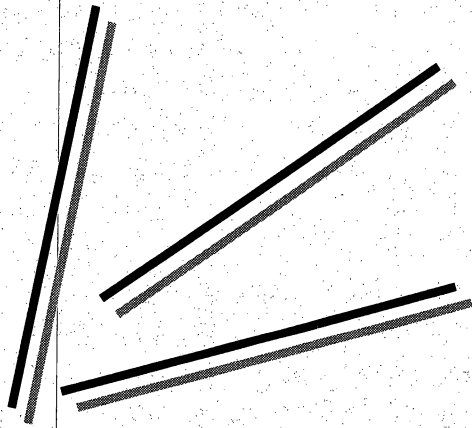
Meaningless
Information
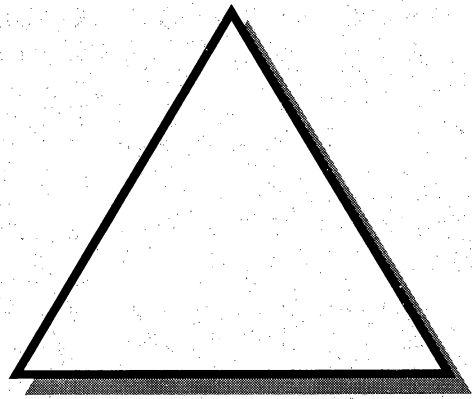
Meaningful
Patterning

Integrated Thematic Instruction

Teacher Rationale for Teaching	Classroom Management, Instruction, and Teaching Strategies
School of Thought, Brain Research, Philosophical Foundations	Resources and Curriculum

Where are we going?

Answer-
Towards Vision-
Logic
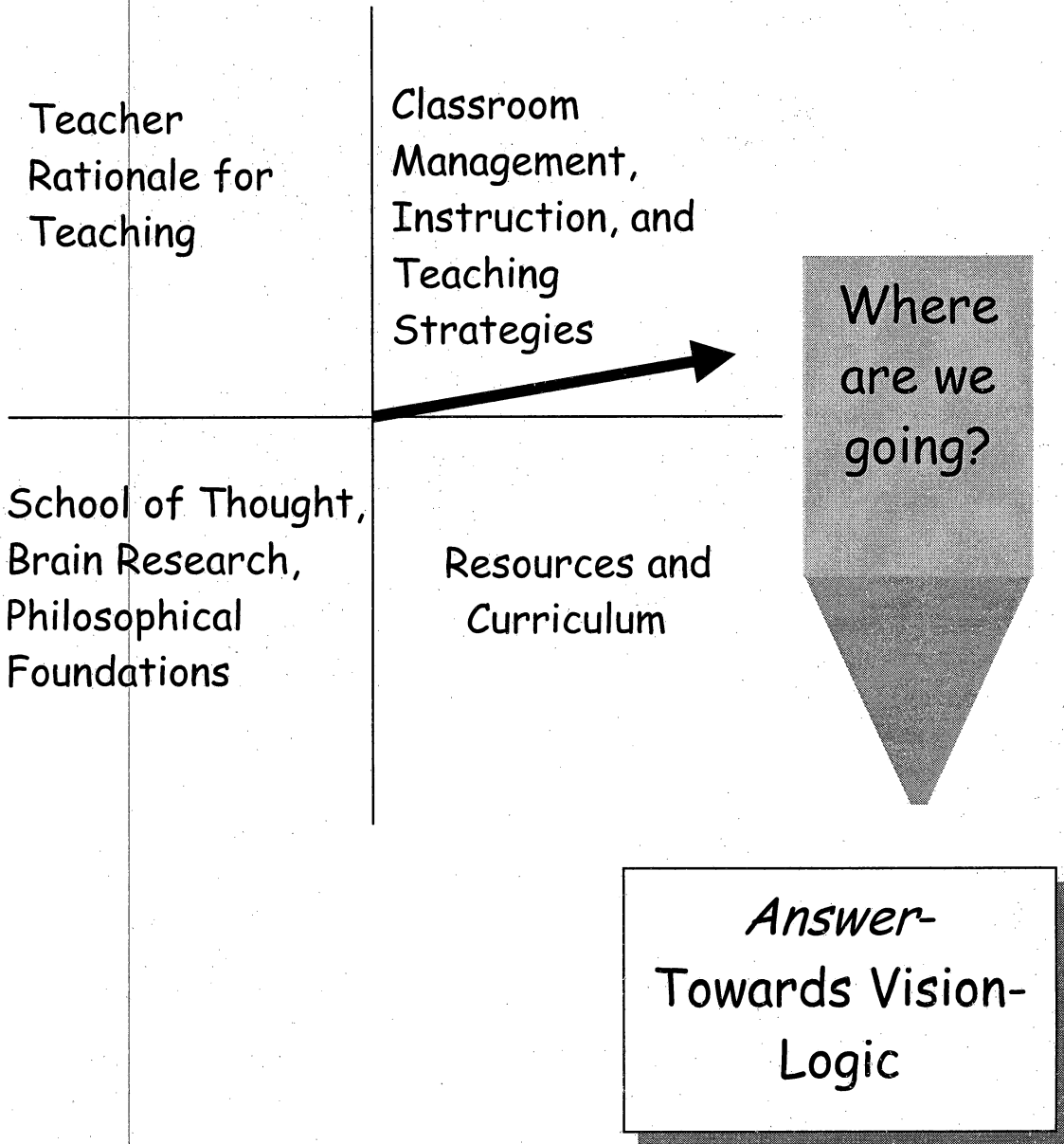
Integrated Thematic Instruction

