

# ADVANCING DIFFERENTIATION: CRITICAL THINKING AND LEARNING FOR THE 21<sup>ST</sup> CENTURY

## POWER POINT SLIDES

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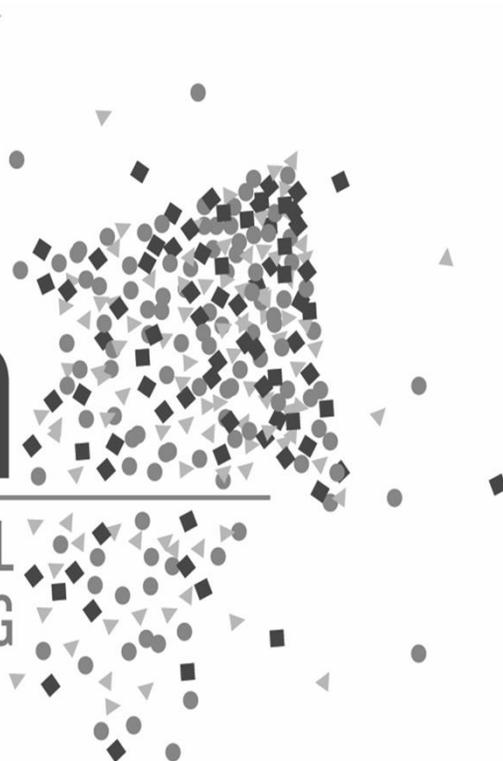
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**THE FOUNDATION:**  
**Four Critical Factors in Student Success**



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**1) Effective Instructional Strategies**  
(DQ2/DQ5/DQ6/DQ8/DQ9)

**1) Brain-compatible learning techniques**

- 1) Gender
- 2) Attention setting and maintaining
- 3) Poverty and race

**2) Differentiation based on**

- 1) Interest
- 2) Readiness
- 3) Learning Profiles





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**2) Clear and Specific Definition of Learning Tasks and Objectives**  
(DQ1/DQ2/DQ3/DQ4/DQ5)

**1) What students are expected to**

- 1) Know (factually)
- 2) Do (procedurally)
- 3) Understand (conceptually)

**2) How the task or objective is**

- 1) Relevant (to self)
- 2) Meaningful (to future success)





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### 3) Articulate Representations of “Success” or Mastery

(DQ1/DQ4/DQ5/DQ6/DQ7/DQ8/DQ9)

- 1) Modeled successful self-regulating strategies
- 2) Shown examples of mastery
- 3) Celebrate the risk-taking



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### 4) Increased Levels of Feedback, that inform students of success AND teacher to adjust instructional strategies

(DQ1/DQ2/DQ3/DQ4)

- 1) Pre-assessment to adjust for readiness/ interest/ learning profile
- 2) Formative assessment to adjust teaching
- 3) Descriptive feedback to encourage a growth mindset
- 4) Summative assessment to inform student, caregiver and teacher of effectiveness of learning strategies and instructional methodology



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### Differentiation and the 21<sup>st</sup> Century Learner



OH MAN... SORRY GUYS, THAT'S ME.

RING-RING RING-RING



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## Teaching for the 21<sup>st</sup> Century

**What**

**What does this mean to you as a teacher?**

↑

**So What**



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## Today's Classroom

**Now What**

Less emphasis should be placed on the amount of material memorized and more weight put on

\_\_\_\_\_ ,

\_\_\_\_\_

**and**

\_\_\_\_\_ .



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## What, So What, Now What

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### Suggestions

~ Research:

- ~ What \_\_\_\_\_
- ~ So What \_\_\_\_\_
- ~ Now What \_\_\_\_\_

~ Math

- ~ What \_\_\_\_\_
- ~ So what \_\_\_\_\_
- ~ Now what \_\_\_\_\_



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## Overview of Differentiated Instruction



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### 10 Critical Factors of Effective Differentiation: ALL STUDENTS

- 1) **Engage in respectful tasks** that address their readiness levels in each lesson
- 2) **Are challenged** to stretch cognitively & creatively
- 3) **Enjoy the learning** experiences
- 4) **Feel valued & nurtured**
- 5) Know they have **something to contribute**
- 6) **Learn something new** each day
- 7) **Are motivated** through their interests or preferred ways of doing
- 8) Find the classroom experiences **worthwhile**
- 9) **Find value** in what they are learning
- 10) Can **count on peers & adults** for support & guidance



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### What Differentiation ISNØT!

