

Differentiated Instruction and  
Brain-Based Learning  
Down Syndrome Conference  
Keynote



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## What is Brain-Based Teaching?

E \_\_\_\_\_

S \_\_\_\_\_

P \_\_\_\_\_



Parts of the brain notes:

Facts about the brain notes:

# 20 Brain- Compatible Strategies

From the Book: *Worksheets Don't Grow Dendrites* by Marcia Tate



1. Humor
2. Storytelling
3. Brainstorming
4. Movement
5. Drawing and Artwork
6. Music
7. Graphic Organizers
8. Visuals
9. Visualization and Guided Imagery
10. Manipulatives
11. Metaphors
12. Mnemonic Devices
13. Games
14. Technology
15. Role Play
16. Cooperative Learning
17. Project Based
18. Journals
19. Work Study
20. Field Trips

# Humor



- ✦ Researchers at Stanford University have discovered that laughter causes biochemical changes in the body, such as an increase in white blood cell activity and changes in the chemical balance of the blood, resulting in an increase in the body's production of neurotransmitters necessary for alertness and memory (Jenson, 2009).
- ✦ Humor has been found to free a person's creativity and to foster higher-level thinking skills, such as perceiving and anticipating novel situations, creating visual images, and forming analogies (Costa, 2008).
- ✦ More than 30 years ago, researchers found that the most effective teachers at the junior high level smiled a great deal and had a tendency to joke with students (Moskowitz & Hayman, 1976).
- ✦ The use of humor is 1 Of 12 intelligent behaviors, labeled as habits of mind. These habits are based on the premise that all students can be taught a set of skills that enable them to behave in intelligent ways (Costa, 1991).

## Humor in the Classroom

- ✦ Locate or create and incorporate cartoons, riddles and jokes which reinforce a concept to be taught into the delivery of instruction.
- ✦ Have students design cartoons or humorous stories that demonstrate their understanding of concept taught.
- ✦ Students work individually or in cooperative groups to design riddles that demonstrate their understanding of a concept taught. Students then work to solve one another's riddles.

# Storytelling



## Research on Storytelling

- ✦ Students who used a narrative chaining, linking items to be remembered into a story framework, could recall more than 90% of a list of 120 unrelated words compared to a control group who remembered only 13%.
- ✦ Storytelling is a wonderful way to access more than one memory lane. Putting semantic information into a story format allows a student to see not only the whole idea but the details as well since the brain processes both in wholes and parts at the same time.
- ✦ Stories provide a script for us to tie information to in our memory.
- ✦ During storytelling, listening and reasoning skills are improved as children use the auditory and frontal lobes of the brain to follow the plot of the story.
- ✦ Storytelling, following intense learning, allows the brain to relax and more easily retain the newly acquired material.
- ✦ Because Stories can include important points, various types of content can be encoded in them. (Allen, 2008)
- ✦ Concrete images in stories activate our emotions and sense of meaning and supply cues and contexts for new information. (Markowitz & Jensen, 2007)
- ✦ The conflict or plot of a story can be addressed through emotional memory. (Sprenger, 1999)

## Storytelling in the Classroom

- ✦ Create a story to help students recall information. Tell or read the story to the class. Have students retell the story to one another.
- ✦ Have students create their own story to help them remember the steps in a multistep process or events in sequential order.
- ✦ My Life in a Bag
- ✦ Curriculum in a Bag

# Drawing and Artwork



## Research on Drawing and Artwork

- ✦ Students who have spatial intelligence are picture smart with the ability to graphically represent visual or spatial ideas.
- ✦ Drawing figures helped improve critical thinking and verbal skills in learning-disabled children.
- ✦ Drawing is a tool that can be used to facilitate student's use of visualization.
- ✦ Having students add drawings or doodles to their notes helps them comprehend and encode new content for later recall (Allen, 2008).
- ✦ Drawing is a powerful way to develop the thought processes and perceptions of children (Art Junction, n.d.).