What should it look like?

There are many models for interdisciplinary instruction. The key to implementation is in recognizing that all of the approaches in each discipline are somehow connected. It is then up to each individual team to help students make those connections. Below are some models of what can be done to implement this type of thinking and practice into your school.

Thematic Instruction:

Looks somewhat like a map. In this kind of example teachers try to design their lessons around the experiences of the learners. The tea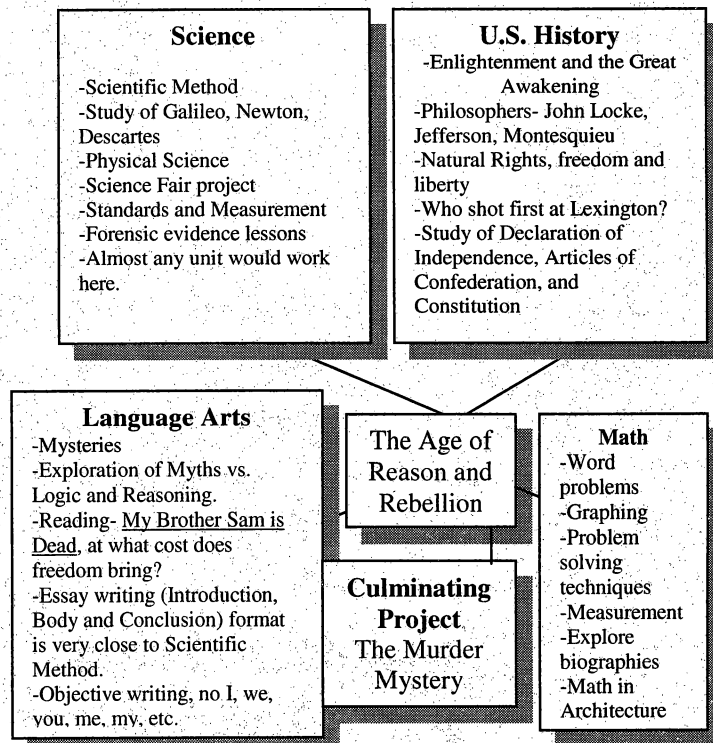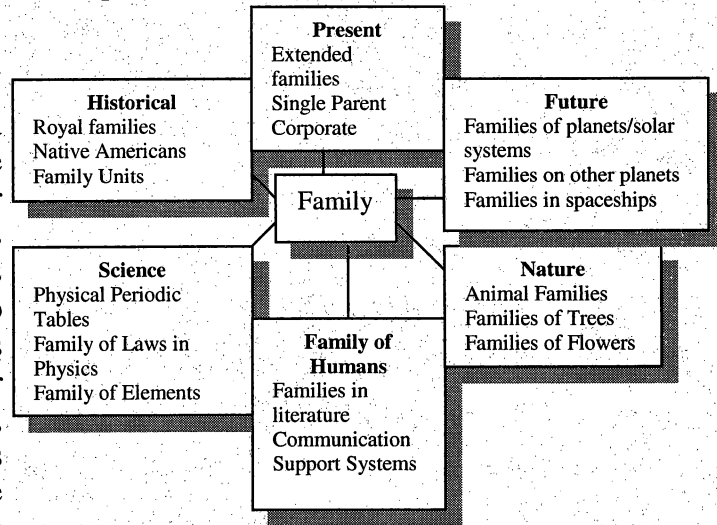chers have a general outline to follow, but implement lessons based on the curiosity of their students. Furthermore, thematic instruction means students are learning the smaller parts in the context of a bigger whole or theme. You can find more information on the unit to your right in Making Connections (Caine and Caine, 1994, p.129).

Interdisciplinary Instruction:

This type of instruction means that the teacher applies the principles of thematic teaching across the different disciplines. Most important to setting these units up is developing a curricular theme. There are many different models to choose from. The example to the right is one my eighth grade team did a few years ago.

