

Concept based learning

AISA/IB
ACCRA
February
2013

Andrea Mwalula

Two decorative blue lines are present at the bottom of the slide. One is a thin line that starts on the left, dips slightly, and then rises towards the right. The other is a thicker line that starts on the left, dips more significantly, and then rises towards the right, crossing under the first line.

Teacher Training Workshop

Run by
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Mission Statement

The International Baccalaureate Organization aims to develop inquiring, knowledgeable and caring young people who help to create a better and more peaceful world through intercultural understanding and respect.

To this end the IBO works with schools, governments and international organizations to develop challenging programmes of international education and rigorous assessment.

These programmes encourage students across the world to become active, compassionate and lifelong learners who understand that other people, with their differences, can also be right.

November 2002

La Déclaration de Mission de L'IBO

L'Organisation du Baccalauréat International (IBO) a pour but de développer chez les jeunes la curiosité intellectuelle, les connaissances et la sensibilité nécessaires pour contribuer à bâtir un monde meilleur et plus paisible, dans un esprit d'entente mutuelle et de respect interculturel.

À cette fin, l'IBO collabore avec des établissements scolaires, des gouvernements et des organisations internationales pour mettre au point des programmes d'éducation internationale stimulants et des méthodes d'évaluation rigoureuses.

Ces programmes encouragent les élèves de tout pays à apprendre activement tout au long de leur vie, à être empreints de compassion, et à comprendre que les autres, en étant différents, puissent aussi être dans le vrai.

Novembre 2002

Declaración de Principos de IBO

La Organización del Bachillerato Internacional tiene como meta formar jóvenes solidarios, informados y ávidos de conocimiento, capaces de contribuir a crear un mundo mejor y más pacífico, en el marco del entendimiento mutuo y el respeto intercultural.

En pos de este objetivo, la Organización del Bachillerato Internacional colabora con establecimientos escolares, gobiernos y organizaciones internacionales para crear y desarrollar programas de educación internacional exigentes y métodos de evaluación rigurosos.

Estos programas alientan a estudiantes del mundo entero a adoptar una actitud activa de aprendizaje durante toda su vida, a ser compasivos y a entender que otras personas, con sus diferencias, también pueden estar en lo cierto.

Noviembre 2002

International Baccalaureate Primary Years Programme

Category 3Q: Concept based learning in the PYP

Supplementary Workbook

Provided by: Andrea Mwalula

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International Baccalaureate Primary Years Programme

Category 3: Concept Based Learning in the PYP

Workshop Objectives

This workshop is for administrators, coordinators and teachers who:

- have been working with the programme for at least one school year
- have previously attending a PYP workshop (regional or in-school) facilitated by IB PYP workshop leaders organized by or through the regional office

The purpose of this workshop is to develop the following understandings:

The purpose of this workshop is to explore IB standards and practices under C3 pertaining to concept based learning.

- Concepts are integral to the inquiry process and one of the essential elements of the PYP.
- A concept driven curriculum promotes meaning and understanding and challenges students to engage authentically with significant ideas.
- It challenges the memorization of isolated facts and the mastery of skills out of context.
- The exploration and re-exploration of concepts lead students towards an appreciation of ideas that transcend disciplinary boundaries as well as towards the essence of each subject area.
- In addition to the key concepts, each discipline has powerful related concepts that also support inquiry.
- The IB scope and sequence documents are written as conceptual understandings to provide a platform for knowledge and skills development – concepts before content.
- Concept based teaching and learning offers a solution to the ‘crowded curriculum’ by linking students’ interests to essential understandings that are transferable across disciplines.
- The concepts are explicit at all stages of curriculum planning, in the central idea, the lines of inquiry, provocations to inquire and assessment.
- Concepts presented as questions are a manageable and open- ended research tool.

Notable Quotations for Inquiring Minds



–A concept is an organizing idea; a mental construct that is:

- Timeless
- Universal
- Abstract
- Represented by 1 or 2 words
- Examples share common attributes

Erickson, H. L.

–In his teaching the wise man guides his students but does not pull them along;
He urges them forward and does not suppress them;
He opens the way but does not take them to the place;
If his students are encouraged to think for themselves we may call the man a good teacher.

(Confucius, circa 500BC)

" The future belongs to a very different kind of person with a very different kind of mind—creators and empathizers, pattern recognizers, and meaning makers. These people—artists, inventors, designers, story tellers, caregivers, consolers, big picture thinkers—will now reap society's richest rewards and share its greatest joys."

Daniel H. Pink: " A Whole New Mind: Moving from the Information Age to the Conceptual Age" (2005)

Concept Based Curriculum

An excerpt from the forward written by Carol Ann Tomlinson regarding Concept Based Curriculum & Instruction by H. Lynn Erickson (2002).

In a captivating story about a young girl at the turn of the 20th century, Dorothy Canfield Fisher (1917/1999) sees learning through the eyes of a child. The main character in *Understood Betsy* has, in all her three school years, been a –good □ student. That is, she learned what she was told and gave it back accurately when questioned. In a magical moment in her third-grade year, Betsy has an encounter with another kind of learning.

On her first day at an aunt's house in the country, Betsy wakes, disoriented and apprehensive about her unfamiliar surroundings. Her aunt wisely understands the need to help the little girl –own □ what happens around her, so she asks Betsy to help with churning the day's supply of butter. As Betsy turns the paddle in the big churn, her aunt talks about the women who have turned the paddle before her – a parade of women who represent both change and stability in the world. As her aunt talks, she helps Betsy measure out ingredients with precision. –She weighed out the salt needed on the scales, and was very much surprised to see that there is such thing as an ounce. She had never met it before outside the pages of her history book and she didn't know it lived anywhere else □ (pp. 57- 58). The work is laced with the aunt's stories about the churn. Once again, Betsy is caught short.

Now for a moment, she stood staring up at Aunt Abigail's face, and yet not seeing her at all because she was thinking so hard... Why, there were real people living with the Declaration of Independence was signed – real people, not just history people... To tell the honest truth, although she had passed a very good examination in the little book on American history they had studied in school, Betsy had never to that moment had any notion that there ever had been really and truly any Declaration of Independence at all. It had been like the ounce, living only inside her schoolbooks for little girls to be examined about. And now Aunt Abigail, talking about a butter pat, had brought it to life. (pp. 59-60)

Educators have known for more than a hundred years what Aunt Abigail knew a hundred years ago. Facts devoid of meaning are stillborn. When we deliver information to students without breathing life into it, we have done no more than throw sand in their faces.

Now, close to a century later, Phil Schlechty (1997) reminds us again. –Students are not products. They are people with motives, wills, capacities, needs to be satisfied, desires, longings. They are not clay to be molded or widgets on an assembly line, though sometimes they must feel as though they are □ (p.58). He calls us again to the one immutable job of schools: –The business of schools is to produce work that engages students, that is so compelling that students persist when they experience difficulties, and that is so challenging that students have a sense of accomplishment, of satisfaction – indeed, of delight, when they successfully accomplish

the tasks assigned□ (p. 58). The job of the teacher is, as it has always been, to make learning so compelling that young people find it more satisfying to learn than to attend to any one of a score of competing possibilities.

So what does it mean to develop curriculum that compels the young mind? Once again, we know the answers to that question. They are not new, although our depth of knowledge about them is richer and fuller than in the past. Among the characteristics of such curriculum are the following:

- It consistently fuels in-depth student understanding by guiding students in making sense of their worlds.
- It helps students organize and retain the important ideas and skills in a discipline; it provides coherence to bodies of knowledge.
- It moves beyond information to thought and to thinking about one's own thought processes.
- It actively involves students as doers and problem solvers.
- It calls on students to use what they learn in ways that demonstrate the efficacy of the ideas and skills.
- It is designed to support transfer of learning.
- It results in students' learning those things recognized by experts in a discipline, adult members of the community, and the society as having enduring value (see, e.g. National Reserch Council, 1999; Schlechty, 1997)
- It is attached to the lives and cultures of learners and to the world beyond the classroom door.
- It attracts students.
- It is based on the principles of knoweldge that support experts in problem solving and knowledge production in a discipline.



21st Century Learners MUST consider Social Change

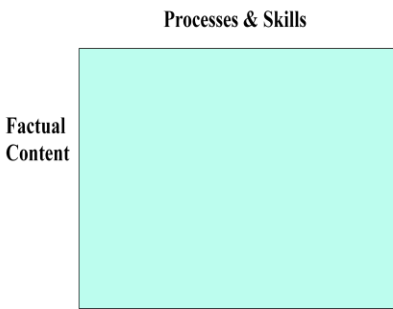
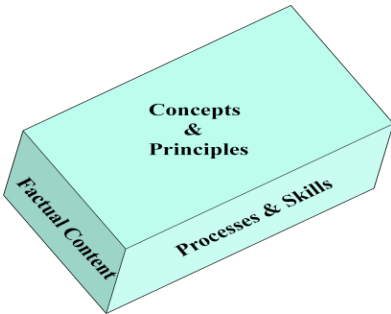
Forces impacting education

- Expanding role of technology
- Changing job demands
- Increasing global interdependence
- Changing social norms and values
- Worldwide competition and markets
- Rapid growth of knowledge
- Ecological concerns



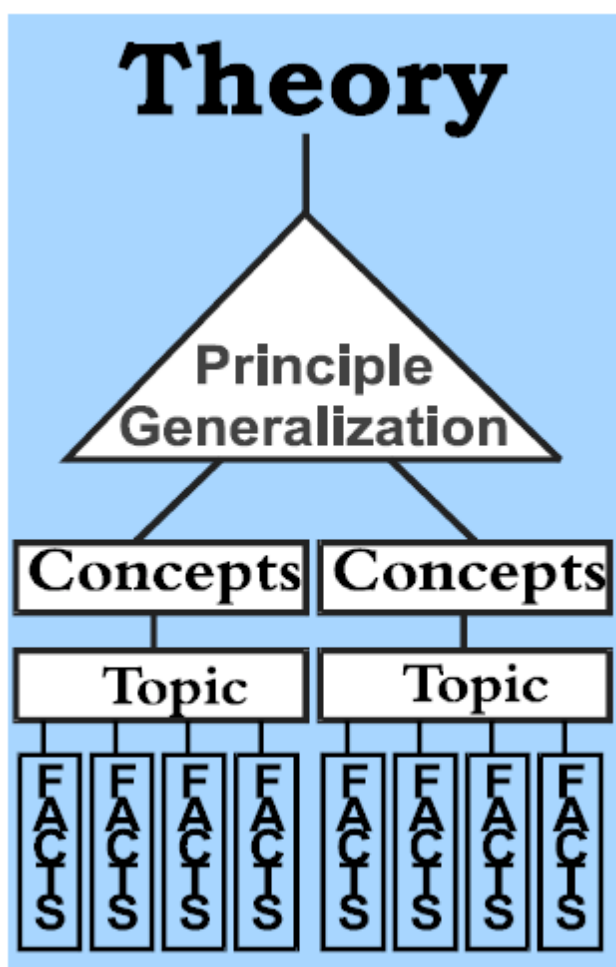
Two Dimensional vs. Three Dimensional Curriculum

(source: Lynn Erickson (2005) www.lynnerrickson.net)

Two Dimensional Curriculum Model – <i>Topic Based</i>	Three Dimensional Curriculum Model – <i>Concept Based</i>
	
Coverage-centered –inch deep, mile wide ☐	Idea-centered <ul style="list-style-type: none"> Facts provide a foundation to understand conceptual, transferable ideas
Intellectually shallow <ul style="list-style-type: none"> Lacks a conceptual focus to create factual/conceptual brain synergy 	Intellectual depth <ul style="list-style-type: none"> A –conceptual lens ☐ or focus, requires mental processing on the factual and conceptual levels – producing intellectual depth in thinking and understanding
Inability to transfer factual knowledge <ul style="list-style-type: none"> Facts do not transfer; locked in time, place or situation 	Concepts and Generalizations Transfer <ul style="list-style-type: none"> Allows the brain to make connections and see patterns
Fails to meet the intellectual demands of the 21st Century	Develops the intellect to handle a world of increasing complexity and accelerating change.

The Structure of Knowledge

Source: Lynn Erickson. (2002). *Concept-Based Curriculum and Instruction: Teaching Beyond the Facts*. Corwin Press: Thousand Oaks, CA.



Theory: A conceptual idea that is yet to be proven.

Principle: A form of generalization, but is a truth that holds consistently through time.

Generalization: Connection/relatedness of two or more concepts.

Concept: An organizing idea, represented by one or two words. Examples have common attributes.

Topic: A category of study with a body of related facts to be learned.

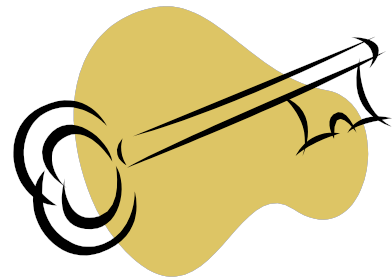
Fact: A statement of truth.

Level	Example
Theory	Migration is a psychologically-driven response to meet an internal need.
Principle/ Generalization	People migrate to meet a variety of needs. Migration may lead to new opportunities or greater freedom.
Concept	<ul style="list-style-type: none"> • Migration • Needs • Opportunity • Freedom
Topic	Westward Movement
Fact	Early American settlers migrated west. Early American settlers looked for new opportunities.