- ~ An educational **fad**
- ~ **Busy work** for advanced learners
- ~ **Fluff 'n stuff** within preferred ways of doing
- ~ **Individualization**
- ~ The magic **panacea**
- ~ A new version of **tracking**
- ~ Done **all the time**
- ~ Constant **group work**
- ~ **Louder and slower** in the back of the room
- ~ **"On the fly"**



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### Critical Reasoning Before the Lesson



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## 1, 3, 6í Snowball



**1:** By yourself

- ~ What you **KNOW** about how the brain learns




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## 1, 3, 6í Snowball



**3:** With your cross town partnerí discuss what you wrote. Begin to share your ideas of:

- ~ What you **KNOW** about how the brain learns
- ~ What **INTERESTS** you about how our brain learns




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## 1, 3, 6í Snowball



**6:** At your tableí synthesize the ideas and write on the chart paper:

- ~ What you **KNOW** about how our brain learns
- ~ What **INTERESTS** you about how our brain learns
- ~ What **QUESTIONS** do you have brain-compatible learning




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## 1,3,6...NOW WHAT

**Based on readiness: 1 lesson period (Content)**

- *Pre-ready:* Video review on fundamentals of how the brain learns
- *Ready:* Website investigation of topic of interest
- *High ready:* Research Mayo Clinic website on neurological diseases

**Based on interests: Anchor activity (Process)**

- Neurological processing
- Gender differences in brain development
- Motivation and learning

**Based on learning profile: Product**

- *Visual:* Draft the topography of the brain
- *Auditory:* Create a PPT with voice over to describe the areas of the brain
- *Kinesthetic:* Plan a plan discussion on the impact of sports on brain development





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## Brain-Compatible Learning: Teaching with the brain in mind




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## Four Principles of Brain-Compatible Learning

>1) \_\_\_\_\_

>2) \_\_\_\_\_  
\_\_\_\_\_

>3) \_\_\_\_\_

>4) \_\_\_\_\_





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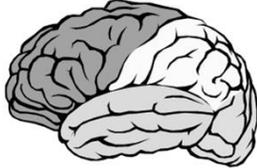
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All brains function the same way, but not all brains learn the same way!



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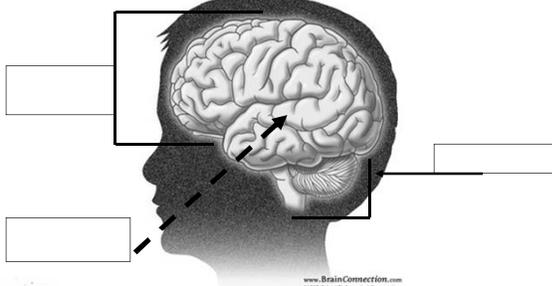
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**Significance of Each of the Three Levels of the Brain:**



www.BrainConnection.com  
©1998 Scientific Learning Corporation



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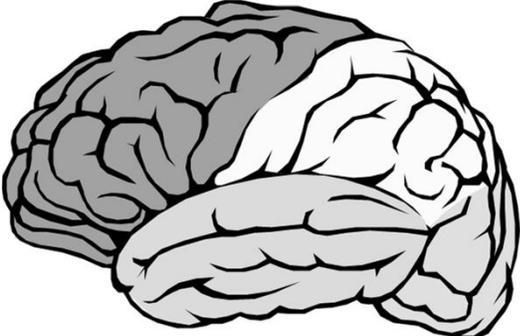
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## Prefrontal Cortex



- Acts as the brain's CEO/f--Chief Executive Operations/functioning:
  - \* Controls planning    \* Empathy
  - \* Working memory    \* Creating insight
  - \* Organization    \* Making judgments
  - \* Modulating mood    \* Impulse control
  - \* Reasoning/introspection
- Develops throughout the teen years
- "The area of sober second thought."