Historical
Royal families
Native Americans
Family Units

Present
Extended families
Single Parent
Corporate

Future
Families of planets/solar systems
Families on other planets
Families in spaceships

Family

Science
Physical Periodic Tables
Family of Laws in Physics
Family of Elements

Family of Humans
Families in literature
Communication
Support Systems

Nature
Animal Families
Families of Trees
Families of Flowers

Science
-Scientific Method
-Study of Galileo, Newton, Descartes
-Physical Science
-Science Fair project
-Standards and Measurement
-Forensic evidence lessons
-Almost any unit would work here.

U.S. History
-Enlightenment and the Great Awakening
-Philosophers- John Locke, Jefferson, Montesquieu
-Natural Rights, freedom and liberty
-Who shot first at Lexington?
-Study of Declaration of Independence, Articles of Confederation, and Constitution

Language Arts
-Mysteries
-Exploration of Myths vs. Logic and Reasoning.
-Reading- My Brother Sam is Dead, at what cost does freedom bring?
-Essay writing (Introduction, Body and Conclusion) format is very close to Scientific Method.
-Objective writing, no I, we, you, me, my, etc.

The Age of Reason and Rebellion

Culminating Project
The Murder Mystery

Math
-Word problems
-Graphing
-Problem solving techniques
-Measurement
-Explore biographies
-Math in Architecture

Other themes that can work as well:

- The six patterns that connect. Below are the six patterns that are always found in nature. No matter how big or how small these patterns always display themselves.
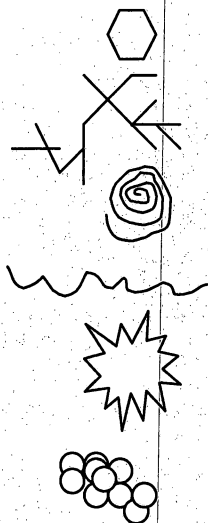
  - The *hexagon* is the strongest structure in the universe. It represents foundations. From crystallization to building skyscrapers, their strength holds us together.
  - *Branching* is a natural way of looking at growth. From trees, to highways, and the veins in your body to migration of civilizations, branching can be seen everywhere you look.
  - The *spiral* is the shape of planets and orbits, of currents in the wind, oceans, or heat convection. From atoms to galaxies, spirals are winding into our lives. Have you ever felt like things were spinning out of control?
  - The *wave* is a meandering wanderer. Would Columbus have found the New World if he had not gotten lost? Could surfers enjoy the riptide in Hawaii? Could a butterfly flapping its tiny wings have an impact on worldwide weather patterns?
  - The *burst* can represent both life and death. The beginning of land formations from a volcano or the end of the city of Pompeii. In learning something have you ever gotten the "aha" explosion?
  - *Clustering* represents our dependence on each other. Is it the attraction of love or magnetic energy? "Like attracts like" and "opposites attract" you know.

To give you a better idea of how you can do this yourself read the curriculum projects at I-Poly High School, a magnet school located on the campus of Cal State Polytechnic University, Pomona.

	First trimester	Second Trimester	Third Trimester
Ninth Grade Project Titles	*Journey of Discovery* Students will engage in an introspective, interpersonal journey that provides the foundation necessary to be successful: with I-Poly's integrated project-based curriculum. Students are introduced to I-Poly Personal Skills that will be incorporated and developed as students discover ways to gather, process and implement information efficiently. Through thematic project components students will begin by analyzing self, then move on their journey to examine families, roles in project groups, their place at I-Poly and their responsibility to the world. The project culminates in a museum exhibit where students celebrate their commonalities and share their discoveries with the community.	*California Cuisine* As student teams engage in a rigorous, high-interest investigation of California's diversity, they will research and design their own multicultural restaurant. Using Los Angeles restaurants as models, student teams will research and select a city outside of Los Angeles County as the site for their restaurant and develop their architectural and culinary ideas. Student teams will create interior and exterior designs, a menu that includes nutritional analyses, a health and safety manual, architectural drawings and a scale model. They will also develop and present a comprehensive business plan. The project teaches students the practical aspects of creating and establishing a small sole proprietorship business. The project culminates in a simulation where the students will attempt to obtain a business loan for their restaurants in a persuasive, multimedia presentation to a panel of potential investors.	*Global Wellness Summit* Student teams will engage in an interdisciplinary investigation focusing on global health and environmental problems in an assigned region of the world and the subsequent physical, emotional, spiritual, social, environmental, intellectual and economic impact on the local people. After extensive research and study, students will represent their assigned region and be challenged to reach creative solutions and an interdependent approach to creating a well planet at the culminating Global Wellness Summit.