Key Points of Structure of Knowledge

- Knowledge has an *inherent* structure from topics and facts, framed by concepts, which combine to form generalizations, principles, and theories.
- Traditional, two-dimensional curriculum/instruction models focus more on the topic and fact levels and *assume* an understanding of related concepts and principles.
- Concept-based, three-dimensional curriculum/instruction models raise the intellectual bar by teaching to ideas (generalizations/principles) and by using the topics and facts as foundational support for the deeper understandings.
- Topics and facts do not transfer. They are locked in time, place, or situation.
- Concepts and Generalizations transfer through time, across cultures, and across situations.
- The concepts, generalizations, and principles add the third intellectual dimension to curriculum and instruction.
- There is a Theory Level, but we need to focus our work on the Concepts, Generalization Levels at this time.
- (A Theory is an idea supported by the best evidence available, but not yet fully proven.)

Source: Lynn Erickson, Brain Presentation Summer 2005



Scaffolding Thinking to Complex Levels Social Studies Example



Level 3: Traditions
help to unify a people.

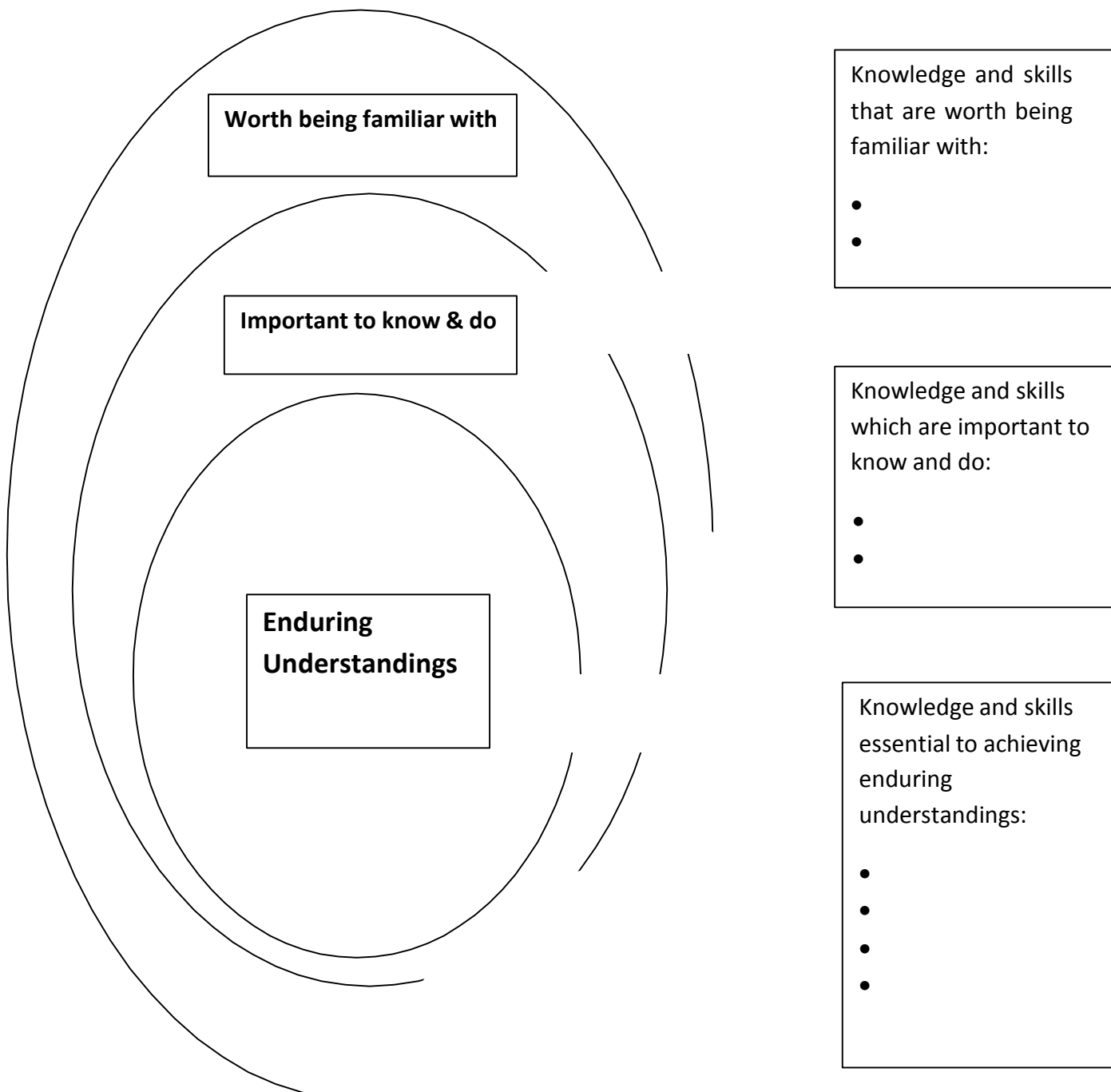
Level 2: *So what- is the significance or effect?*
Celebrations express traditions of a culture.

Level 1: *Why do cultures have celebrations?*
All cultures have celebrations.

Evaluating Scaffolding Criteria

- Do the ideas grow in sophistication?
- Do the ideas become clearer from level to level because they are more specific (use more specific concepts)?
- Did the writers answer their question at each level?
- Are the verbs active and present tense?
- Are the ideas based in fact? Are they true?
- Are the ideas important?
- Are the ideas developmentally appropriate for students?

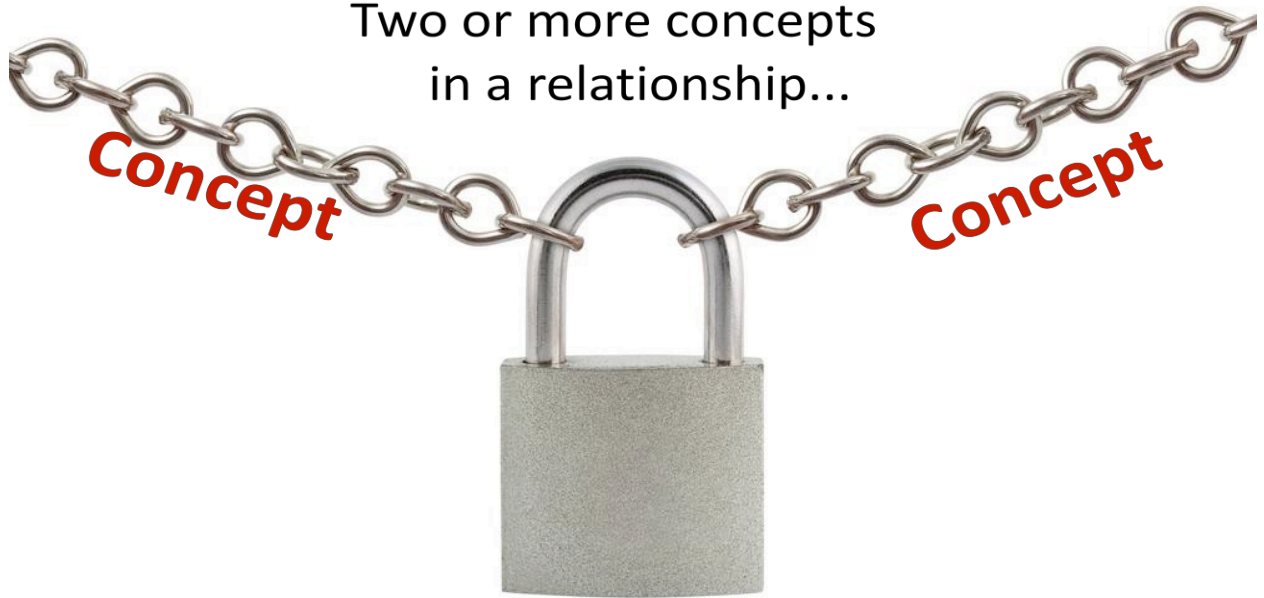
Clarifying Content Priorities



Source: Derived from Wiggins & McTighe's *Clarifying Content Priorities* figure 3.3, Understanding by Design (2005)

GENERALIZATION=
Enduring Understanding
Essential Understanding

Two or more concepts
in a relationship...



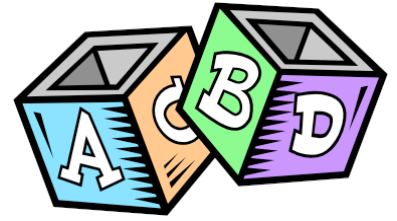
Topic-Based and Concept-Based Curricular Designs

Topic-Based Curricular Designs	Concept-Based Curricular Designs
Facts and activities center around a specific topic of study, such as the Industrial Revolution.	Facts and activities center around a specific topic of study, but a conceptual lens forces thinking to higher levels as students consider –transferable ideas from questions□ that derive from the topic of study.
Topic-based objectives drive instruction.	Essential questions that are drawn from both the topic and generalizable levels of knowledge drive instruction.
Curriculum is focused on learning and thinking about specific facts.	Curriculum is focused on using specific facts to understand transferable concepts and ideas.
Content categories and topics provide the curricular structure for Grades K – 12.	Discipline-based concepts structure the categories and topics of curriculum for Grades K – 12.
Instructional activities focus on specific topics and facts.	Instructional activities focus on specific topics and facts in order to generalize understanding beyond the facts to the conceptual level.
Instructional activities call on a variety of discrete skills.	Instructional activities call on complex performances using a variety of skills.
Curriculum is topic centered.	Curriculum is idea centered.

Source: Erickson, L. (2002). Concept-Based Curriculum and Instruction: Teaching Beyond the Facts.
Chart 5.6 Topic-Based and Concept-Based Curricular Designs



5 Things that Concept-Based Curriculum & Instruction Does



- A** *Aligns* curriculum, instruction and assessment
- E** *Emphasizes* and identifies what students should KNOW, UNDERSTAND and DO
- I** *Identifies* concepts in curriculum, rather than just facts
- O** *Organizes* the concepts/content into instructional units/lessons that contextualize the standards
- U** *Unites* –big ideas □ for deeper understanding

(source: Public Schools of North Carolina, NCCTm Mathematics Conference, Oct 29

http://math.ncwiseowl.org/UserFiles/Servers/Server_4507209/File/NCCTM%202009/CFair.Creating%20a%20Concept-Based%20Unit.ppt.pdf)

Subject Area Concepts

science

- Order
- Organism
- Population
- System
- Change
- Evolution
- Cycle
- Interaction
- Energy/Matter
- Equilibrium

social studies

- Conflict/Cooperation
- Patterns
- Populations
- System
- Change/Continuity
- Culture
- Evolution
- Civilization
- Migration/Immigration
- Interdependence

literature

- Time
- Space
- Interactions
- Change
- Beliefs/Values
- Emotions
- Motivation
- Conflict/Cooperation
- Perceptions
- Patterns
- Character
- Symbolism

mathematics

- Number
- Ratio
- Proportion
- Symmetry
- Probability
- Pattern
- Order
- Quantification
- System

visual art

- Rhythm
- Line
- Color
- Value
- Shape
- Texture
- Composition
- Elaboration
- Aesthetic

music

- Rhythm
- Melody
- Harmony
- Tone
- Pitch
- Form
- Tempo
- Timbre
- Pattern

source: Lynn Erickson (2002)

Transferable Concepts – BIG IDEAS (UbD, pg 74)

Abundance/scarcity	Democracy	Migration
Acceptance	Discovery	Mood
Adaptation	Diversity	Order
Aging/maturity	Environment	Patterns
Balance	Equilibrium	Perspective
Change/continuity	Evolution	Production
Character	Exploration	Proof
Community	Fairness	Repetition
Conflict	Friendship	Rhythm
Connections	Harmony	Survival
Cooperation	Honour	Symbol
Correlation	Interactions	System
Courage	Interdependence	Technology
Creativity	Invention	Tyranny
Culture	Justice	Variance/variable
cycles	liberty	Wealth