## Drawing and Artwork in the Classroom

- ✦ Stick Person
- ✦ Drawing for vocabulary
- ✦ Wikki Stix : [wikkistix.com](http://wikkistix.com)
- ✦ Symbolic Summary - paper folded into four squares see your sample
- ✦ Allow students to design a book jacket or cover that depicts their understanding of the major ideas of a book or story previously read.
- ✦ Allow students to design a poster that illustrates the major details of a specific unit concepts or unit of stud, for example, five characteristics of the planet Mars or the three major land forms in the state of Georgia.
- ✦ Student can draw pictures that depict their understanding of content covered during a previous class session.
- ✦ Students read a word problem and then draw a series of pictures that illustrate their understanding of what is actually happening in the problem. They then use the pictures to assist them in writing the numerical symbols for the word problem.
- ✦ Student draw and label a particular part or process of the human body, for example, heart, lungs, digestive process.
- ✦ Allow student to make comic book to illustrate the summary of a reading passage or story.

# Music

## Research on Music



- ✧ Music Increases both memory and test taking skills.
- ✧ Listening to background music can enhance recall, visual imagery, attention, concentration, and dexterity.
- ✧ Music is a powerful carrier of signals that activate emotions and long-term memory.
- ✧ Low socioeconomic eighth through twelfth graders who took music lessons increased not only their math scores but also their reading, history, geography, and even social skills (by as much as 40%) when compared to their peers who had no music instruction.
- ✧ Music activates and synchronizes neural networks which increase the brain's ability to reason spatially, think creatively, and perform in generalized mathematics.
- ✧ Music has the remarkable ability to energize, relax, set the daily mood, stimulate student brains, inspire, and make the learning fun (Jensen, 2009).
- ✧ The critical ingredient for improving the performance of students on spatial tasks is musical rhythm (Jensen, 2007).
- ✧ Classical music by composers like Mozart and Beethoven stimulate beta waves in the brain and is appropriate for students to use when brainstorming or problem solving (Sprenger, 2007).

## Music in the Classroom

- ✧ Best practices states that you should only use music 15-20% of the time in the classroom.
- ✧ Songs for Teaching: <http://www.songsforteaching.com/>
- ✧ Students can listen to classical music during transition times to minimize disruptions and ensure a smooth change of activity.
- ✧ Have students work in cooperative groups to create a rap or rhyme or song that symbolizes their understanding of a concept taught or content read.
- ✧ Search for songs that teach concepts (multiplication facts, alphabet, S-K-I-N)
- ✧ Sing-A-Long Science CD: Warren Phillips
- ✧ Teachers should have an objective/purpose for the music used in the classroom.

# SKIN

You there,  
tanning skin in the sun.  
Epidermis,  
damage may have begun.  
That top layer,  
help protect us from harm  
like bacteria and bad germs.  
Your skin  
is shedding from head to toe  
while it's making  
many new cells below.  
Lots of pigment,  
melanin is displayed.  
It protects us from UV rays.

I'm wrapped up in my S-K-I-N  
I'm wrapped up in my S-K-I-N  
It makes Vitamin D  
Keep your body waste free  
Stops infections from getting to me

Dermas,  
second layer of skin,  
With blood vessels,  
all around us within.  
And their endings  
help us deal with what's out there.  
While the follicles grow our hair.

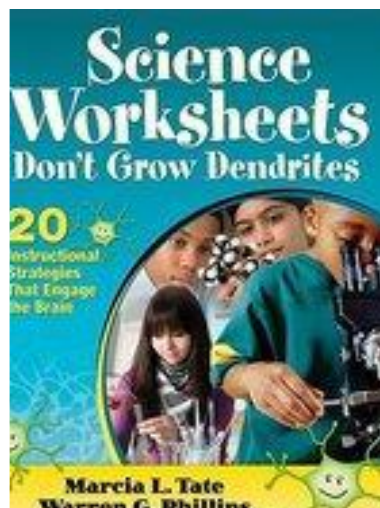
Oil glands,  
they receive and produce.  
Keeps our skin moist,  
and our skin waterproof.  
And the sweat glands-  
sweat comes out of our pores  
to help maintain temperatures.