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## The Prefrontal Cortex



- Synthesizes inner and outer sensory worlds
- Critical for emotional self-regulation
  - "the most common determiner of failure to self-regulate emotional responses is the lack of emotionally consistent parenting in the early years" (Siegle, 2000, as quoted in Wolfe, 2001).




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The biological system of brain development is influenced by the social, cultural and familial systems.







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## How our brain is organized

~ Poverty has a substantial effect on students' ability to attend, stay motivated and self-regulate  
Pellino, K.M. (2007).

~ Supporting Students in Poverty

- ~ Need reliable relationships in the classroom
- ~ Want strong peer relationships
- ~ Require individual importance

R. Jackson, 2009





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## The Emotional Keyboard

<p><b>Natural</b></p> <p>Sadness Disgust Anger Fear</p>	<p><b>Learned</b></p> <p>Patience Shame Cooperation Forgiveness Empathy Optimism Compassion</p>	<p><b>Natural</b></p> <p>Joy Surprise Happy</p>
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Adapted from: Jensen, 2009




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## The Gendered Brain




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**Brain Research and the Adolescent**



- A period of circuit refinement and pruning predominant in the prefrontal cortex
- Brain change is necessary for survival




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**Gender, Competition, and Stress: A Caution!**



- Females: stress **inhibits** learning
- Males: stress **facilitates** learning





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**Gender and the Brain: Girls**

- Larger corpus callosum
  - Cross talk between hemispheres
  - Ability to multi-task
  - Learn to read faster
- Stronger neural connectors in the temporal lobes
  - More sensual detailed memory storage
  - Better listening skills
  - Greater detailed writers



Gurian, M. and Stevens, K. (2004)




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### Gender and the Brain: Girls

- Larger hippocampus
  - Advantage in learning í especially language arts
- More active prefrontal cortex
  - Fewer impulse decisions
- Use more cortical areas for verbal and emotive functioning.



Gurian, M. and Stevens, K. (2004)




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### Gender and the Brain: Boys

- More cortical areas dedicated to spatial-mechanical functioning (i.e. move objects through space)
  - Better able to distinguish
    - “ Symbols
    - “ Abstractions
    - “ Pictures

Gurian, M. and Stevens, K. ( 2004)





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### Gender and the Brain: Boys

- Less serotonin and oxytocin (human bonding chemical);
  - “ More physically impulsive
  - “ Less likely to bond through language
  - “ Don't understand emotions
  - “ Need clear directions

Gurian, M. and Stevens, K. ( 2004)





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### Gender and the Brain: Boys

- Increases in amygdala volume during adolescences:
  - “Unable to explain own emotions
  - “Prefer to isolate when stressed
  - “Thrill seekers
  - “Aggression may be play/sign of status
  - “May not understand moral conundrums

Gurian, M. and Stevens, K. (2004)




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### Gender and the Brain: Boys

- “Don’t recognize subtleties of facial expressions
- “Hide facial emotions
- “Repetitious talk is a turn off




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### Gender and the Brain: Boys

- “Work well with brief communication
- “Seek greater independence earlier
  - “Less willing to accept help
- “More creative and thrill seeking with other boys
- “Can be repulsed by mom’s touch/smells




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### The Facts

- > Boys earn 70% of all Ds and Fs and fewer than half of all the As
- > Boys account for two-thirds of LD diagnosis
- > Boys represent 90% of discipline referrals
- > Boys dominate such brain disorders as ADD/ADHD
- > 80% of high school drop outs are male
- > Males make up fewer than 40% of college students

Gurian, M. and Stevens, K. (2004)