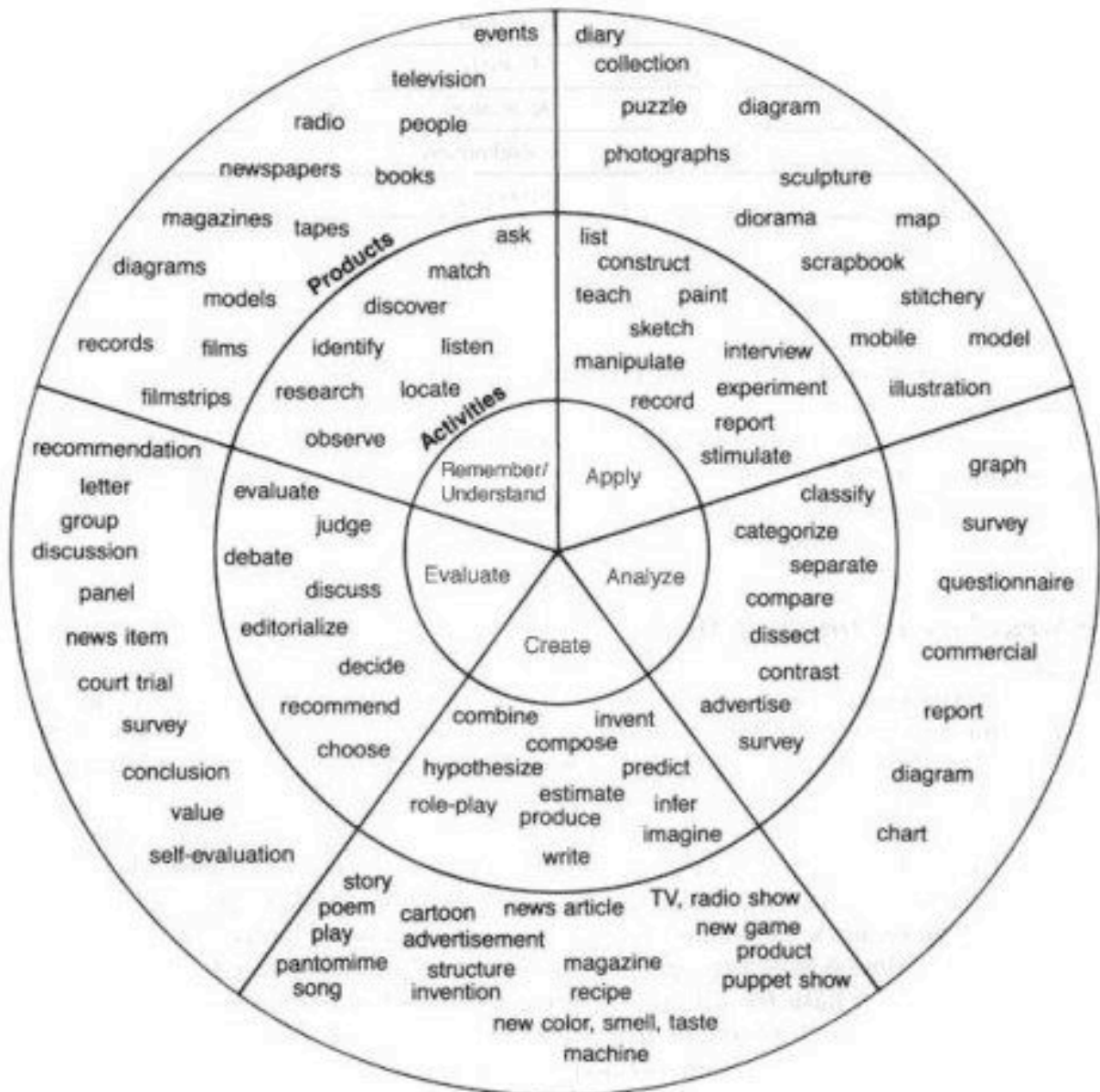
Recalling Bloom's Taxonomy for Student Engagements

Students will KNOW (topical, factual knowledge)	Students will UNDERSTAND (the conceptual, transferable understandings of the discipline	Students will be ABLE TO DO (the specific processes and skills of the discipline)
Students will know the life cycle stages of a butterfly NO VERB LEAD-IN	Students will understand that life cycles ensure the continuation of a species NO VERB LEAD-IN	The students will be able to create models and diagrams that represent natural objects or events VERB LEAD-IN NEEDED



http://www.odu.edu/educ/roverbau/Bloom/blooms_taxonomy.htm

Product Wheel



Overhead 9: Examples of Know, Understand, Able to Do

Students will *know, understand, and be able to do* . . .

1. Students will *know* . . .

- ❖ Factual knowledge, memorized knowledge
- ❖ Critical factual knowledge for understanding the unit generalization(s)
- ❖ Critical factual knowledge for competency with the unit topics
- ❖ Nontransferable—locked in time, place, or situation

Examples: . . . Newton's laws

. . . key vocabulary

. . . the causes of the American Revolution

. . . the names and contributions of historical figures in our community

. . . the formulas for finding the area of quadrilaterals

2. Students will *understand* . . .

- ❖ Transferable generalizations/enduring understandings

Examples: . . . systems are interdependent (macro-level)

. . . organisms adapt to changing environments (micro-level)

. . . rational numbers, including whole numbers, fractions, and decimals can be expressed in equivalent forms of standard notation or scientific notation (micro-level)

3. Students will be *able to do* . . .(skills)

- ❖ Taken (often verbatim) from the State Skill Standards
- ❖ Transfer across applications
- ❖ Not tied to a specific topic (attaching a skill to a specific topic makes it an activity or a performance)

Examples: Create tables, graphs, and charts to display scientific data.

Analyze primary and secondary source documents to evaluate historical information.

Analyze the use of connotative and denotative language in text.

Use context clues in reading to determine meaning.

Types of Teaching

<i>What the teacher uses</i>	<i>What the students need to do</i>
Didactic or direct instruction <ul style="list-style-type: none"> • Demonstration or modeling • Lecture • Questions (convergent) 	Receive, take in, respond <ul style="list-style-type: none"> • Observe, attempt, practice, refine • Listen, watch, take notes, question • Answer, give responses
Facilitative or Constructivist methods <ul style="list-style-type: none"> • Concept attainment • Cooperative learning • Discussion • Experimental inquiry • Graphic representation • Guided inquiry • Problem-based learning • Questions (open-ended) • Reciprocal teaching • Simulation (eg. Mock trial) • Socratic seminar • Writing process 	Construct, examine, and extend meaning <ul style="list-style-type: none"> • Compare, induce, define, generalize • Collaborate, support others, teach • Listen, question, consider, explain • Hypothesize, gather data, analyze • Visualize, connect, map relationship • Question, research, conclude, support • Pose or define problems, solve, evaluate • Answer and explain, reflect, rethink • Clarify, question, predict, teach • Examine, consider, challenge, debate • Consider, explain, challenge, justify • Brainstorm, organize, draft, revise
Coaching <ul style="list-style-type: none"> • Feedback and coaching • Guided practice 	Refine skills, deepen understandings <ul style="list-style-type: none"> • Listen, consider, practice, retry, refine • Revise, reflect, refine, recycle through

Source: Wiggins, Grant & McTighe, Jay. (2005) Understanding by Design, Figure 10.2, pg. 241

Content of Teaching

Column A	Column B
<ul style="list-style-type: none"> • Facts • Discrete knowledge • Definitions • Obvious information • Literal information • Concrete information • Self-evident information • Predictable result • Discrete skills & techniques • Rules & recipes • Algorithm 	<ul style="list-style-type: none"> • Concepts & principles • Systemic connections • Connotations • Subtlety, irony • Symbolism • Abstraction • Counterintuitive information • Anomaly • Strategy (using repertoire & judgement) • Invention of rules & recipes • Heuristic

Source: Wiggins, Grant & McTighe, Jay. (2005) Understanding by Design, Figure 10.3, pg. 244

Central Ideas

Central Ideas are the enduring understandings, the big ideas, the answer to the –so what?□ of a particular study.

Conceptual understanding requires content knowledge, but the reverse is not true. Students knowing the science or social studies standards does not necessarily signify their deeper understanding of concepts and principles.

Central ideas are NOT topical – they are conceptual.

It is NOT about Transportation – it is about movement and/or the wheel.

It is NOT about Oregon Trail or Trail of Tears – it is about migration.

It is NOT about the structure of Parliament – it is about governance.

It is NOT about the food pyramid – it is about nutritional needs changing over time.

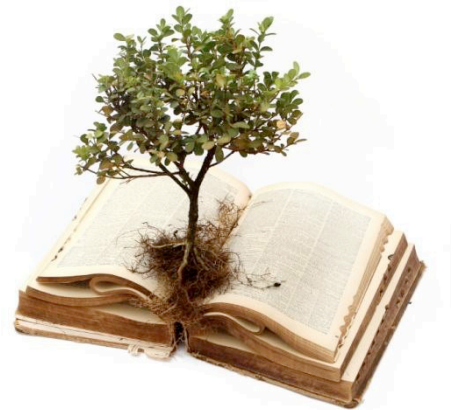
Continuum of Central Ideas

The Chinese immigrants who came to San Francisco in the 1800's established the *hui kuan*.

Chinese immigrants in the United States established various forms of social organizations.

All groups that have immigrated to the United States have established social organizations.

In human societies, forms of social organizations emerge to satisfy the needs of individuals and groups.



Writing Generalizations

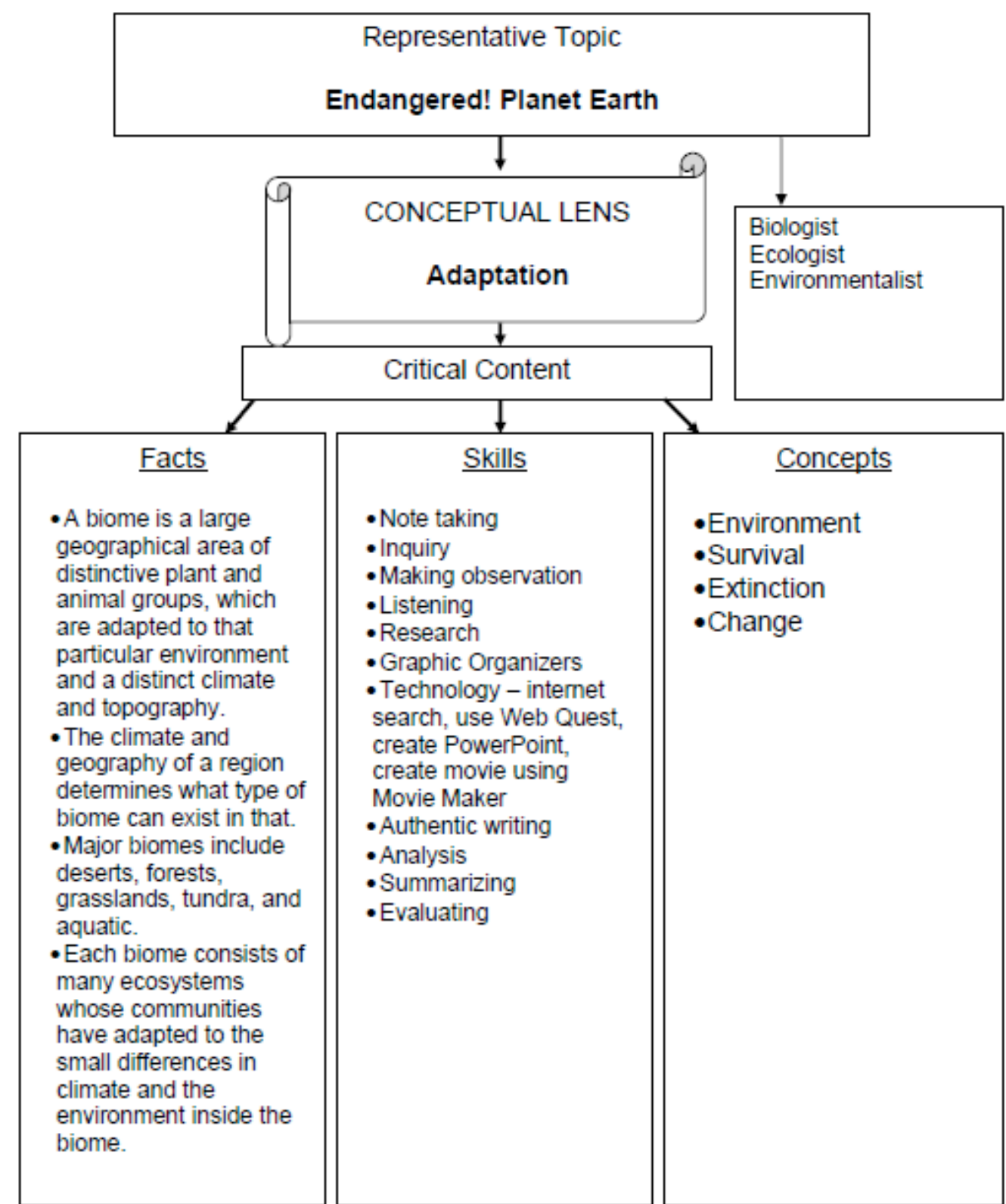
Generalization:

Conceptual Lens: _____

Checklist	Self	Peer	Group
Is the generalization supported by topic/factual content?			
Does the generalization contain at least two connecting concepts?			
Is the generalization connected to content and concepts in the unit?			
Is the generalization clear?			
Is the verb tense present?			
Does the generalization avoid the use of pronouns, proper nouns, and personal nouns?			
Does the generalization use an active verb choice?			
Does the generalization avoid opinions or judgements?			
Does the generalization require a qualifier? (may, can, often)			
Is the generalization timeless, universal, transferable, and worth understanding?			

Created by Maxine Bone, Amy McClellan, and Melissa Koop based on the work of H. Lynn Erickson (2010)

Concept-Based Curriculum Flowchart



Essential Understandings/Generalizations

- The living organisms of a biome must learn to adapt and change to the environment in order to survive.
- If adaptation does not come about, extinction may occur.
- Environmental changes may be caused by human's actions.
- The survival and well being of a biome and its organisms depends on ecological relationships throughout the world.

Essential Questions

- What is necessary to occur to assure survival if there are changes in the environment?
- What may occur if adaptation does not take place?
- How do human beings effect changes in the environment that might bring about extinction?
- How can changes in distant parts of the world and its atmosphere affect our environment and us?
- How are biomes changing because of human behavior?
- What kind of adaptations have some organisms made in order to "deal" with the environmental factors they face?

Culminating Performance Task

Scenario: You will be working with a team of scientist from the Animal Planet network. Your group of scientist has been assigned to investigate a type of species (mammals, birds, reptiles, amphibians, fish, and invertebrates) that are endangered. Your job is to find out as much as you can about one particular animal from your type of species, make a digital story, and present your findings and story to Jeff Corwin. If your group is picked, you will assist Jeff in a presentation to President Bush making recommendations to protect your imperiled animal under the Endangered Species Act.