I'm wrapped up in my S-K-I-N  
I'm wrapped up in my S-K-I-N  
It makes Vitamin D  
Keen your body waste free

Bottom,  
Subcutaneous skin.  
Mostly fatty,  
so it holds the heat in.  
Shock absorbing,  
when you bump and you bruise.  
And it holds skin to our tissues.

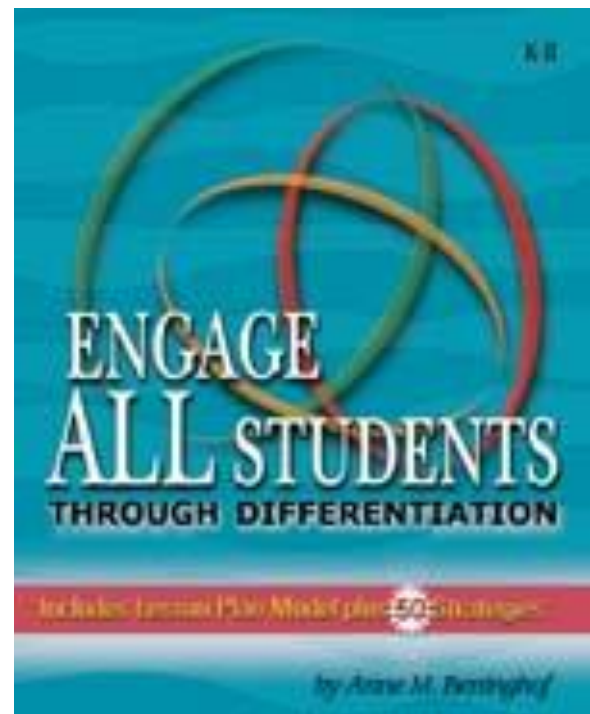
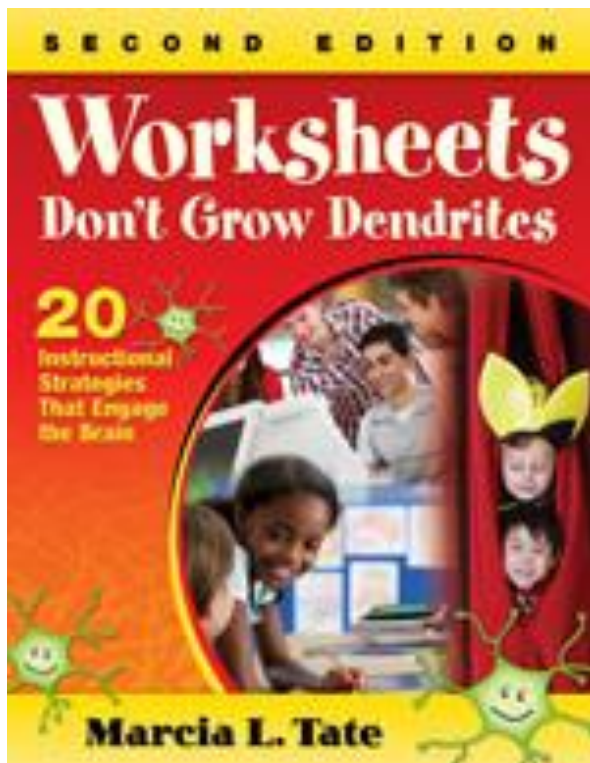
I'm wrapped up in my S-K-I-N  
I'm wrapped up in my S-K-I-N  
It makes Vitamin D  
Keep your body waste free  
Stops infections from getting to me