For further information about I-Poly High School's curriculum visit their website at
http://www.csupomona.edu/~library/ipoly/projects/ProjectsAtGlance.html

Virtually any theme can work as long as it is meaningful and makes sense to the learner. Don't try to force connections across classes that really don't work. Just two classes working together is much more powerful than separated and fragmented ones.

Applying it in the Classroom

Each team- Come up with one interdisciplinary lesson that is consistent with brain-based learning.

Framing Metaphors for Schooling

Components	1830-Present	1870-Present	1890-Present	1985-Present
Image of School/Educational Philosophy	*A Community Center* Essentialism	*The Factory* Behaviorism	*The Hospital* Progressivism	*Global market* Towards Brain-based
Purpose of Schooling	To promote republican/Protestant morality and civic literacy.	To select, sort and Americanize.	To redress ills created by social inequality and to remediate deficiencies.	To develop the capacity to work on and with knowledge and information.
Primary Function of School	Socialization into the norms and values of the culture.	Labeling in accordance with known standards.	Diagnosis and prescription.	Production of knowledge work that engages the young.
Role of the Curriculum	Lore to be passed to neophytes. Focus on Greek and Roman culture, English literature, and Protestant religion.	An assembly line, down which children go, differentiated by family background and measured in terms of ability to do work.	A treatment to be prescribed; for example the individual educational plans developed in response to diagnostic testing.	Raw material (knowledge) on which students work.
Role of the Student	Neophytes to be inducted into the group and taught the ways of the community.	Products to be molded.	Patients or clients to be served.	Customers for knowledge work.
Role of the Teacher	Members of a sacred profession; in but not of the community.	Technicians and/or assembly-line workers.	Service-delivery professionals similar to physicians.	Leaders and inventors.
Role of the Principal	Chief priests/polite strangers.	First-line supervisors; shop foremen.	Mid-level bureaucrats/managers.	Leaders of leaders/executives.
Focus of the Metaphor	*Culture*	*Work*	*Child*	*The Child doing real work that is valued by the culture.*

Note. From Schools for the Twenty-First Century (pp. 5-8), by Phillip Schlecty, 1990, San Francisco: Jossey-Bass Inc.

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The 12 Principles of Brain-based Learning

1. **The brain is a complex adaptive system.**
   - ❑ The brain is a parallel processor.
   - ❑ Learning engages the entire physiology.

2. **The brain is a social brain.**
   - ❑ We strive for acceptance and relationships with others.

3. **The search for meaning is innate**
   - ❑ From basic survival to spiritual unfoldment- *Abraham Maslow*
   - ❑ Our five basic needs are love, power, freedom, fun, and survival- *William Glasser*

4. **The search for meaning occurs through patterning**
   - ❑ Here the ideas of thematic, integrated, interdisciplinary, and whole language approaches to education apply, as well as many others.
   - ❑ "Effective education must give learners an opportunity to formulate their own patterns of understanding"- *Sam Crowell, Caine and Caine*

5. **Emotions are critical to patterning**
   - ❑ There must be a relaxed compassionate environment.
   - ❑ Classroom meetings- as suggested by *William Glasser and Jane Nelson*

6. **Every brain simultaneously perceives and creates parts and wholes**
   - ❑ Relate what you are teaching to student's prior knowledge and a larger, real life, or global perspective.

7. **Learning involves focused attention and peripheral perception**
   - ❑ Attention to classroom environment is essential- Use of art, music, candles/incense, lighting, color are examples.
   - ❑ Classroom management, passion for teaching, and attitude of the teacher are extremely important to recognize and monitor on a consistent basis.

8. **Learning always involves conscious and unconscious processes**
   - We must allow for active processing so that students go beyond the curriculum and get to their own independent thoughts and feelings.

9. **We have at least two ways of organizing memory**
   - Taxon memory- (Otherwise known as rote learning or short term memory) <u>Route Learning</u>- The brain stores information that does not have much meaning for it, which makes it difficult to retrieve, it has few routes to travel to retrieve data, i.e. unpatterned information.
   - Spatial memory- <u>**Map learning**</u>, where information is stored and retrieved with a variety of connections, i.e. orchestrated immersion.

10. **Learning is developmental**
    - The brain has plasticity, it grows, develops and connects based on the environment it is placed in- *Marion Diamonds*

11. **Complex learning is enhanced by challenge and inhibited by threat**
    - Downshifting and The Triune Brain Theory- When threatened the brain reverts back to our reptilian brain (survival mode) and limbic system (emotions). Generally we cut off our ability to maximize our creative potential- taken from P.D. MacLean and Leslie Hart

12. **Every brain is uniquely organized**
    - Students should be given choices of what they want to study and how to do it.
    - The theory of multiple intelligences applies here- *Howard Gardner*

Ideally curriculum design should involve these four areas, but certainly are not limited to them:
Relaxed alertness
Orchestrated immersion
Social relationships
Active processing

Note. The information above can be found in <u>The Re-Enchantment of Learning</u> (pp. 7-10), by Crowell S., Caine R.N. and G. Caine, Tucson: Zephyr Press, 1998.