Instructional Activities

Research from trade books, textbooks, encyclopedia, internet
Videos from United Streaming/Discovery Science Connection
Field trip or on site visitor from BSC Environmental Department
Teacher created Web Quest
Power Point instruction (including saving images and sources)
Photo Story 3 instruction (including storyboarding)

Design Process for Deep Understanding

Understanding of Curricula:

Uncovering “What Matters” about and beyond the curriculum, unit or topic:

- Deconstructing, interpreting & connecting curriculum learning outcomes-
 - What is important and worth knowing and doing through examining the curriculum?
- Defining Understanding –
 - What transfers “beyond” the content knowledge of the curriculum and the classroom?
 - What is not obvious and requires uncoverage?
- Establishing Student Engagement –
 - Why would you and your students care about the lesson/activity?
 - What provokes and sustains the learning?
- Identifying Inquiry Questions-
 - What questions become the climate of your classroom and guide the learning within each and every lesson?
 - What questions have no obvious “right” answers and raise other questions?
 - What questions help to focus the learning?

Evidence of learning:

Designing learning that counts as evidence of understanding and “ongoing” assessment that measures understanding-

- Designing and connecting lessons/activities for knowledge building -
 - What lessons/activities will build upon, connect and help to deepen the understandings of the curriculum?
- Designing and connecting performance tasks -
 - What final products/performance tasks will invite students to demonstrate their deep understandings of curricular outcomes.
- Designing and connecting ongoing Assessment for Learning -
 - What targets, rubrics, checklists, exemplars etc. will guide the learning and facilitate descriptive feedback for learning and teaching?

Infusing Technology:

Identifying and choosing appropriate technology for the purpose of:

- Enhancing the building of knowledge-
 - What technologies enhance the building of knowledge?
- Enabling sharing -
 - What technologies enable sharing of knowledge within and outside of the classroom?
- Enabling collaboration -
 - What technologies enable collaboration in the building of knowledge within and outside of the classroom?

How can a teacher promote deep understanding?

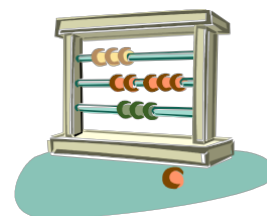
<i>Dimension</i>	<i>Level 1 Procedural Focus</i>	<i>Level 2</i>	<i>Level 3</i>	<i>Level 4 Teaching for Deep Understanding</i>
Teacher's Role	Teacher is the sole knowledge expert. Student roles focus on tasks which require minimal cognitive effort.	Although the teacher is the sole knowledge expert, some student expertise is acknowledged. Students are assigned roles with the teacher being central to the activities.	The teacher shares the knowledge expertise role with the students. More teacher-directed tasks are provided for students with lower abilities, and more student centered activities are provided for higher ability students.	The teacher is co-learner with the students. The teacher and the entire student body are responsible for building a math community. The teacher ensures that each student is an integral part of the learning process.

Source: Leithwood, McAdie, BAscia & Rodrigue. (2006). Teaching for Deep Understanding. Table 5.1, pg. 35

Implications for Teaching

Teaching for deep understanding in mathematics = Rich talk about rich tasks:

1. There is a program scope.
2. Students have access to all forms of mathematics.
3. Teachers strive to raise student self-confidence.
4. Student tasks are complex, open-ended.
5. Instruction focuses on the construction of mathematical ideas through student discovery.
6. Teacher's role is that of a co-learner or co-creator.
7. Mathematical problems are undertaken with the aid of manipulatives.
8. The classroom is organized so that students work together to develop and share solutions.
9. Assessment is authentic.
10. Teacher's conception of mathematics is that of a dynamic subject.



Source: Leithwood, McAdie, BAscia & Rodrigue. (2006). Teaching for Deep Understanding. Pg. 37

<p>Designing for Student Engagement and Authentic Intellectual Work</p> <p><i>Tasks, Activities and Evidence of Learning</i></p>
<p>Topic:</p>
<p>Evidence of Learning</p> <ul style="list-style-type: none"> ○ What evidence of student learning will you gather along the way? In what ways might you document the learning of the students as they progress through this study? How might this help to guide the next steps in your students' learning? Design assessment strategies to enable students to acquire the knowledge and competencies that have been set for them. (multiple feedback loops)
<p>Task possibilities – Design learning experiences that really lead somewhere.</p> <ul style="list-style-type: none"> ○ Which major ideas need to be developed, explored or investigated? ○ What authentic work could students participate in? ○ What could students produce that would have social, personal or aesthetic significance? ○ What could students create to demonstrate deep understanding of fundamental ideas, issues or problems? ○ Where could this work go? ○ Who might be potential audiences? <p>Technology Possibilities – how will technology be used to support student learning?</p> <ul style="list-style-type: none"> ○ Could technology be used to communicate ideas in more compelling ways? (documentaries, pod-casts, simulations, online debates) ○ Can we take advantage of communication technologies to connect with others outside of the classroom? (online discussions, blogs, pod-casts) ○ What opportunities are available for communicating with experts or connecting with expertise online? ○ Are there global databases, networks or other online places where students could collaborate with others to produce products that have personal, social and/or aesthetic significance? ○ How could technology be used to document or assess student learning?

Source: Adapted from Galileo Educational Network, 2007

Moving to toward using a *conceptual* lens

Topical Organizers or Thematic Based units

- Frame of isolated facts
- Maintain lower level of thinking
- Hold learning to the fact or activity level
- Have short-term use – to cover an event, issue, facts
- Increase the overload curriculum
- Topics sometimes selected at random
- Activities are loosely linked to the topic
- Activities may be discrete or unconnected
- Activities may be entirely chosen by the teacher

Concept-based Inquiry Units:

- Provide mental schema for categorizing common examples
- Are driven by the study of the world. Math, language, art and other process areas are selected according to the extent to which they can be purposefully used by the learner.
- Lead to higher level of thinking
- Include activities that are designed to develop planned understandings
- Aid in the development of higher order generalizations
- Contain activities that are developed along an inquiry model of teaching and learning
- Merge areas of the curriculum together in purposeful ways.
- Serve as a tool for processing life events
- Are a significant part of the program.
- Reduce the overload curriculum by framing the most salient or critical examples of concepts
- Acknowledge needs and choices of students in their planning

Teachers can:

- Put a conceptual lens on a problem-solving study to get students to think beyond the facts.
- Move toward thinking beyond the facts, understanding the conceptual structure of the disciplines, and clearly identify key ideas that illustrate deep knowledge.
- Understand that deep knowledge transfers across time and cultures and provides a conceptual structure for thinking about related and new ideas.
- Use a set of unifying concepts that provide a conceptual lens to facilitate integrated thinking.
- Help students draw from a fact base and see the patterns and connections of science at a deeper level of conceptual understanding.

Lynn Erickson



Big Ideas About Teaching Big Ideas

Edwin Ellis Theresa Farmer Jane Newman

Enabling students to understand big ideas about our world is essential to an effective democracy and, other than basic literacy skills and social competence, is the most important kind of knowledge we can impart to all our children. In this age of high-stakes testing and accountability, instruction in big ideas may be more elusive than ever. The presence and quality of big idea instruction is affected by many variables. In this article, we present four big ideas about teaching big ideas—and along the way, challenge some myths and misconceptions about teaching and learning today.

Big Idea #1: Separate Myths and Political Rhetoric From Reality

In theory, empirical evidence (research) provides reliable data that should form the basis of our beliefs and decisions about what to do and how to teach students with and without disabilities. To us, the relative influence of research is minor when compared to the power of long-held social beliefs and the political rhetoric of the moment. The result is that much of what we do is strongly guided by myths. Here are what we believe to be myths that are currently affecting instruction (or lack of) in big ideas.

Figure 1. Questions From Unit Test on Age of Exploration (Seventh Grade)

Name of Columbus' 3 ships (Nina, Pinta, Santa Maria)
Which of the 3 ships sank? (Santa Maria)
Captain of the Pinta? (Martin Pizon)
Explorer seeking the Fountain of Youth? (Ponce De Leon)
Explorer who discovered the Mississippi River? (De Soto)
Conquered the Aztecs? (Cortez)
Leader of the Aztecs? (Montezuma II)

Myth: Good Grades = Good Learning; Good Learning = Good Grades

Even though we know better, most of us who are parents experience a sense of joy when our children bring home a "good" report card. Those good grades elicit a feeling that our child is learning what he or she needs to learn. Upon closer examination, however, grades in secondary schools are often a function of four things: obeying rules, completing tasks on time, memorizing information for tests, and demonstrating test-taking skills.

Figure 1 shows test questions that assess whether students memorized factual information. Many students are effective memorizers when the teacher explicitly tells them what to study. And many perform considerably worse when they have to make decisions about what

aspects of the content they should attend to when memorizing for the test. Thus many students are good memorizers but are poor at processing information.

Consider the questions illustrated in Figure 2. Notice that they were listed as "bonus" questions, implying that these ideas reflect incidental learning that some students (i.e., the gifted students) might manage to acquire, but it is considered acceptable if students didn't gain these understandings. One might argue that these questions reflect understandings that all students should be expected to gain, at least to some degree. These questions reflect big ideas, trends, or phenomena that are *generative* in nature—that is, the ideas themselves are universal and are not unique to a specific time and place. One might wonder if it is better for students

Figure 2. Bonus Questions From Unit Test on Age of Exploration (Seventh Grade)

Competition for resources often causes powerful countries to manipulate and exploit weaker countries. Explain how this idea showed up during this age.

[BIG idea: Throughout the ages, groups with power tend to exploit other groups in weaker positions in order to maintain their power.]

If a "lost continent" were suddenly discovered today, would the people and resources there be treated the same way as in the Age of Exploration? Why or why not?

[BIG idea: Although not "politically correct," exploitation is still rampant in today's world.]

Do you think religion was intentionally used by countries as a way to build wealth during the Age of Exploration? Why or why not?

[BIG idea: Throughout the ages, groups of people have used religion as an opportunity to build wealth and gain power.]

to experience the satisfaction and validation of making excellent grades when they are only expected to memorize trivia, or to make lower grades because their understanding of the generative idea might be less than stellar. In other words, is it better to know a lot of trivia (at least long enough to score well on tests) or is it better to have some level of understanding, even if somewhat erroneous, of the generative idea?

Traditional classroom tests tend to assess knowledge as dichotomous—that is, the answer is correct or incorrect. In reality, only knowledge of factual information is dichotomous. All other types of knowledge are forms of or degrees of understanding, which fall on a continuum ranging from sophisticated, accurate, and complete to superficial, erroneous, or incomplete. Figure 3 illustrates some of the kinds of evidence that reflect understanding of big ideas.

Teachers should not confuse the problems with teaching trivia with the necessity of teaching relevant details and facts. To have a contextual understanding of a big idea (i.e., why the idea matters in our world), one must have a minimal understanding of the details of the context in which the idea is relevant. In short, students need to know both the big idea and its components—the little ideas that make it big.

There are basically two approaches to big idea instruction. The first is a con-

structive approach whereby the educator teaches a series of pertinent little ideas that lead students to constructing an understanding of the big idea. Here, the teacher's task is not done until students demonstrate an understanding of both the big idea and its essential components or details. The second takes an opposite track. Here, the big idea is first explained and then de-constructed as the details supporting the ideas are identified and understood. Unfortunately, teachers typically do neither. Rather, most teach an assortment of details and ideas that neither lead to an understanding of a big idea nor enable students to construct a big idea. The really scary part is that a great many "expert," highly qualified teachers do not know what the big ideas are, nor do they have a way to access this information.

Myth: Hands On = Minds On

There are many kinds of knowledge, but the two that are most critical to academic success are *episodic knowledge* (what one knows from experience, as in "hands-on activities") and *semantic knowledge* (what one knows from language or words). Episodic knowledge is gained when one observes tadpoles and sees their different stages of metamorphosis. Semantic knowledge is gained when one reads about things that are going on during the metamorphosis

process that cannot be readily observed or experienced.

Popular teachers are often considered good because their instruction is largely hands-on—it's interesting, fun, and experiential. It is assumed that students are learning something during these experiences. In many cases, students thoroughly enjoy the activity, but they totally do not "get it" nor gain a deep understanding of the concept the activity was designed to teach. This is, in part, likely because semantic and episodic learning experiences were not sufficiently intermingled. Put another way, students failed to use language as a learning tool to elaborate on the experience.



Language learning, or elaboration, is an essential ingredient to developing deeper understandings of ideas. In the absence of elaboration, students will memorize what they believe they need to know for an upcoming test. The less one elaborates on information, the less likely it will be remembered. Thus, many students who make reasonably good grades actually know very little. In short, although hands-on experiences are an important ingredient to learning, what makes them really powerful is when there is a considerable degree of student elaboration of those experiences.

Myth: The General Education Curriculum is Worth Learning

The notion that all students should learn the general education curriculum

Figure 3. Indexes of Understanding Big Ideas

- Makes many connections to other ideas.
- Can explain how idea is affected by various phenomena.
- Can explain impact of idea on the world.
- Makes effective comparisons with other ideas.
- Can summarize or explain gist of idea in own words.
- Has sufficient knowledge of relevant facts.
- Can identify different manifestations of idea.
- Can recognize inappropriate applications or iterations of idea.

(GEC) is based on the assumption that it is worth learning. Take for example, the test questions illustrated in Figure 1 (based on GEC) and the bonus questions illustrated in Figure 2 (not from GEC). Which kind of knowledge is more valuable?

We lean heavily toward the generative ideas because these ideas help learners understand what goes on in the world and how things occur the way they do, and how or why they will probably occur again.