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### Using Brain-Compatible Strategies to Motivate and Engage Adolescents





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### For boys:

- ~ Limit explanation and extensive conversations
- ~ Use "where" questions rather than "what"
- ~ Use more manipulatives
- ~ Require greater movement to learn
- ~ Ensure safety and ownership (nurture the primitive brain)





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**For boys:**

- ~Limit emotional conversations/talk about ðselfö
- ~ Structure/organize transitions
- ~Use competitive activities to nurture friendships /camaraderie /excitement
- ~Teach how/when to ask for help



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**For boys:**



- ~Use symbols, pictures and ðproximityö when giving directions
- ~Prefer non-fiction /action /blood & guts /adventure /how things work
- ~Use reflection to refocus and assess for challenge



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**More ideas**



- ~Use technology as a learning tool
- ~Use graphic organizers
- ~Provide male mentors or role models
- ~Place closer to the sound



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**More ideas**

- ~ Offer writing assignments about action/gore/B&G/adventure
- ~ Set clear and consistent rules/guidelines (they want to play by the rules)
- ~ Use more natural light
- ~ Avoid direct eye contact ó as it may be perceived as a threat/distraction





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**Curriculum Design for the 21<sup>st</sup> Century:  
Infusing the Common Core State Standards**




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**Students need clear articulation of...**

- ✘ What they will understand
- ✘ What they will be able to do
- ✘ What they will know



**...by the end of every lesson**




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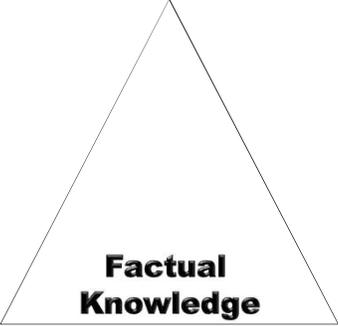
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**Factual Knowledge**



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### Factual Knowledge

#### What you want students to KNOW



- Grounds the student in the discipline
- Knowledge of:
  - Terminology
    - ~ Such as: vocabulary, terms, music symbols, academic language
  - Knowledge of specific details
    - ~ Such as: major natural resources, types of equations, forms of writing
  - Elements
    - ~ Such as: chemical elements, shape type, what makes a good paragraph



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### Academic Language (AL)

- ~ Used in textbooks, classrooms, standards and on examinations
- ~ Structure differs considerably from conversational English
- ~ Sub-technical: not linked to content specific vocabulary
- ~ Greater complexity in word usage and sentence structure
- ~ Acquired through exposure

Underline the Academic Language used on this slide



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## Defining Academic Language

- 1) Select terms that are consistently used across content and grade levels
- 2) Define terms in student ready language
- 3) Post and have readily available
- 4) Hold students accountable for knowing the terms
- 5) Use and practice the Academic Language





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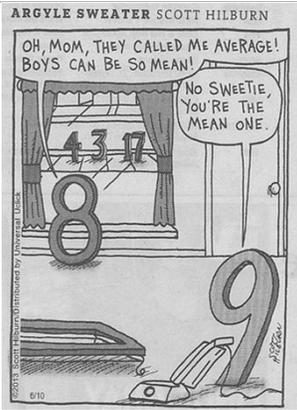
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## Content Vocabulary

- ~ Words specific to the content
- ~ Words that may appear in other content areas but will have different meanings, such as:
  - ~ Average
  - ~ Mean





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## Non-Linguistic Representations

- ~ Based on research: 27% gain in achievement
- ~ Allows students to fully become aware of terms
- ~ Ensures multiple modes of processing
- ~ To avoid confusion, no more than 9 new terms
- ~ Greater brain retention with images





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### Tips for Using Nonlinguistic Representations

- ~ Begin with concrete examples (car, plane, busí )
- ~ Move to process oriented vocabulary (division, sequence, analyzeí )
- ~ Finally, use when learning abstractions (control, rage, desireí )
- ~ Offer multiple types of graphics:
  - ~ Cause & effect chain
  - ~ Frayer model
  - ~ Sequence/Time line