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Teaching with the principles of brain-based learning in mind means changing a lot about how we do things in class. Following is an infrastructure for incorporating brain-based learning into your classroom from The Re-Enchantment of Learning by Crowell, Caine and Caine (1998).

1) Design units and lessons around the idea of *Orchestrated Immersion* in which students are fully immersed in their learning. Lessons should be designed around models of thematic, integrated, interdisciplinary, inquiry-based, and project-based teaching. Teach to individuation and meaningful knowledge. It is a classroom that is student-centered, not teacher-centered.

2) Classrooms should have an environment of *Relaxed Alertness* in which teachers create warm caring environments that encourage students to take risks. In this type of setting downshifting is less likely to occur.

3) *Social Relationships* must be developed in the classroom. Here students engage in cooperative learning and interactive discussions, because the dissemination of knowledge is passed on culturally. Social communication skills are vital to a healthy democracy.

4) Students are consistently given assignments in which they actively engage in processing the knowledge they are learning. *Active Processing* gives time for reflection and contemplation, allowing students to find deep meaningful knowledge, not the unconnected surface knowledge that quickly slips from memory and fosters little growth.

Note. The information above can be found in The Re-Enchantment of Learning
by Crowell S., Caine R.N. and G. Caine, Tucson: Zephyr Press, 1998.

Comparative Teaching Methods

Elements of Orchestration	Brain-based Classrooms (Student-centered) Orientation Three Teachers	Traditional Classrooms (Teacher-centered) Orientation One Teachers
Class structure/ Lesson design	Dynamic/Integrated/Thematic/ Interdisciplinary/ Cooperative Learning/ Teaching to Individuation	Teacher directed/often disengaging/ Individual assignments/ Textbook or worksheet driven
Standards/ Outcomes	Authentic assessment/Focus is on using information in a variety of contexts and disciplines	Testing for short term-taxon memory
Discipline/Classroom Management	Individual responsibility/ Student assigned roles/ Choice Theory- teaches that all behavior is of one's choice, not an outside force	Teacher dominated/ Power struggles in the classrooms

Note. From Making Connections (p.133), by R. N. Caine and G. Caine, Menlo Park, CA: Addison-Wesely.

Towards Orientation Three

Orientation Three thinking means moving from individualistic or fragmented thinking to "connected" thinking. It means people are consciously working towards vision-logic development. Below is a comparison of Orientation One, Two and three thinking.

Orientation One- Formal Operations. Is at home with the factory model of current school setup. Team is fragmented and separated with little or no cross-discipline design.

Orientation Two- High formal operations/low vision-logic. Recognize some clear changes that need to be made. Is sometimes willing to work at connecting curriculum across the subjects, but have some strong conceptual boundaries.

Orientation Three- Vision-logic. Open to multiple possibilities and connections. Every discipline is a way of organizing information and is connected at a very deep level. Subjects and skills may have a basic focus, but they recognize that every subject is connected in multiple ways to other subjects, ideas, and skills at some level.

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Comparative Teaching Models

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Note. From Making Connections (p.133), by R. N. Caine and G. Caine, Menlo Park, CA: Addison-Wesely.

Applying it to the Standards

Can the standards be effectively aligned so that they are consistent with brain-based learning principles?

For Further Reading

Making Connections by Renata Nummela Caine and Geoffrey Caine. Menlo Park, CA: Addison-Wesely, 1994.

Education on the Edge of Possibility by Caine and Caine. Alexandria, VA: ASCD.

Unleashing the power of Perceptual Change: The Promise of Brain-Based Teaching by Caine and Caine. Alexandria, VA: ASCD.

Mindshifts: A Brain-Based Process for Restructuring Schools and Renewing Education by Crowell, Caine and Caine. Tucson, AZ: Zephyr Press, 1994.

The Re-Enchantment of Learning by Crowell, Caine and Caine. Tucson, AZ: Zephyr Press, 1994.

Democracy and Education by John Dewey, 1916. Available at http://www.ilt.columbia.edu/academic/texts/dewey/d_e

Frames of Mind: The Theory of Multiple Intelligences Revised Edition by Howard Gardner. New York: Basic Books, 1993.

Choice Theory in the Classroom by William Glasser. New York: Harper Perennial, 1988.

The Quality School Teacher by Glasser. New York: Harper Perennial, 1988.

Human Brain and Human Learning by Leslie Hart. New York: Brain Age Publishers, 1983.