A common argument is that we should be teaching both. Yes—if we had unlimited time, energy, and resources to do so, but the reality is that time to teach the curriculum is relatively fixed (175–200 school days per year); there are limits to teachers' energy reserves and instructional resources are consistently being reduced. Teachers are under enormous pressure to teach more, in less time, with fewer resources, to students with widely diverse abilities and backgrounds. In short, there is a limit to what teachers can accomplish, so we believe they should be focusing on teaching a curriculum that has some degree of relevance; unfortunately, this is not always reflected by GEC.

GEC, as it currently stands, does not measure up to a level warranting insistence that all students learn it. It tends to not address generative ideas for several reasons. First, there is little agreement among content experts what the generative ideas are, whereas facts are less debatable and more assessable. Second, special interest groups put enormous pressures on textbook companies not to have their material include

ideas that might be offensive to some. Texts, therefore, tend to be highly homogenized and devoid of honest discussions of critical issues to decrease the likelihood of rejection by sensitive members of selection committees or school boards. Thus, teachers often do not have access to text information about generative ideas associated with the content they are teaching. Third, U.S. education has placed so much emphasis on memorization of trivia as the standard for learning that few teachers have any sense of what the genera-

Big, "generative" ideas help learners understand what goes on in the world and how things occur the way they do, and how or why they will probably occur again.

tive ideas are because they never had opportunities to learn them themselves. These individuals subsequently find themselves on state curriculum committees writing standards for their state's GEC. To insist that all students learn GEC in its current state seems illogical, at best.

On a more optimistic note, many national professional organizations have developed sets of standards that very effectively address big ideas and

principles. For example, a consortium of four geography professional organizations published a set of national standards that reflect 6 big ideas and 18 principles that spring from them (Geography Standards Committee, 1994). These clearly define what it is about geography that students need to understand.

Myth: Highly Qualified = Good Teacher (or, at Least, Better Teacher)

There are many merits to insisting that our children's teachers be knowledgeable in their subject area, thus "highly qualified" (HQ); we certainly do not want our children to be taught erroneous information. However, keep in mind that the information teachers are expected to master in order to become HQ often suffers from the same limitations as discussed previously.

Parenthetically, teachers' knowledge of their subject matter influences how they teach it. Some do not know enough about the content, in spite of their HQ status, to prioritize the information into essential and nonessential information to teach. These teachers are often highly dependent on their textbooks and teacher guides. Because they tend to be somewhat overwhelmed with trying to teach unfamiliar information, utilizing anything other than the most basic forms of pedagogy (lecturing) is often beyond their capacity. Classes comprised of students representing a range of ability and background knowledge are typically provided a one-size-fits-all form of instruction.

Other teachers who lack knowledge of their subject often disguise this by substituting activities and projects that keep students occupied with surface-level information—the notion being that they are allowing students to "construct their own understanding." Other content teachers' ability to help students understand what is essential to know is handicapped by their abundance of knowledge about a topic. From their perspective, everything is relevant and essential to understand; the idea that the subject matter should be differentiated into essential-to-understand big ideas from related, but less essential-to-

know concepts and facts violates the integrity of the subject matter. Students in these classes are provided little assistance with understanding generative ideas. Students know that the key to success with these teachers is to secure a study guide that lists everything they will be expected to memorize.

Big Idea #2: Make Content More Learner Friendly Rather Than Water It Down

To make the curriculum more accessible for students with disabilities, accommodations should be one of the first things teachers should do because the expectations for learning are maintained. In contrast, modifications should be one of the last things teachers do because learning expectations are reduced. These two kinds of strategies are often used together as if they were synonymous when they are anything but. As a result, expectations for learning are almost always reduced at the onset.

From our perspective, most of the information about accommodations that is circulated to teachers reflects lists of relatively shallow, superficial strategies (i.e., move student to front of room, provide a note-taker, etc.). These lists often fail to include what we believe are the two most robust things teachers can do to facilitate understanding: reduce information processing demands and maximize opportunities for student elaboration.

Reducing Information Processing Demands

Many students with dual disabilities experience language learning disabilities that are manifested in a variety of ways and lead to difficulty processing information. These include

- Short-term memory deficits (the student's brain cannot hold on to the information long enough to get it processed).
- Working memory deficits (the student experiences difficulty accessing related background knowledge or applying various elaboration strategies such as predicting, questioning, summarizing, imaging, and monitoring comprehension).

Some students can use these cognitive processes effectively, but simply need more time to apply them. An unfortunate net result is that students do not appear to learn the complex information, so expectations are lowered via curriculum modifications.

An alternative strategy to "dumbing down" the curriculum is to focus on ways to make the information easier to process by increasing its clarity (Deshler, et al., 2001; Ellis, 1997). Two ways to do this are (a) reduce the verbiage, and (b) make the organization of the to-be-learned information self-evident to the learner.

Reducing Verbiage. The more words we use to explain an idea, the more language students with language learning disabilities must process. Complex ideas expressed using concise and precise language is considerably easier to understand than when these ideas are expressed in rambling, poorly conceptualized, fuzzy language. Novice teachers frequently do not know the content well enough to express it clearly, and content experts often flood students with far too much information than is needed to develop a novice's understanding of the complex idea.

Organizing Information Into Recognizable Patterns. Most teachers are familiar with graphic organizers, primarily webs and Venn diagrams. Webs depict hierarchic organizational structures, whereas Venn diagrams facilitate compare/contrast structures. Other graphic organizers depict cause/effect relationships and either linear or circular sequences. A wealth of research has demonstrated their utility both as literacy tools and as content-learning tools. These are powerful tools presumably because when one processes information, the brain is engaged in an array of cognitive processes centered around relating the information to prior knowledge, conceptualizing how the information is structured or organized, differentiating supra-ordinate, coordinate, and subordinate levels of information (separating main ideas from details) and monitoring comprehension.

Using graphic organizers relieves the brain from engaging in some of these processes, hypothetically freeing it to

engage in the other information processes required to construct meaning. Critical to understand is that when the brain does not have to work as hard to process and understand information, teachers can increase the complexity of the content rather than decrease it. Basic graphic organizers provide structural prompts to help students understand the information's organization structure (see our Web site, www.GraphicOrganizers.com).

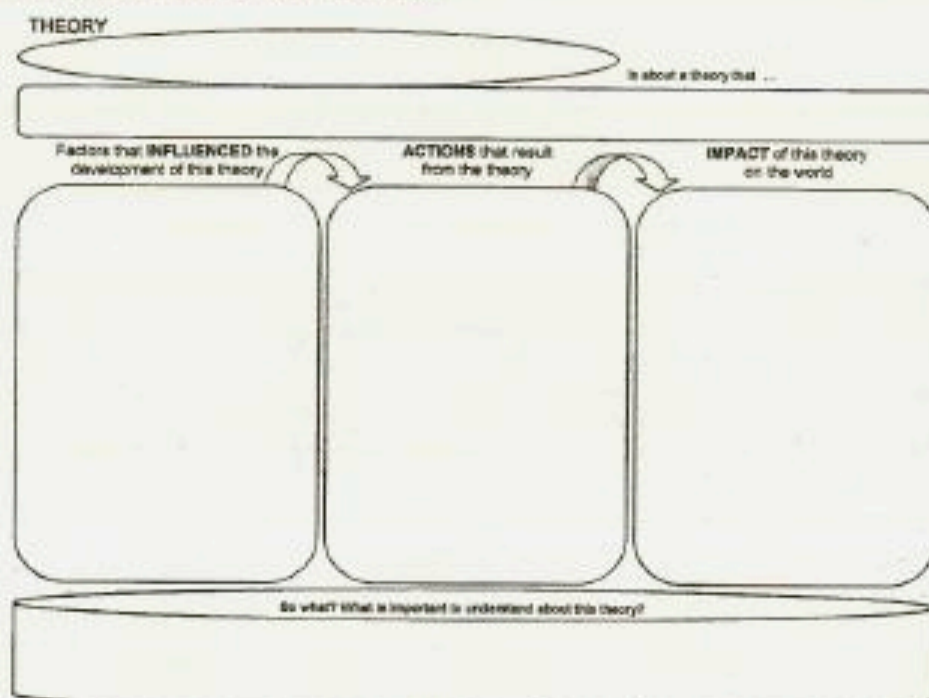
Conceptual and relational prompts can be embedded into graphic organizers to make them even more robust. Conceptual prompts focus the students' attention on specific ways to conceptualize the to-be-learned information. The words embedded in the graphic organizer in Figure 4 direct students to think about the topic in specific and important ways.

**Basic graphic organizers
provide structural
prompts to help students
understand
the information's
organization structure.**

Maximizing Opportunities for Low-Risk Elaboration

Simply put, the more students elaborate on ideas they are learning, the better they develop meaningful understanding and remember them. One of the problems most readily noticeable in students with language learning disabilities is their struggle with elaborating ideas. They say as little as possible in class, rarely ask questions, or otherwise voluntarily engage in class discussions. When prompted to verbalize in class, they sometimes express ideas in ways that subject them to ridicule. As a result, to avoid embarrassing these students as well as having the instructional flow stall, these students are often the least likely to be called on in class. Thus, they are least likely to have opportunities for developing elaboration

Figure 4. Graphic Organizer With Content Prompts



skills (Ellis, 1998). They approach test preparation primarily as a rote learning task rather than an elaborative learning task. These are the overt symptoms.

The covert symptoms manifest in ways that significantly contribute to failure and subsequent lack of motivation and include inability to paraphrase, summarize, form predictions, use imagery, generate questions, and connect ideas to background knowledge. Brief factual statements followed by succinct open-ended questions are often preferable to long, extended questions. Likewise, activities that focus on helping students construct concise elaborations are considerably more robust than those that seek brief answers or imprecise elaborations (Ellis, 1997).

Big Idea #3: Scaffold Knowledge Complexity

When teaching students how to perform a skill, process, or strategy, most teachers are familiar with the process of scaffolding assistance whereby the teacher gradually fades support as students learn to independently apply the skill. When teaching students about big

ideas, scaffolding knowledge is an essential tool. Here, teachers take the time to find out what students already know, or think they know about the concept, as well as what misconceptions or erroneous understandings they may have at the onset. The teacher then uses this background knowledge as a basis for teaching the abstract information. Likewise, they scaffold the complexity of the concept.

Educators need to focus their limited time and resources on teaching a curriculum that has some degree of relevance for students.

When faced with complex concepts from the general curriculum, a common initial reaction is to assume that students with learning problems cannot

learn such abstract information. What is often substituted is instruction in more concrete concepts, or even worse, forgoing concept instruction and just teaching related factual information. In contrast, recursively teaching the same concept on increasingly more sophisticated levels (as opposed to attempting to initially teach the complex version of it) can often result in surprisingly complex and sophisticated understanding.

Big Idea #4: Meaningful, Intentional Learning Experiences

There are many paths to gaining knowledge of big ideas. In some instances, students need is to have someone explicitly explain the idea to them. However, what really makes understanding of the idea come alive for students is to engage them in authentic learning opportunities via structured inquiry. The idea is to provide students with opportunities to conduct their own investigations that have an authentic purpose.

Research has clearly demonstrated that students who are gifted perform

best in these circumstances when the projects are opened-ended, yet have a degree of structure and scaffolded assistance as needed. This would seem especially true for students with dual exceptionalities given their organizational problems. The idea is to provide enough structure as to enable the learner to be successful, yet not so much structure that the task is stifled by directions and inflexible procedures. Generally, these experiences fall into interrelated categories of project-based, problem-based, and service-based learning. We collectively refer to these as project-based learning (PBL).

Essential to understand about PBL, however, is that merely creating the project-oriented learning experience or opportunity is insufficient. The PBL must be intentionally linked to specific academic standards, and there must be a way to assess whether the standards were actually attained.

PBL focuses on student-team (or individual) investigations and/or applied real-life problem-solving actions or authentic application of knowledge. Guided by content area national standards and the teacher's expertise, students target areas of interest or a community need, plan and conduct investigations, develop and implement action plans and then share what they have learned with authentic audiences. As students conduct investigations into content-area subjects, they also develop essential skills for gathering and making sense of information, communicating, using higher order thinking, collaborating, reflecting, and self-evaluating. Perhaps most important, they experience a sense of active participation and enfranchisement with the community (Corporation for National and Community Service, 2002; Kauffman, 1999). Figure 5 shows PBL tasks in graphic form.

PBL provides a format for implementing several very powerful instructional principles, including differentiating instruction, scaffolding instruction, and facilitating socially constructed knowledge. This approach fosters the development in students of a sophisticated understanding of content-area subjects, as well as development of

effective and efficient strategies for information-gathering and processing; communicating; critical, analytical, and creative thinking; collaborating; goal setting; and self-evaluating.

In addition to helping students develop specific skills and knowledge related to standards from the state course of study, PBL teachers emphasize the following:

- Using effective task-specific strategies that get the job done in an effective and efficient manner.
- Employing effective collaboration strategies and work habits.
- Maintaining a commitment to quality at all levels of project work and results (Ellis & Farmer, 2005; also, refer to Figure 5).

Final Thoughts

In teaching big ideas to any students, you must know where you want to go, you must want to get there, and you must be willing to do what is necessary to make it happen. Be persistent, show commitment, and use multiple strategies to encourage your students. The depth of their learning may surprise and delight you.

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Figure 5. Project-Based Learning Tasks

PLANNING

- o Anticipating tasks.
- o Setting goals.
- o Making commitments.

INVESTIGATING

Investigate topic or problem using multiple sources of information.

Consolidating, synthesizing & organizing information for a presentation.

Conducting an experiment to generate new information.