Warren Phillips: <http://www.wphillips.com>

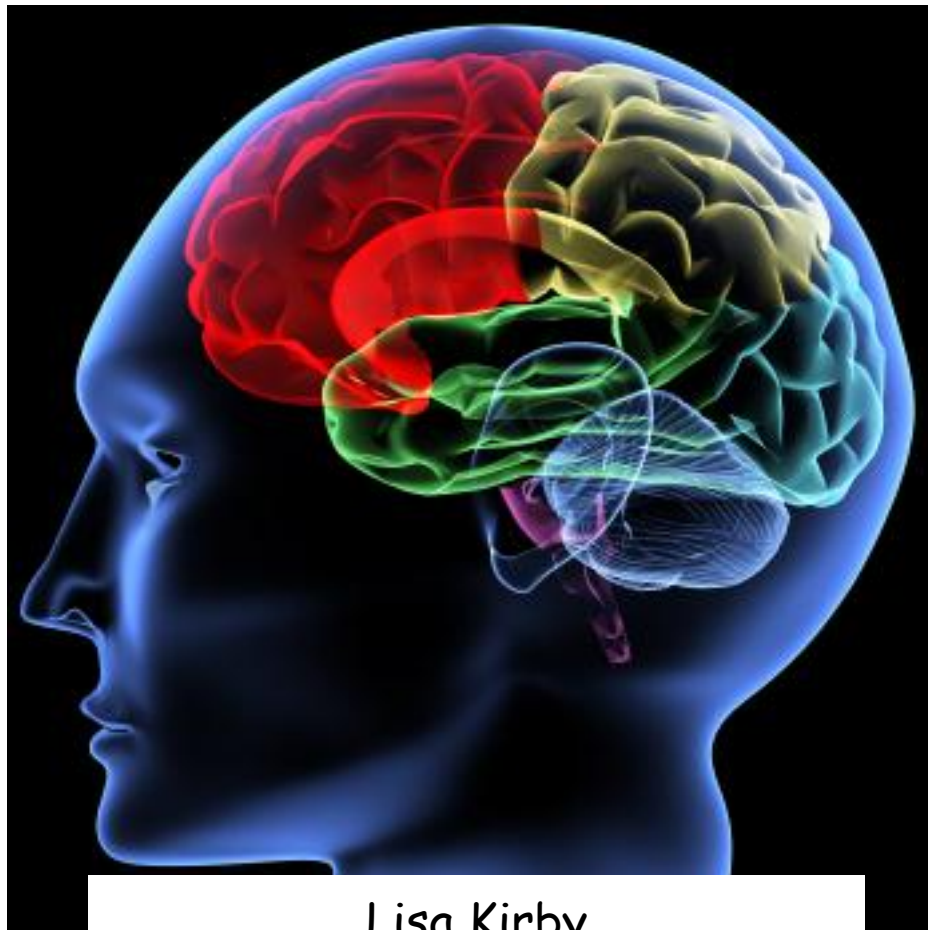


The resources used for this presentation included the following two books: *Worksheets Don't Grow Dendrites* by Marcia Tate, *Engage All Students through Differentiation* by Anne Benninghof and my own teaching experience and research.

~Lisa Kirby



# Differentiated Instruction and Brain-Based Learning Session 1 & 2 Handouts



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# Brain Storming and Discussion



First monday of the month the corp group gets together for a brainstorming s

## Challenge Questions - Cross Content

<p><b>If you were to have a bumper sticker on your car about this concept, what would it say?</b></p>	<p><b>If you could go back home and change clothes to fit this lesson, what would you wear and why?</b></p>
<p><b>If this concept were a store in the mall, what would it be called and what would you buy there?</b></p>	<p><b>If you were creating a web page for this concept, what would it look like?</b></p>
<p><b>If you were to google about this lesson, what 3 keywords would you enter for your search?</b></p>	<p><b>If you were to design a reality tv show based on this lesson, what would it be called and what would it be about?</b></p>
<p><b>If this concept was a flavor of ice cream, what would it and would it be chunky or creamy? Why?</b></p>	<p><b>If this concept was a song, what genre of music would it be and what title would you give it?</b></p>
<p><b>If you were to find something on eBay related to this lesson, what would it be and how much would it auction for?</b></p>	<p><b>If you didn't know the language the teacher was speaking, what would you think this lesson was about and why?</b></p>

Beninghof, A.M. (2006) Engage ALL Students through Differentiation  
Crystalsprings.com