A Mind of Three Minds: Educating the Triune Brain by P.D. McLean. In Education and the Brain and the Brain, edited by Jeanne Chall and Allan Mirsky, pp. 308-342. Chicago: University of Chicago Press.

Outsmarting IQ: The Emerging Science of Learnable Intelligence by David Perkins. New York: The Free Press, 1995.

The Evolution of Consciousness by Robert Ornstein. New York: Simon and Schuster, 1991.

Fostering Emotional Well-Being in the Classroom by Randy M. Page and Tana S. Page. Boston: Jones and Bartlett, 2000.

Sylwester, Robert. *A Celebration of Neurons.*

A Brief History of Everything by Ken Wilber. Boston: Shambhala, 1996.

New Horizons by Dee Dickinson. Website available at www.newhorizons.org.

APPENDIX B:

DESIGN PLAN

A Generalized Outline of Aligning the Standards with the Principles of Brain-based Learning

1st- Departments must all align the standards on a trimester-by-trimester or semester-to-semester basis.

2nd- Final Exams and/or final projects should be made by all departments to make sure students are learning.

3rd- Some teams should align the individual department standards so that connections are fostered across all classrooms teaching to spatial memory.

-Each team should create one interdisciplinary thematic unit each trimester.

-They should work closely with English Language Development, Special Day, Resource, and GATE teachers to modify units to student's varying ability levels.

4th- Each teacher should create one student-choice project per year- four per team. Students will be more intrinsically motivated to inquire about their own curiosities within that subject area.

5th- Administration should hold all departments and teams accountable for the aligning of standards and units, and projects. Time, during in-services, minimum days, and common prep-periods, is essential to developing a school site and individual team plan.

6th- Teams should be consistently improving and creating better connections across all classrooms.

DESIGN PLAN

Aligning Brain-based Middle School Reform with the California State Standards

These steps are absolutely necessary for the effective implementation of interdisciplinary teams on a middle school campus within the California Standards framework. While there is immense freedom within very broad boundaries it is highly suggested that no steps are skipped. The outline below not only provides what to do, it gives suggestions on how to do it. While reading through and implementing this model always remember that the goal is to teach meaningful knowledge and patterning that fosters connections across all the classrooms, to the student's prior knowledge, and to the real world.

Step One: Infrastructure

Before the school year begins schools must:

1. Develop teams in which a group of students have the same core of teachers in Language Arts, Math, Science, Physical Education, and History.

While many schools have already switched to this model it is imperative to do so if your school has not already. Adolescents coming from an elementary school with a single teacher, still need the comfort and close relationships with their teachers as they transition into adulthood. Exploratory or electives teachers should not be included in this model for students should have a choice in choosing these classes, but all teachers are certainly encouraged to work with them as they see fit.

2. Create common preparation periods amongst the four academic teachers.

While the students are in P.E. the academic teachers will have time to meet with each other to develop curriculum, set up parent meetings, share ideas, etc.

3. Teachers on the same team should be in very close proximity to each on campus.

Room to room is ideal, for it keeps the teachers in constant contact with each other. When teams are separated across the campus, the ability to communicate is constricted and student learning suffers.

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4. The master schedule should allow for at least one in-service day a month, preferably more.

5. Schools must have at least a week to prepare for the upcoming school year.

Step Two: Training and Aligning the Standards

During the first school year:

1. *There should be training for brain-based learning and interdisciplinary teaching.* Done during the first week of the school year I recommend that each teacher use these strategies in their classroom throughout the school year. Future in-services should be designed to reinforce these principles.

2. *Department alignment of the state and/or district standards done on a trimester-by-trimester or semester-to-semester basis.*

   ❑ Each department amongst the different grades should collaboratively work to align the standards in a way that will work for all of them. Your goal is to include all of the standards, do not skip any, but focus your attention on the most important areas. This alignment is a work in progress, but the first trimester should be completed before the school year begins.

   ❑ The different grade levels should work with each other to align the standards in a way that is beneficial to all grades. For instance, eighth grade American history standards start with the Revolutionary War, therefore seventh grade might want to end with the Age of Exploration, Scientific Revolution, Protestant Reformation and the Enlightenment so students more easily retrieve and relate memory to America's roots.

   ❑ Later as the school year moves forward teachers should share lessons they have developed or used in the past. At sometime in the year these ideas should be incorporated into the standards, keeping in mind they are just ideas. Teachers are free to teach the standards the way they please. For example, the seventh grade history standards might look like this:

   Standard 2: Identify the European and Eurasian land maps: location, topography, waterways, vegetation, and climate.
   Activity: Physical feature map of Europe.

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Standard 3: Analyzes feudalism: development, operation of, role of the manor and growth of towns, relationships, development of political order.

Activities: Feudal pyramids, Cornell notes on feudalism, Tied to the land experiential activity, video on knighthood.