Designing an invention to solve a problem.

Providing a service to meet a social need.

DEVELOPING & IMPLEMENTING ACTION PLANS

- o Planning tasks.
- o Establishing priorities & responsibilities.
- o Defining quality indicators for each task.
- o Specifying timelines.

COMMUNICATING OUTCOMES

Clearly communicate results of project to authentic audience.

EVALUATING

Effectiveness of ...

- o Planning strategies
- o Investigation strategies
- o Communication strategies

Quality of ...

- o Presentation
- o Permanent products
- o Service provided

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Information about the Make Sense Strategies, an instructional model designed for teaching big ideas and thinking skills, can be found at www.GraphicOrganizers.com.

TEACHING Exceptional Children, Vol. 38, No. 1, pp. 34-40.

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<http://mildpdf.com/search-teaching-big-ideas.html>

What is a Big Idea?

by Grant Wiggins

Jun 10, 2010

Source: http://www.authenticeducation.org/ae_bigideas/article.lasso?artid=99

Nobody can be a good reasoner unless by constant practice he has realized the importance of getting hold of the big ideas and of hanging onto them like grim death.

– A. N. Whitehead, 1929

What is a “big idea”?

An idea is —big□ if it helps us make sense of lots of confusing experiences and seemingly isolated facts. It’s like the picture that connects the dots or a simple rule of thumb in a complex field. For example: —the water cycle□ is a big idea for connecting seemingly discrete and one-way events (the water seems to just disappear as it evaporates). —The heroic cycle□ enables us to comprehend literature from many places, cultures, and times. —Measure twice, cut once□ is a profound reminder about how to avoid heartache and inefficiency in building anything.

A big idea is thus a way of seeing better and working smarter, not just a vague notion or another piece of knowledge. It is more like a lens for looking than another object seen; more like a theme than the details of a narrative; more like an active strategy in your favorite sport or reading than a specific skill. It is a theory, not a detail.

If an idea is —big□ it helps us make sense of things. So, an idea is not —big□ merely because it categorizes a lot of content. —Change,□ —relationships,□ and —number system□ certainly encompass an enormous amount of knowledge and understanding, but these concepts don’t contain much insight or direction beyond their definition. They aren’t particularly powerful or illuminating on their own as concepts. On the other hand, —For every action there is an equal reaction□ is a powerful idea about change: we can use it to study, organize, make sense of phenomena, and predict changes in motion. So, too, is the idea that —blood is thicker than water□

powerful for understanding many relationships in societies and throughout history – and, perhaps for understanding a few puzzling decisions made by our family members!

A genuine idea is thus not a —mere□ idea. It is not abstract in the bad sense, it is concrete; it is a *useful* theory; it has real impact. For example, consider a detective trying to make sense of many puzzling clues whose meaning and relationship are unclear. Any theory as to —whodunit□ will relate to motive. A good detective has some big ideas about motive to bring meaning to what might otherwise seem like odd, isolated, and unique little facts to the rest of us. The —big idea□ (whether it is —Look for love triangles□ or —Follow the money□) is thus quite practical: it helps distinguish clues from unimportant facts, and shows the way toward more facts – and a persuasive narrative.

Similarly, in literacy or history teaching, the important –themes□ are big ideas. Why? Because – if used properly – they provide learners with mental schemas or templates that help make sense of all the details of texts that threaten to overwhelm inexperienced readers. If I am alerted to –the heroic quest,□ or –the American Dream □ I can read and think with more control and insight.

In science, the most illuminating hypotheses are the big ideas of science. So, the idea that we are all part of a –food chain□ of living and nonliving things is big because it links seemingly different (and isolated) animals and plant matter into a bigger comprehensible –ecosystem□ of energy exchange. We then see the role of predators, garbage, and our relationship to nature in a completely new and helpful way than before. Newton’s laws of motion are three of the biggest ideas ever posed: suddenly, thousands of seemingly unrelated facts and phenomena – spoons dropping, the tides, the moon’s orbit – had not only a meaningful explanation but could be seen as part of a huge coherent system with endless predictive and connective power.

In short: think of –big□ as –powerful□ not as a large abstract category.

A powerful idea vs. a mere abstraction

John Dewey – as we might expect – articulated the notion of a useful idea long ago. He often wrote to describe the difference between a –genuine □ idea and an idea treated as a –fact□:

Ideas are not then genuine ideas unless they are tools in a reflective examination which tends to solve a problem. Suppose it is a question of having the pupil grasp the idea of the sphericity of the earth. This is different from teaching him its sphericity as a fact. He may be shown (or reminded of) a ball or a globe, and be told that the earth is round like those things; he may then be made to repeat that statement day after day till the shape of the earth and the shape of the ball are welded together in his mind. But he has not thereby acquired any idea of the earth's sphericity; at most, he has had a certain image of a sphere and has finally managed to image the earth after the analogy of his ball image. To grasp sphericity as an idea, the pupil must first have realized certain perplexities or confusing features in observed facts and have had the idea of spherical shape suggested to him as a possible way of accounting for the phenomena in question. Only by use as a method of interpreting data so as to give them fuller meaning does sphericity become a genuine idea. There may be a vivid image and no idea; or there may be a fleeting, obscure image and yet an idea, if that image performs the function of instigating and directing the observation and relation of facts.

- John Dewey (1910) – *How We Think*. Emphasis added.

So, we musn’t equate –big idea □ with a concept taught as a fact or definition. Only when we help the learner see firsthand that an idea is an inference, and one with power to provide meaning and

transfer, does it become a –big idea. □

The difference between a vital idea with power and a lifeless scientific notion was beautifully clarified by Nobel Physicist Richard Feynmann in discussing science instruction:

There is a first grade science book which, in the first lesson of the first grade, begins in an unfortunate manner to teach science, because it starts off with the wrong idea of what science is. There is a picture of a dog--a windable toy dog--and a hand comes to the winder, and then the dog is able to move. Under the last picture, it says "What makes it move?" Later on, there is a picture of a real dog and the question, "What makes it move?" Then there is a picture of a motorbike and the question, "What makes it move?" and so on.

I thought at first they were getting ready to tell what science was going to be about--physics, biology, chemistry--but that wasn't it. The answer was in the teacher's edition of the book: the answer I was trying to learn is that "energy makes it move."

That's only the definition of energy; it should be reversed. We might say when something can move that it has energy in it, but not what makes it move is energy. This is a very subtle [but important] difference.

Perhaps I can make the difference a little clearer this way: If you ask a child what makes the toy dog move, you should think about what an ordinary human being would answer. The answer is that you wound up the spring; it tries to unwind and pushes the gear around.

What a good way to begin a science course! Take apart the toy; see how it works. See the cleverness of the gears; see the ratchets. Learn something about the toy, the way the toy is put together, the ingenuity of people devising the ratchets and other things. [Otherwise,] suppose a student would say, "I don't think energy makes it move." Where does the discussion go from there?

I finally figured out a way to test whether you have taught an idea or you have only taught a definition.

Test it this way: you say, "Without using the new word which you have just learned, try to rephrase what you have just learned in your own language." Without using the word "energy," tell me what you know now about the dog's motion." You cannot. So you learned nothing about science.

In short, if the word is just a technical term rather than a vital approach, it isn't a big idea.

Covering facts vs. uncovering understandings: avoiding the temptation to treat all scientific ideas as facts.

But teachers often unwittingly conflate terms with ideas. In their desire to make teaching more efficient, they often treat the theory or strategy as a fact related to a definition, as in Feynmann's example. They end up turning an insightful inference into a thought-ending word. We pay for this desire to cover things ever more quickly: by treating all ideas as facts to be learned instead of inferences to be validated and analyzed through use, we unwittingly end up inhibiting meaning and transfer. Students end up just trafficking in meaningless words; science gets treated as a foreign language rather than a body of knowledge and understanding.

Let's put this issue of efficiency vs. effectiveness in terms of the learner, the novice struggling to understand. After a few days in your room as a new student, I will likely feel overwhelmed with information; I don't yet see a pattern or a mental organizer by which I can begin to make sense of all that you are teaching me and that we are reading about. I need a helpful schema, a framework, a touchstone, a guidepost, a strategy for making sense of everything I am learning. In other words, I need a framework for my new content: I need a way to order, categorize and prioritize what I am learning.

Now, suppose we ask: if you could as teacher alert the student to a key recurring idea that can make sense of the learning as well as further it, what would it be? What aphorism, imperative, and/or rules of thumb would permit the student to make more and more sense of their work and how to be successful all year in your course? That's what we're calling a big idea.

Here are some possible answers, for different subjects and grade levels:

- In history class: verify the source and determine the credibility of the source. Keep asking: Who said it? Why? How credible a statement is it? How credible is the source of the statement?
- In reading: Converse with the author. Assume the text makes sense. You will likely only understand the text if you assume it is meaningful and ask questions of it – if you converse with the author.
- In evolution: keep remembering that the idea that mutations are random and that selection is –natural□ means that there is no guiding purpose to life-form change. This is the part of the theory of evolution that is most controversial, not the idea of evolution per se.
- In writing: keep asking – Who is my audience? What is it I want them to see, think, feel, or do?

What modern theories of human learning and understanding tell us is that the learner has to be helped to –construct□ understandings, not just be told them. No meaning and no transfer occur if –useful theory□ is reduced to fact – even though teaching thereby becomes more efficient. The distinction between –knowledge□ and –understanding□ (or, if you like, –facts□ and –genuine ideas□) is not merely semantic. We slowly come to an understanding, as a result of using facts and ideas to make sense of things. (Facts are apprehended, ideas are comprehended, in Dewey’s original formulation). –Teaching□ an understanding is as counter-productive as –teaching□ someone to be honest. Learners have to see the power of honesty and the unforeseen consequences of dishonesty before they can truly commit to honesty as a value.

The real harm of stressing that ideas are merely words, phrases, and statements with technical meaning (instead of the power they represent) is that such teaching tends to end thought rather than further it. Rather, a big idea is alive. We develop understanding by extending and challenging understanding. A big idea reaches out, it pushes against boundaries, it asks us to possibly rethink other things we thought we knew. It raises questions and problems - and thus, generates new ideas. We see new connections and we initiate inquiries to validate or critique the idea. A big idea activates thought and permits transfer – and, thus creativity. –Coverage□ of an idea, by contrast, kills it: our job is not to think with ideas but just learn stuff. The best teaching does the opposite. It brings seemingly inert content to life. And in science it reminds us that today’s Big Idea is potentially tomorrow’s discredited notion. This is key to empowering the student: there will always be room for new ideas in any authentic teaching of science as fallible theorizing.

The article Jay McTighe and I recently wrote for *Educational Leadership* called 'Put Understanding First' makes the point in a different way: both teachers and students need to understand that there are three different educational goals always at play: Acquisition, meaning-making, and transfer or prior learning. Here is a brief excerpt from the article (which was in the May 2008 issue, on High School Reform):

To better explain what curriculum needs to be, we think it is helpful to distinguish what are in fact three different yet interrelated academic goals of high school -- students should be helped to: 1) acquire important information and skills, 2) make meaning of that content (i.e., come to understand important ideas), and 3) transfer their learning to new situations, effectively. In this paper, we will refer to these three key learning goals as A-M-T. Acquisition is a means; meaning making and transfer are the ends.

The categories should seem intuitively sound. A fact is a fact; a skill is a skill. We acquire each in turn. To ask, however: What do these facts imply? Or: When would I use this skill (or not)? is to ask what those facts and skills mean. A third question can also be asked: How should I apply my prior facts, skills, and ideas effectively in this particular situation? This question is about transfer.

I must take what I have previously acquired and understood, and see how it can best be used in a particular and novel situation. Thus, when we speak of –learning for understanding, □ we really are referring to two different long-term aims: meaning making and transfer, utilizing previously acquired knowledge and skills – our short-term goal.

While such a classification scheme is not new or radical (see Dewey, 1933 ; Bloom, 1956 ; Marzano, et. al. 1992), the distinctions are real – and critical to intelligent planning, purposeful instruction, and valid assessment. Put simply: if you want understanding and transfer, you have to design backward from it.

Any understanding, essential question, or transfer task is made up of a big idea; it is built out of it, in other words. So, making a question using a big idea turns into an essential question. A food chain is a big idea. –On what energy do we depend and how can we ensure access to it? □ is an essential question about that big idea. While it is true that sometimes when asked to name a big idea we frame it instinctively as a question or a statement, sometimes we just express it as a phrase or word.

We first started talking about –big ideas □ to help those using the UbD template who did not find it easy to come up with essential questions (and understandings). People were often inappropriately trying to come up with a factual question, such as: "What is a food chain?" So, we would say,

"No, that is a factual question that is answered in the book." We would follow this up by asking them: "So, what's the big idea about the fact? What does the idea of 'food chain' help us to see or understand better? □

Our hope was that this additional step might ease the transition from focusing only on –content □ to focusing on learning content for understanding. Alas, some people heard the phrase differently: they thought the phrase –big idea □ was synonymous with –understanding □ Or –question. □ Others, who had no trouble coming up with questions and understandings, then wondered if they had somehow missed something by not also coming up with big ideas. So, they would ask: –Why is there no box in the template for big ideas? □

"Big idea" doesn't have its own template box because many boxes in the template should refer directly or indirectly to big ideas. If I say –audience and purpose □ that's a phrase representing a big idea in writing and reading. If I ask: –What is my purpose and who is my audience? □ I am acknowledging the importance of that idea and framing it as an essential question. If I say –Great writing, like great art, is a function of utter clarity about purpose and audience, □ then I am proposing a specific understanding about that idea. If I ask you to write the same piece for two different audiences, I am asking you to transfer your grasp of the idea in writing. (Note, therefore, that we both may agree on the importance of –audience and purpose □ as an idea but propose different –understandings □ about it.)