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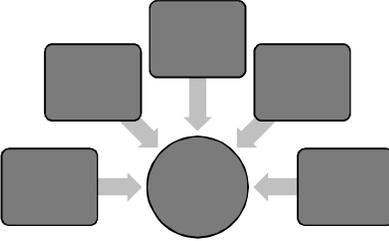
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### Causes of the Civil War

Draw out:

- 1) Economic and social differences between the North and the South.
- 2) States versus federal rights
- 3) The fight between Slave and Non-Slave State Proponents
- 4) Growth of the Abolition Movement.
- 5) The election of Abraham Lincoln



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Definition	Draw a picture
<div style="border: 1px solid black; border-radius: 10px; padding: 5px; display: inline-block;">Term or Vocabulary</div>	
Examples from text	Non-examples



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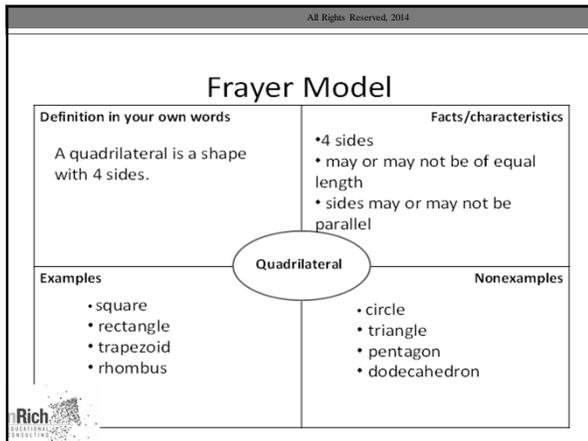
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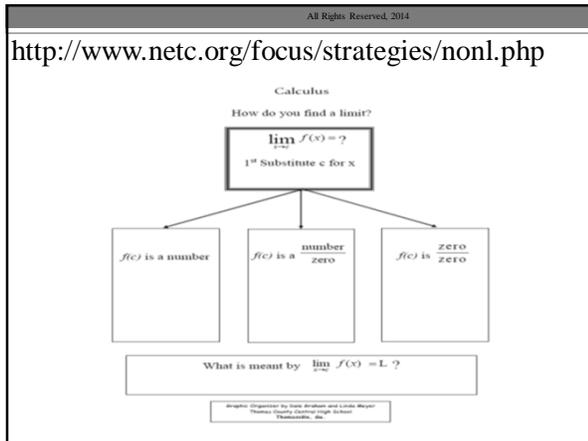
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Students learn  
factual knowledge  
through  
repetition





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## Differentiating Factual Knowledge

- ~ More/Less repetition (time)
- ~ Different modes of repetition
- ~ Use technology to reinforce
- ~ Different facts





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## Different Facts

- ~ **Identify general interests:**
  - ~ Strong women
  - ~ The arts
  - ~ Leadership
- ~ **Determine how the facts may enhance the learning**
  - ~ Women's role during conflict
  - ~ The arts role in conflict
  - ~ Leadership strategies during conflict
- ~ **What's worth knowing**
  - ~ Important women during the civil war
  - ~ How the arts influenced solidarity
  - ~ Strategies of leadership to maintain power





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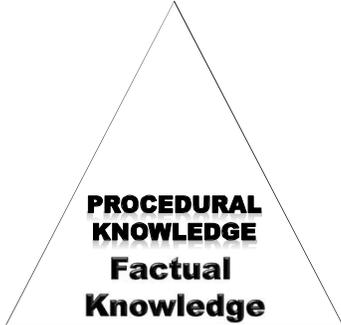
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**PROCEDURAL  
KNOWLEDGE**  
**Factual  
Knowledge**




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### Procedural Knowledge

#### What you want students to BE ABLE TO DO

- **Strategies** within a specific subject,
- **Discrete, conscious actions**
  - Step-by-step procedures
  - Example: Scientific method:
    1. Ask a Question
    2. Do Background Research
    3. Construct a Hypothesis
    4. Test Your Hypothesis by Doing an Experiment
    5. Analyze Your Data and Draw a Conclusion
    6. Communicate Your Results