Key Vocabulary: Homage, manor, serf, guild, feudalism.

3. *Final exams and/or final projects*

Expectations must be high, therefore accountability is a must. While the author strongly approves of a final culminating project that incorporates most of the standards, he is a bit skeptical about final exams. Testing though is a necessary evil, especially standardized tests. If students must take them, and they probably always will, they should get practice on them. If final exams are decided upon they should have:

- ❑ Many visuals, like charts and graphs.
- ❑ Many skills-based questions, not just memorization questions.
- ❑ An essay or project component to be done at a different time than the final, which counts for a sizable portion of the grade.

4. *Individual student choice projects.*

Studies show that students generally say they like hands-on projects much more than what they perceive to be meaningless homework. When students get to choose what they will study they are more intrinsically motivated to learn. Intrinsic motivation is one of the driving forces behind our spatial memory. Every teacher on a team should design or incorporate one project that students get a choice in. The author highly encourages that they be interdisciplinary and/or in cooperative groups.

5. *One voluntary team to begin working at step three- Interdisciplinary Instruction.*

It is important not to move all teams to an interdisciplinary format in the same year. As with any other reform or program being implemented in a school it is necessary to move slowly. During the following year a few more teams will integrate it and eventually by the third or fourth year all teams will be set up in this way. Other teams are certainly encouraged to use brain-based learning strategies and curriculum as they see fit.

Step Three-Interdisciplinary Instruction

Beginning with the second year:

1. *Two to three more teams should be moved to the interdisciplinary models.* Again, schools should take a slow pace in incorporating this change.

   ❑ Using thematic integrated teaching these teams are to meet in groups on a regular basis to design lessons and units that incorporate brain-based principles in the classroom. At least one unit per trimester should be designed. Teachers should use time before the school year, during in-services, and during their preparation periods to design them. Districts are strongly encouraged to pay for the extra time that inevitably is needed when doing such work.

   ❑ The focus must be on the standards. Teams should deviate very little from them. Many charter schools are facing lower test scores, not because they are bad schools, but because they did not pay much attention to the standards.

2. *All teams should be working closely with the Special Day, English Language, Resource, and GATE instructors at the school to modify the curriculum in accordance with their student's various needs.*

3. *How much integration is too much?* Make connections that are solid and firm. Consider Martinello and Cook:

   > "It is far more important that the curriculum be relevant and significant to the learner and that the activities and ideas naturally involve interdisciplinary and cross-disciplinary thinking and questioning, than that every subject area be forced into the integrated curriculum" (1994, p. 9)

4. *Teams should have at least one unit per trimester that is shared with the administration and staff for reflection and refinement.*

5. *When designing these lessons and units always stay focused on where we are going- towards vision-logic.*

6. *Use open-ended rubrics so the students know exactly what to expect.*

Step Four- School Wide Interdisciplinary Instruction

Beginning with the third year:

1. *The entire school should move to the interdisciplinary model.* Of course some schools may find that this could be difficult. They are free to limit how fast they are moving in this direction, but consider this:

   ❑ At least three to four teams have already been teaching in this manner. They have a wealth of information and ideas to share.

   ❑ The staff already has on hand units and lessons for use. Why not use them and adapt them to individual team needs.

   ❑ Brain-research shows that students retain much more and experience more success in learning environments like these. Students learn more and feel more connected to school when they are experiencing success.

   ❑ Working as a collaborative team is an excellent model for students, many of whom can barely communicate with others. And it's a much more enjoyable atmosphere being creative and working with others towards common goals.

2. *Teams already using the interdisciplinary model are allowed to adjust the departmental guidelines* to fit their individual needs so long as they are still teaching the same standards as the rest of the school, they just might be switch standards from one trimester to another.

   ❑ These second and third year teams should focus on making trimester long or yearlong themes and connections.

   ❑ Exams and/or projects should be adjusted if the standards are adjusted.

Step Five: School Project Alignment

While the other sections had a generalized outline to follow this step is extremely flexible. It is certainly attainable if all staff members are committed to becoming a more and more connected school. At this level all teams, departments, and staff work together to create a curriculum plan that is much similar to the previous alignment of the standards.

   ❑ *On a trimester-by-trimester or semester-to-semester basis, teams and departments work towards aligning curricular projects in each grade.* In essence the school here becomes committed to developing trimester long integrated thematic projects. All teams have already collaboratively created different projects, but the

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goal here is to align these projects by grades and trimesters so as not to be redundant. To do this teams share their projects, their ideas, and past mistakes. Like all the other projects this is a work in progress to be refined throughout the year and following years.