So, what makes an idea *big*? An idea is *big* if it helps us make sense of lots of otherwise meaningless, isolated, inert, or confusing facts. A big idea is a way of usefully seeing connections, not just another piece of knowledge. It is more like a lens for better looking than

something additionally seen; more like a theme than the facts of the story.

In the language of UbD, a *big idea* is a powerful intellectual tool, from which we can derive more specific and helpful understandings and facts.

A true idea doesn't end thought, it activates it. It has the power to raise questions and generate learning. So, build your unit around one idea with power, an idea that helps learners make sense of otherwise isolated content and which cannot help but bring inquiry to the fore.



The Educated Person

by Ernest L. Boyer

As we anticipate a new century, I am drawn back to questions that have, for generations, perplexed educators and philosophers and parents. What is an educated person? What should schools be teaching to students?

In searching for answers to these questions, we must consider first not the curriculum, but the human condition. And we must reflect especially on two essential realities of life. First, each person is unique. In defining goals, it is crucial for educators to affirm the special characteristics of each student. We must create in schools a climate in which students are empowered, and we must find ways in the nation's classrooms to celebrate the potential of each child. But beyond the diversity of individuals, educators also must acknowledge a second reality: the deeply rooted characteristics that bind together the human community. We must show students that people around the world share a great many experiences. Attention to both these aspects of our existence is critical to any discussion of what all children should learn.

What, then, does it mean to be an educated person? It means developing one's own aptitudes and interests and discovering the diversity that makes us each unique. And it means becoming permanently empowered with language proficiency, general knowledge, social confidence, and moral awareness in order to be economically and civically successful. But becoming well educated also means discovering the connectedness of things. Educators must help students see relationships across the disciplines and learn that education is a communal act, one that affirms not only individualism, but community. And for these goals to be accomplished, we need a new curriculum framework that is both comprehensive and coherent, one that can encompass existing subjects and integrate fragmented content while relating the curriculum to the realities of life. This curriculum must address the uniqueness of students' histories and experiences, but it also must guide them to understand the many ways that humans are connected.

Some schools and teachers are aiming to fully educate students, but most of us have a very long way to go in reaching this goal. Today, almost all students in U.S. schools still complete Carnegie units in exchange for a diploma. The time has come to bury the old Carnegie unit; since the Foundation I now head created this unit of academic measure nearly a century ago, I feel authorized to declare it obsolete. Why? Because it has helped turn schooling into an exercise in trivial pursuit. Students get academic "credit," but they fail to gain a coherent view of what they study. Education is measured by seat time, not time for learning. While curious young children still ask why things are, many older children ask only, "Will this be on the test?" All students should be encouraged to ask "Why?" because "Why?" is the question that leads students to connections.

In abandoning the Carnegie unit, I do not endorse the immediate adoption of national assessment programs; indeed, I think we must postpone such programs until we are much clearer about what

students should be learning. The goal, again, is not only to help students become well informed and prepared for lifelong learning, but also to help them put learning into the larger context of discovering the connectedness of things. Barbara McClintock, the 1983 winner of the Nobel Prize for Physiology–Medicine, asserts: "Everything is one. There is no way to draw a line between things." Contrary to McClintock's vision, the average school or college catalog dramatizes the separate academic boxes.

Frank Press, president of the National Academy of Sciences, compares scientists to artists, evoking the magnificent double helix, which broke the genetic code. He said the double helix is not only rational, but beautiful.

Similarly, when scientists and technicians watch the countdown to a space launch, they don't say, "Our formulas worked again." They respond, "Beautiful!" instinctively reaching for the aesthetic term to praise a technological achievement. When physicist Victor Weisskopf was asked, "What gives you hope in troubled times?" he replied, "Mozart and quantum mechanics." Most schools, however, separate science and art, discouraging students from seeing the connections between them.

How, then, can we help students see relationships and patterns and gain understanding beyond the separate academic subjects? How can we rethink the curriculum and use the disciplines to illuminate larger, more integrated ends?

Human Commonalities

In the 1981 book *A Quest for Common Learning*, I suggested that we might organize the curriculum not on the basis of disciplines or departments, but on the basis of "core commonalities." By core commonalities, I mean universal experiences that make us human, experiences shared by all cultures on the planet. During the past decade and a half, my thinking about this thematic structure has continued to evolve. I now envision eight commonalities that bind us to one another.

I. The Life Cycle.

As life's most fundamental truth, we share, first, the experience that connects birth, growth, and death. This life cycle binds each of us to the others, and I find it sad that so many students go through life without reflecting on the mystery of their own existence. Many complete twelve or sixteen years of formal schooling not considering the sacredness of their own bodies, not learning to sustain wellness, not pondering the imperative of death.

In reshaping the curriculum to help students see connections, I would position study of "The Life Cycle" at the core of common learning. Attention would go to nutrition, health, and all aspects of wellness. For a project, each student would undertake the care of some life form.

My wife is a certified nurse-midwife who delivers babies, including seven grandchildren of our own. Kay feels special pain when delivering the baby of a teenage girl because she knows that

she is delivering one child into the arms of another, and that both have all too often lived for nine months on soda and potato chips. Some young mothers first learn about the birth process between the sharp pains of labor.

Too many young women and young men pass through our process of education without learning about their own bodies. Out of ignorance, they suffer poor nutrition, addiction, and violence. "Maintaining children's good health is a shared responsibility of parents, schools, and the community at large," according to former Secretary of Education William Bennett (1986, p. 37). He urges elementary schools "to provide children with the knowledge, habits, and attitudes that will equip them for a fit and healthy life."

Study of the Life Cycle would encourage students to reflect sensitively on the mystery of birth and growth and death, to learn about body functions and thus understand the role of choice in wellness, to carry some of their emotional and intellectual learning into their relations with others, and to observe, understand, and respect a variety of life forms.

II. Language.

Each life on the planet turns to symbols to express feelings and ideas. After a first breath, we make sounds as a way of reaching out to others, connecting with them. We develop a variety of languages: the language of words (written and spoken), the language of symbols (mathematics, codes, sign systems), and the language of the arts (aesthetic expressions in language, music, paint, sculpture, dance, theater, craft, and so on). A quality education develops proficiency in the written and the spoken word, as well as a useful knowledge of mathematical symbol systems and an understanding that the arts provide countless ways to express ourselves.

Our sophisticated use of language sets human beings apart from all other forms of life. Through the created words and symbols and arts, we connect to one another. Consider the miracle of any moment. One person vibrates his or her vocal cords. Molecules shoot in the direction of listeners. They hit the tympanic membrane; signals go scurrying up the eighth cranial nerve. From that series of events, the listener feels a response deep in the cerebrum that approximates the images in the mind of the speaker. Because of its power and scope, language is the means by which all other subjects are pursued.

The responsible use of language demands both accuracy and honesty, so students studying "Language" must also learn to consider the ethics of communication. Students live in a world where obscenities abound. They live in a world where politicians use sixty-second sound bites to destroy integrity.

They live in a world where clichés substitute for reason. To make their way in this world, students must learn to distinguish between deceit and authenticity in language.

Writers and mathematicians have left a long and distinguished legacy for students to learn from. Through words, each child can express something personal. Through symbols, each child can increase the capacity to calculate and reason. Through the arts, each child can express a thought or a feeling. People need to write with clarity, read with comprehension, speak effectively, listen with understanding, compute accurately, and understand the communicative capabilities of the arts. Education for the next century means helping students understand that language in all its forms is a powerful and sacred trust.

III. The Arts.

All people on the planet respond to the aesthetic. Dance, music, painting, sculpture, and architecture are languages understood around the world. "Art represents a social necessity that no nation can neglect without endangering its intellectual existence," said John Ruskin (Rand 1993). We all know how art can affect us. Salvador Dali's painting *The Persistence of Memory* communicates its meaning to anyone ever haunted by time passing. The gospel song "Amazing Grace" stirs people from both Appalachia and Manhattan. "We Shall Overcome," sung in slow and solemn cadence, invokes powerful feelings regardless of the race or economic status of singer or audience.

Archaeologists examine the artifacts of ancient civilization—pottery, cave paintings, and musical instruments—to determine the attainments and quality of a culture. As J. Carter Brown (1986) observes, "The texts of man's achievements are not written exclusively in words. They are written, as well, in architecture, paintings, sculpture, drawing, photography, and in urban, graphic, landscape, and industrial design."

Young children understand that the arts are language. Before they learn to speak, they respond intuitively to dance, music, and color. The arts also help children who are disabled. I once taught deaf children, who couldn't speak because they couldn't hear. But through painting, sculpture, movement, and rhythm, they found new ways to communicate.

Every child has the urge and capacity to be expressive. It is tragic that for most children the universal language of the arts is suppressed, then destroyed, in the early years of learning, because traditional teaching does not favor self-expression and school boards consider art a frill. This is an ironic deprivation when the role of art in developing critical thinking is becoming more widely recognized.

Jacques d'Amboise, former principal dancer with the New York City Ballet, movie star, and founder of the National Dance Institute, offers his view on how art fits into education: "I would take the arts, science and sports, or play, and make all education involve all of them. It would be similar to what kindergarten does, only more sophisticated, right through life. All of the disciplines would be interrelated. You dance to a poem: poetry is meter, meter is time, time is science" (Ames and Peyser 1990).

For our most moving experiences, we turn to the arts to express feelings and ideas that words cannot convey. The arts are, as one poet has put it, "the language of the angels." To be truly educated means being sensitively responsive to the universal language of art.

IV. Time and Space.

While we are all nonuniform and often seem dramatically different from one another, all of us have the capacity to place ourselves in time and space. We explore our place through geography and astronomy. We explore our sense of time through history.

And yet, how often we squander this truly awesome capacity for exploration, neglecting even our personal roots. Looking back in my own life, my most important mentor was Grandpa Boyer, who lived to be one hundred. Sixty years before that, Grandpa moved his little family into the slums of Dayton, Ohio. He then spent the next forty years running a city mission, working for the poor, teaching me more by deed than by word that to be truly human, one must serve. For far too many children, the influence of such intergenerational models has diminished or totally disappeared.

Margaret Mead said that the health of any culture is sustained when three generations are vitally interacting with one another—a "vertical culture" in which the different age groups are connected. Yet in America today we've created a "horizontal culture," with each generation living alone. Infants are in nurseries, toddlers are in day care, older children are in schools organized by age. College students are isolated on campuses. Adults are in the workplace. And older citizens are in retirement villages, living and dying all alone.

For several years, my own parents chose to live in a retirement village where the average age was eighty. But this village had a day-care center, too, and all the three- and four- year-olds had adopted grandparents to meet with every day. The two generations quickly became friends. When I called my father, he didn't talk about his aches and pains, he talked about his little friend. And when I visited, I saw that my father, like any proud grandparent, had the child's drawings taped to the wall. As I watched the two of them together, I was struck by the idea that there is something really special about a four-year-old seeing the difficulty and courage of growing old. And I was struck, too, by watching an eighty-year-old being informed and inspired by the energy and innocence of a child. Exposure to such an age difference surely increases the understanding of time and personal history.

The time has come to break up the age ghettos. It is time to build intergenerational institutions that bring together the old and young. I'm impressed by the "grandteacher" programs in the schools, for example. In the new core curriculum, with a strand called "Time and Space," students should discover their own roots and complete an oral history. But beyond their own extended family, all students should also become well informed about the influence of the culture that surrounds them and learn about the traditions of other cultures.

A truly educated person will see connections by placing his or her life in time and space. In the days ahead, students should study Western civilization to understand our past, and they should study non-Western cultures to understand our present and our future.

V. Groups and Institutions.

All people on the planet belong to groups and institutions that shape their lives. Nearly 150 years ago, Ralph Waldo Emerson observed, "We do not make a world of our own, but rather fall into institutions already made and have to accommodate ourselves to them." Every society organizes itself and carries on its work through social interaction that varies from one culture to another.

Students must be asked to think about the groups of which they are members, how they are shaped by those groups, and how they help to shape them. Students need to learn about the social web of our existence, about family life, about how governments function, about the informal social structures that surround us. They also must discover how life in groups varies from one culture to another.

Civic responsibility also must be taught. The school itself can be the starting point for this education, serving as a "working model" of a healthy society in microcosm that bears witness to the ideals of community. Within the school, students should feel "enfranchised." Teachers, administrators, and staff should meet often to find their own relationship to the institution of the school. And students should study groups in their own community, finding out about local government.

One of my sons lives in a Mayan village in the jungle of Belize. When my wife and I visit Craig each year, I'm impressed that Mayans and Americans live and work in very similar ways. The jungle of Manhattan and the one of Belize are separated by a thousand miles and a thousand years, and yet the Mayans, just like us, have their family units. They have elected leaders, village councils, law enforcement officers, jails, schools, and places to worship. Life there is both different and very much the same. Students in the United States should be introduced to institutions in our own culture and in other cultures, so they might study, for example, both Santa Cruz, California, and Santa Cruz, Belize.

We all belong to many groups. Exploring their history and functions helps students understand the privileges and the responsibilities that belong to each of us.