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### Procedural Knowledge

#### What you want students to BE ABLE TO DO

- **Skills** within a discipline
  - When strategies have been amassed, and
  - Becomes automatic
  - Including general thinking skills
    - Problem solving & Decision making
    - Critical reasoning and Creative thinking
    - Communication & Collaboration
    - Self-Regulation





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### Procedural Knowledge

Strategy  
Strategy  
Strategy  
Strategy  
Strategy



→ SKILL

Critical in the CCSS




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Students learn  
procedural knowledge  
through  
**practice**





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**Differentiating Procedural Knowledge:  
Process**

- ~ More/ Less practice (time)
- ~ Different modes of practice
- ~ More/Less sophisticated practice
- ~ Disciplinary practice using discipline tools
  - ~ Practice oriented
  - ~ Authentic





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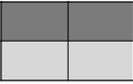
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**Clarification: Fold paper into 4**

- 1) Select 3 words and define in your own words  
(to advanced: within and outside of context)
- 2) Simplify a confusing phrase
- 3) Summarize the Preamble in your own words
- 4) Draw a picture that represents the Preamble  
(Adapted from: Pete & Fogarty, 2009)





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### The Preamble to the US Constitution

“We the people of the United States, in order to form a more perfect union, establish justice, insure domestic tranquility, provide for the common defense, promote the general welfare, and secure the blessings of liberty to ourselves, and our posterity, do ordain and establish this Constitution for the United States of America





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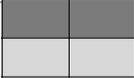
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### Four Quadrants in Math



- 1) Define the problem(s) to be solved. Cite the text that help you find the problem(s).
- 2) Identify ways to solve the problem. Cite key words that assisted you in your method.
- 3) Construct a graphic representation of the problem. Be sure to include measurement marks.
- 4) Relate this problem to a real situation and define where in your life this problem solving method might be useful.

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### Painter's Dilemma

“A painter is on the middle step of a ladder. This means that there are an equal number of steps above and below her. If the painter goes down 4 steps, then up 7 steps, and then down 13 steps, she will be on the very first step of the ladder. If each step is separated by 8' (the first step is 8' off the floor), and the painter's reach is 24' beyond the top of the ladder. Without additional information, identify what is the highest wall she can paint without falling off the ladder or stepping on the top three steps. If she were asked to paint a wall that is 13' high, what additional information would you need?




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## How might you extend this activity?

1	2
3	4



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Additional Strategies:  
[www.nrichconsulting.com/handouts](http://www.nrichconsulting.com/handouts)

- ~ Content
- ~ Process
- ~ Product
- ~ Environment
- ~ Interest
- ~ Readiness
- ~ Learning Profiles



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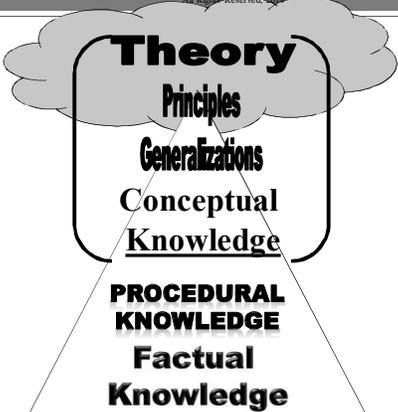
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## Conceptual Knowledge

What you want students to **UNDERSTAND**



- The interrelationships between disciplines
- Knowledge of:
  - **Classifications and categories**
    - ~ Periods of geological time, animal kingdoms
  - **Generalizations and principles**
    - ~ Pythagorean theorem, economic laws
  - **Theories, models and structures**
    - ~ Theory of evolution, governmental structures




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## Sample Interdisciplinary Concepts