❑ *Very briefly the alignment of project titles may look something like this:*

Seventh grade:

Trimester One:	*The Patterns that Connect*
Trimester Two:	*Multicultural Universe*
Trimester Three:	*Exploring Your Place in the World*

Eighth grade:

Trimester One:	*The Age of Reason and Rebellion*
Trimester Two:	*Growing up: Healthy and Unhealthy Decisions in Life*
Trimester Three:	*Towards Equality: Freedom vs. Power*

❑ This can be done on a school wide basis or be restricted to teams, the choice of course is up to each individual school. If your school is on a track system you may want curricular projects for each track.

Once again the idea is to align the different interdisciplinary projects so students don't have to repeat the same types of thematic units throughout their middle school careers. A school that works together in this fashion is more organized and can respond to student needs much quicker.

Every Step of the Way: Assessment and Refinement

This is really not a separate section; it is one that is in place every step of the way. Along the entire journey teachers are to create and recreate the curriculum. Complex systems like schools are ever evolving and changing so they must adapt to the new demands placed on them every year. At all times schools must do the following:

1. *New teachers must be trained at the beginning of each new school year in the principles of brain-based learning.* Qualified on-site staff members can even indoctrinate them by putting on their own workshop. Paid for by the district of course.

2. *Share their work with the staff during in-services.* These are times for critique and renewal. One thing teachers don't get enough of is time to share their ideas with others, thus in-services should provide ample time to present, discuss, share, and steal ideas. Both departments and teams should be allotted time to strengthen curriculum as they see fit.

Always remember where we are headed- towards a greater union with life, towards larger connections, towards Vision-logic.

APPENDIX C:

PROJECT EVALUATION

PROJECT EVALUATION

For the following six statements please rank the project regarding its effectiveness and feasibility. Circle numbers one through five and provide a brief comment under each. You may provide comments on another sheet of paper if necessary.

(1) Disagree very strongly (2) Somewhat disagree (3) Agree

(4) Very much agree   (5) Agree very strongly

The project is understandable.

Evaluator One: 1   2   3   4   **5**

Comments:

This project is very understandable. It clearly defines the brain-based interdisciplinary plan and offers clear examples of how this program can be implemented in the classroom.

Evaluator Two: 1   2   3   4   **5**

Comments:

The program makes sense. The purpose, implementation and outcome of a brain based learning system are clearly stated and thoroughly explained.

An integrated, brain-based, interdisciplinary plan is a desirable model for middle school reform.

Evaluator One: 1   2   3   4   **5**

Comments: Middle school students need a variety of stimuli in order to stay focused and to participate in their learning. The world is so full sensory alternatives that compete for the students' attention that the classroom

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teacher needs many different tools at his/her disposal that will help keep the students interested.

Evaluator Two: 1 2 3 4 **5**

Comments: Based on the writing as well as the research the brain based lear4ning system is well suited for a middle school.

The project is feasible.

Evaluator One: 1 2 3 4 **5**

Comments: Not only is this project feasible, but it is being used, in part, in many classrooms today. Many of the these techniques mentioned in this project I have personally used in my classroom, and I know that they are effective.

Evaluator Two: 1 2 3 4 **5**

Comments: The project is very feasible and implementation on a school wide basis could be implemented with few issues.

This is a workable plan for professional development.

Evaluator One: 1 2 3 4 **5**

Comments: Teachers are always searching to discover a well-organized program, which can be easily implemented and followed. This plan not only outlines the steps to follow, but also gives examples of assignments that can be used in the classroom.

Evaluator Two: 1 2 3 **4** 5

Comments: Though professional development at a year round school is difficult because of the time utilizing the interdisciplinary teams as well as common prep period would make implementation more possible. The one day all day in-service for collaboration would be difficult on our current

model as would the two day beginning of the year in-service under the current schedule.

The project is flexible enough to suit the local needs of all middle schools.

Evaluator One: 1   2   3   4   **5**

Comments: This project discusses the needs of students in such universal terms that it would fit or be able to be molded to almost all classroom environments.

Evaluator Two: 1   2   3   **4**   5

Comments: The plan as stated earlier is very doable despite staff development constraints and is flexible enough to fit easily into our middle school model.

What would you add or delete to make this project stronger?

Evaluator One:

Comments: There is nothing I would change in the actual outline of the project. After finishing reading this program, I have a clear understanding of its various elements and the importance of implementing these components into our curriculum.
I have always been a true believer in the philosophy that this program supports, and the only addition to this project that I could recommend would be more and more examples of actual lessons to be used in its implementation in daily classroom activities.

Evaluator Two:

Comments: I believe John has done an excellent job of pulling this program together and I have no suggestions to add.

Evaluator One
Bernice Gregory
Teacher Raney Intermediate School
M.A. in Education

Evaluator Two
Don Ward
Principal R.I.S.
M.A. in Administration

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