VI. Work.

We all participate, for much of our lives, in the commonality of work. As Thoreau reminds us, we both "live" and "get a living." Regardless of differences, all people on the planet produce and consume. A quality education will help students understand and prepare for the world of work. Unfortunately, our own culture has become too preoccupied with consuming, too little with the tools for producing. Children may see their parents leave the house carrying briefcases or lunch pails in the morning and see them come home again in the evening, but do they know what parents actually do during the day?

Jerome Bruner (1971) asks: "Could it be that in our stratified and segmented society, our students simply do not know about local grocers and their styles, local doctors and their styles, local taxi drivers and theirs, local political activists and theirs? . . . I would urge that we find some way of connecting the diversity of the society to the phenomenon of school" (p. 7). A new, integrative curriculum for the schools needs to give attention to "Producing and Consuming," with each student studying simple economics, different money systems, vocational studies, career planning, how work varies from one culture to another, and with each completing a work project to gain a respect for craftsmanship.

Several years ago when Kay and I were in China, we were told about a student who had defaced the surface of his desk. As punishment, he spent three days in the factory where the desks were made, helping the woodworkers, observing the effort involved. Not surprisingly, the student never defaced another desk.

When I was Chancellor of the State University of New York, I took my youngest son, then eight, to a cabin in the Berkshires for the weekend. My goal: to build a dock. All day, instead of playing, Stephen sat by the lake, watching me work. As we drove home, he looked pensive. After several miles, he said, "Daddy, I wish you'd grown up to be a carpenter—instead of you-know-what!"

VII. Natural World.

Though all people are different, we are all connected to the earth in many ways. David, my grandson in Belize, lives these connections as he chases birds, bathes in the river, and watches corn being picked, pounded into tortillas, and heated outdoors. But David's cousins in Boston and Princeton spend more time with appliances, asphalt roadways, and precooked food. For them, discovering connectedness to nature does not come so naturally.

When I was United States Commissioner of Education, Joan Cooney, the brilliant creator of Sesame Street, told me that she and her colleagues at Children's Television Workshop wanted to start a new program on science and technology for junior high school kids. They wanted young people to learn

a little more about their world and what they must understand as part of living. Funds were raised, and 3–2–1 Contact went on the air. To prepare scripts, staff surveyed junior high school kids in New York City, asking questions such as "Where does water come from?"—which brought from some students the disturbing reply, "The faucet." They asked, "Where does light come from?" and heard, "The switch." And they asked, "Where does garbage go?" "Down the chute." These students' sense of connectedness stopped at the VCR or refrigerator door.

Canadian geneticist David Suzuki, host of *The Nature of Things*, says: "We ought to be greening the school yard, breaking up the asphalt and concrete. . . . We have to give children hand-held lenses, classroom aquariums and terrariums, lots of field trips, organic garden plots on the school grounds,

butterfly gardens, trees. Then insects, squirrels—maybe even raccoons and rabbits—will show up, even in the city. We've got to reconnect those kids, and we've got to do it very early. . . . Our challenge is to reconnect children to their natural curiosity" (Baron Estes 1993).

With all our differences, each of us is inextricably connected to the natural world. During their days of formal learning, students should explore this commonality by studying the principles of science, by discovering the shaping power of technology, and, above all, by learning that survival on this planet means respecting and preserving the earth we share.

VIII. Search for Meaning.

Regardless of heritage or tradition, each person searches for some larger purpose. We all seek to give special meaning to our lives. Reinhold Niebuhr said, "Man cannot be whole unless he be committed, he cannot find himself, unless he find a purpose beyond himself." We all need to examine values and beliefs, and develop convictions. During my study of the American high school, I became convinced ours is less a school problem and more a youth problem. Far too many teenagers feel unwanted, unneeded, and unconnected. Without guidance and direction, they soon lose their sense of purpose—even their sense of wanting purpose.

Great teachers allow their lives to express their values. They are matchless guides as they give the gift of opening truths about themselves to their students. I often think of three or four teachers, out of the many I have worked with, who changed my life. What made them truly great? They were well informed. They could relate their knowledge to students. They created an active, not passive, climate for learning. More than that, they were authentic human beings who taught their subjects and were open enough to teach about themselves.

Service projects instill values. All students should complete a community service project, working in day-care centers and retirement villages or tutoring other students at school. The North Carolina School of Science and Math develops an ethos of responsible citizenship. To be admitted, a child must commit to sixty hours of community service per summer and three hours per week during the school year (Beach 1992, p. 56).

Martin Luther King, Jr., preached: "Everyone can be great because everyone can serve." I'm convinced the young people of this country want inspiration from this kind of larger vision, whether they come across it in a book or in person, or whether they find it inside themselves.

Values, Beliefs, and Connections

What, then, does it mean to be an educated person? It means respecting the miracle of life, being empowered in the use of language, and responding sensitively to the aesthetic. Being truly educated means putting learning in historical perspective, understanding groups and institutions, having reverence for the natural world, and affirming the dignity of work. And, above all, being

an educated person means being guided by values and beliefs and connecting the lessons of the classroom to the realities of life. These are the core competencies that I believe replace the old Carnegie units.

And all of this can be accomplished as schools focus not on seat time, but on students involved in true communities of learning. I realize that remarkable changes must occur for this shift in goals to take place, but I hope deeply that in the century ahead students will be judged not by their performance on a single test but by the quality of their lives. It is my hope that students in the classrooms of tomorrow will be encouraged to create more than conform, and to cooperate more than compete. Each student deserves to see the world clearly and in its entirety and to be inspired by both the beauty and the challenges that surround us all.

Above all, I pray that Julie and David, my granddaughter in Princeton and my grandson in Belize, along with all other children on the planet, will grow to understand that they belong to the same human family, the family that connects us all.

Fifty years ago, Mark Van Doren wrote, "The connectedness of things is what the educator contemplates to the limit of his capacity." The student, he says, who can begin early in life to see things as connected has begun the life of learning. This, it seems to me, is what it means to be an educated person.

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Inquiry Rubric

	Beginning	Developing	Accomplished
Authenticity	The scope of the inquiry is determined mainly by the curriculum.	The students have some influence in determining the scope of the study.	The inquiry study emanates from a question, problem, issue or exploration that is significant to the disciplines, has meaning to the students and has significant influence in determining the scope of the study.
	The task/s would not likely be tackled outside a school setting.	Other adults outside the school are intrigued by the task/s and can find ways to contribute to it.	An adult at work or in the community might actually tackle the question, problem or exploration posed by the task/s.
	The inquiry study originates with and only meets programs of study expectations.	The inquiry study originates with the program of studies but provides some opportunities to extend beyond curriculum expectations.	The inquiry study originates with an issue, problem, question or exploration that provides opportunities to create or produce something that contributes to the world's knowledge.
	The task/s contain/s few roles which reflect a single perspective.	The task/s contain/s some separate roles which reflect few perspectives.	The task/s require/s a complex array of roles and diverse perspectives.

	Beginning	Developing	Accomplished
Academic Rigor	The inquiry study provides for the acquisition of factual known information.	The inquiry study facilitates the acquisition and application of a broader understanding.	The inquiry study leads students to build deep knowledge that leads to deep understanding.
	Students are required to follow clearly defined approaches to teacher-generated criteria.	Students are offered a menu of approaches organized around the problem, issue or question under study in order to meet specific learning outcomes.	Students are offered a menu of approaches organized around the problem, issue or question under study that use methods of inquiry central to the disciplines that underpin the problem, issue or question.
	The inquiry study encourages students to memorize and repeat facts.	The inquiry study encourages students to find relationships between and among concepts in more than one subject area.	The inquiry study encourages students to develop habits of mind that encourage them to ask questions of: <ul style="list-style-type: none"> • evidence (how do we know what we know?) • viewpoint (who is speaking?) • pattern and connection (what causes what?) • supposition (how might things have been different?) • why it matters (who cares?)

	Beginning	Developing	Accomplished
Assessment	All assessment is done at the end of the study.	Ongoing assessment is conducted on an informal basis and evaluation is conducted at logical midpoints in the process. Assessment is used in a limited way in guiding teacher's instructional planning.	Ongoing assessment is woven into the design of the inquiry study providing timely, descriptive feedback and utilizes a range of methods, including peer and self-evaluation. Assessment guides student learning and teacher's instructional planning.
	The study provides no opportunities for students to reflect on their learning. There are few criteria to guide the students' learning. There is little or no evidence of goal setting.	The study provides opportunities for students to reflect on their learning using clear criteria established by the teacher. Teachers help students set learning goals, establish next steps and develop effective learning strategies.	The study provides opportunities for students to reflect on their learning using clear criteria that they have helped to set. The students use these reflections to set learning goals, establish next steps and develop effective learning strategies.
	The teacher is the only adult who assesses the work.	Teacher and student self-assessment are used.	Teachers, peers, adults from outside the classroom and the student are involved in the assessment of the work.

	Beginning	Developing	Accomplished
Beyond the School	The study involves a teacher-structured problem framed directly from stated curriculum outcomes.	Students help develop or contribute to defining a relevant question, exploration, problem or issue for study that relates to the world outside the school.	The inquiry requires students to address a semi-structured question, exploration, issue or problem, relevant to curriculum outcomes, but grounded in the life and work beyond the school.
	All parameters of the inquiry (e.g. outcomes, due dates, and expectations) are established by the teacher prior to commencement of the inquiry.	Parameters and desired outcomes of the inquiry are set by the teacher. Milestones and organizational strategies are provided for student self-monitoring.	The study requires students to develop organizational and self-management skills in order to complete the study.
	The inquiry requires mainly individual effort, with little ongoing feedback on performance; the expectation for completion is handing it in.	Teacher presents the study and students choose group members and topics from a menu of choices. The task could be completed independently, but this is not encouraged.	The study leads students to acquire and use competencies expected in high performance work organizations (e.g. teamwork, problem solving, communications, decision-making, project management).

	Beginning	Developing	Accomplished
Appropriate Use of Technology	Technology is used for the sake of using technology, not because it will enhance the inquiry. The technology is not needed to accomplish the task.	Technology has some relevance to the inquiry. The technology is somewhat needed to accomplish the task.	Technology is used in a purposeful manner that demonstrates an appreciation of new ways of thinking and doing. The technology is essential in accomplishing the task.
	Teacher decides which technologies will be used.	Students and teachers collaboratively decide which technologies will be used.	The study requires students to determine which technologies are most appropriate to the task.
	The major focus is on developing skill and fluency with software applications.	The study requires students to conduct research, share information, make decisions, solve problems, create meaning and communicate, mainly inside the classroom.	The study requires students to conduct research, share information, make decisions, solve problems, create meaning and communicate with various audiences inside and outside the classroom.
	The ongoing inquiry study is not available online.	Students have ongoing, online access to the study as it develops.	Students, parents and the larger community have ongoing, online access to the study as it develops.
	The study requires use of word processing or simple presentation software.	The study permits the use of a wider variety of technology choices.	The study requires sophisticated use of multimedia/hypermedia software, video, videoconferencing, simulation, dynamic geometry, databases and/or programming.

	Beginning	Developing	Accomplished
Active Exploration	The study can be completed in a limited amount of time, in a few areas, with teacher-generated tasks.	The study requires increased time and variety of tasks spent on exploration.	The inquiry requires students to spend significant amounts of time doing field work, labs, interviews, studio work, construction, etc.
	The study requires students to complete a series of teacher-constructed activities using limited resources.	The study requires students to engage in a basic investigation using a variety of sources.	The study requires students to engage in real (authentic) investigations using a variety of media, methods and sources.
	The study requires students to communicate what they are learning with a presentation to teacher audience (i.e. handing in as an assignment).	The study requires students to communicate what they are learning in a presentation to the classroom audience.	The study requires students to communicate what they are learning with a variety of audiences through presentation or exhibition.

Connecting with Expertise	Beginning	Developing	Accomplished
	Students hear or read about relevant information only from the teacher, or through resources provided by the teacher.	The study involves speakers or interviews with experts outside the classroom.	The study requires students to observe and interact with adults with relevant expertise and experience in a variety of situations.
	Students have limited or no access to experts.	Guest speakers, other teachers, older students or other adults are available in a limited, perhaps one-time way.	The study requires students to work closely with and get to know at least one adult other than their teacher.
	The teacher designs the task in isolation (without input from external expertise).	The teacher designs the task in consultation with experts, either directly or indirectly regarding the topic for inquiry.	The teacher designs the task in collaboration with experts, either directly or indirectly. The inquiry requires adults to collaborate with one another and with students on the design and assessment of the inquiry work.

Elaborated Communication	Beginning	Developing	Accomplished
	Students have little or no opportunity to discuss their work with others.	The task provides opportunities for students to share their ideas with each other. Opportunities to respond to each other's ideas may be limited.	Students have extended opportunities to support, challenge and respond to each other's ideas as they negotiate a collective understanding of relevant concepts. Students have opportunities to negotiate the flow of conversation within small and large group discussions.
	The task dictates the form of expression that students may use. Students have little opportunity to reflect on how the selected medium enhances their message.	Students have limited opportunities to choose forms of expression and to reflect on what media would best communicate their message.	Students have opportunities to choose forms of expression appropriate to the task (e.g. Powerpoint, iMovie, tableau, mime, puppet show, readers' theatre, drum solo, interpretative dance, artwork, debate, etc.) and to reflect on the impact of their choices.
	The inquiry requires students to communicate what they are learning to a teacher audience (e.g. handing it in as an assignment).	The inquiry requires students to communicate what they are learning with a classroom audience.	The inquiry provides opportunities for students to communicate what they are learning with a variety of audiences.

Good inquirers need a place to write...

(insert brilliant ideas here)