<ul style="list-style-type: none"> <li>~ Adaptation</li> <li>~ Change</li> <li>~ Cause &amp; Effect</li> <li>~ Evolution</li> <li>~ Extinction</li> <li>~ Equality</li> <li>~ Family</li> <li>~ Freedom</li> <li>~ Good &amp; Evil</li> </ul>	<ul style="list-style-type: none"> <li>~ Justice</li> <li>~ Knowledge</li> <li>~ Life &amp; Death</li> <li>~ Loyalty</li> <li>~ Models</li> <li>~ Origins</li> <li>~ Patterns</li> <li>~ Responsibility</li> <li>~ Survival</li> <li>~ Systems</li> <li>~ Truth</li> </ul>
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Students learn conceptual knowledge through **experience**





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### Differentiating Conceptual Knowledge

- ~ Less to more authentic experiences/problems
- ~ Use nonlinguistic representations
- ~ Leveled essential questions
- ~ Interdisciplinary experiences
- ~ Different modes of experiencing
- ~ Independent study



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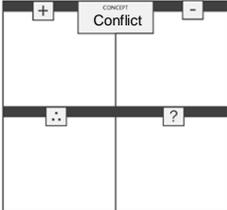
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### Critical Thinking through Concept Development

(Taba, 1962)

- ~ List examples
- ~ List non-examples
- ~ Categorize
- ~ Generalize



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### Generalizations

- ~ Offer important understandings about the concept
- ~ Explore adequately the scope of the concept under study
- ~ Are valid for the content area
- ~ Apply to other disciplines in a coherent way



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### Conflict Generalizations

- " Conflict requires opposing forces.
- " Conflict may happen naturally or unnaturally.
- " Conflict may be perceived as orderly or random.
- " Conflict may be positive or negative.
- " Conflict is inevitable.





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### Designing Good Questions: DOT



- "Divergent thinking
- "Open-ended
- "Take time to answer




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### Designing Good Questions 2 Types

- " Open ended
  - In what ways?
  - Who/What/When/Where/Why/How might?
- " Forced choice with explanation:
  - Who/What is more important and why?
  - Where can you find? and why?
  - When/How do? and why?





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### Writing Essential Questions

#### Based on Concepts

- Essential questions are created using the concepts and generalizations
- What is this subject really about (the most relevant aspects of the unit)?
- What will be of enduring value to the students (how this subject transcends to other disciplines)?
- How can I get students truly passionate about this topic (what will ignite other questions)?



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### Sample Essential Questions

- Why is it important to understand the world around us?
- In what ways do we use science and math to help us understand our world?
- How do causes predict effect?
- How does changing a cause change an effect?
- How can cycles help in predicting effects?



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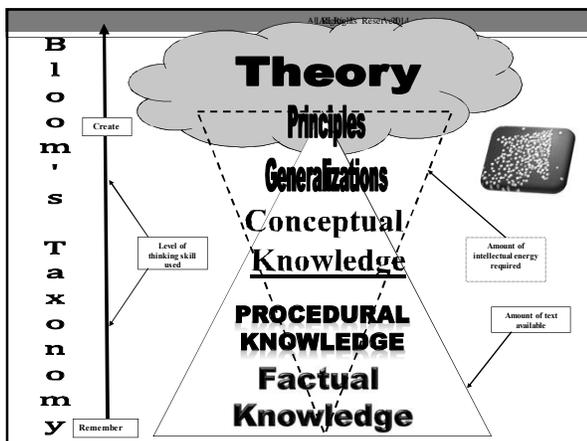
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### How to Identify the Essentials

- ✘ **Conceptual knowledge**  
What students will understand
- ✘ **Procedural knowledge** What students will be able to do
- ✘ **Factual knowledge**  
What students will know




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### Examples:

~ Analyze the water cycle of evaporation, condensation, precipitation, ground water.

- ~ Factual knowledge?
- ~ Procedural knowledge?
- ~ Conceptual knowledge?

~ Compile weather data to establish climate trends.

- ~ Conceptual knowledge?





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Thank you for attending this session!  
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