## Challenge Questions for Literacy

<b>What are some of the things you wondered about while this was happening?</b>	<b>Pick one vocabulary word and make up a short rhyme that includes the word</b>
<b>How is this story different from a story you read last week?</b>	<b>Compare this story to life in your house.</b>
<b>What would your mother think of this story?</b>	<b>Decide what you think is the most important idea in this story and prepare to defend your choice</b>
<b>If you were the main character in this story, what would you have done?</b>	<b>Discuss how this story might be written if it took place 200 years in the future.</b>
<b>How many ways can you think of to solve one of the problems in this story&gt;</b>	<b>What could you change in this story that would affect the outcome?</b>
<b>Does this story remind you of any fairy tales or fables?</b>	<b>Would this story make a good movie? Why or why not?</b>

Beninghof, A.M. (2006) Engage ALL Students through Differentiation  
Crystalsprings.com

## Challenge Questions for Science

<b>Pick a person who is currently famous. How does this science concept relate to his or her life?</b>	<b>If you were teaching this science concept to someone, how would you teach it in a different way?</b>
<b>How might your mother (father, grandparent) apply this science concept in their lives?</b>	<b>If you were writing a fictional story that involved this science concept, what would the title of the story be?</b>
<b>Does this science concept remind you of any others we've studied this year? How?</b>	<b>Develop a rhyme or rap to help someone remember this science concept.</b>
<b>Make a prediction about how this science concept will advance in 500 years.</b>	<b>What could you invent that would require this science concept?</b>
<b>How could you make money off your understanding of this science concept?</b>	<b>What might happen if you reversed this process?</b>
<b>Think of a movie in which this science concept was utilized in some way.</b>	<b>How might geographical location affect this science concept?</b>

Beninghof, A.M. (2006) Engage ALL Students through Differentiation  
Crystalsprings.com

## Challenge Questions for History

<b>What are some of the things you wondered about while you were reading?</b>	<b>Pick one vocabulary word and try to determine its historical origin.</b>
<b>How does this time period in history differ from the last one we studied?</b>	<b>Compare this historical experience to a time in your own life</b>
<b>What would your mother (father, grandparent) say about this event in history?</b>	<b>What do you think was the most important single action during this period? Prepare to defend your choice.</b>
<b>If you were a leader during this time period, what would you have done?</b>	<b>Discuss how this event might be different if it took place 200 years in the future.</b>
<b>Pick a person who is currently famous. How would they have handled this problem in history?</b>	<b>What could you change in this story that would affect the outcome?</b>
<b>Does this period in time remind you of any others?</b>	<b>What type of movie would you make about this time in history? Describe it</b>

## Challenge Questions for Mathematics

<b>What are some of the things you wondered about while doing this lesson?</b>	<b>If you were teaching this math concept to someone, how would you teach it in a different way?</b>
<b>How might your mother (father, grandparent) apply this math concept in their lives?</b>	<b>If you were writing a fictional story that involved this math concept, what would the title of the story be?</b>
<b>Does this math concept remind you of any others we've studied this year? How?</b>	<b>Develop a rhyme or rap to help someone remember this math concept.</b>
<b>Where might you find examples of this math concept in nature?</b>	<b>What could you invent that would require this math concept?</b>
<b>How might this math concept apply to a household appliance? Explain</b>	<b>If you had to apply a color to this math concept, what would it be? Why?</b>
<b>Think of a movie in which this math concept was utilized in some way.</b>	<b>How might people in another country view this math concept differently?</b>

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Crystalsprings.com

# Remember (Knowledge) Level

- shallow processing: drawing out factual answers, testing recall and recognition)
- Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers

## Verbs:

choose	describe	define	identify	label
list	locate	match	memorize	name
omit	recite	recognize	select	state
show	tell	spell	what	when
where	which	who	why	

## Model Questions:

Who?

What is ...?

Where?

How did \_\_\_ happen?

Which One?

How would you show \_\_\_?

What?

Who were the main \_\_\_?

How?

When did \_\_\_ happen?

What is the best one?

How would you explain \_\_\_?

Why?

How would you describe \_\_\_?

How much?

Can you recall \_\_\_?

When?

Can you select \_\_\_?

What does it mean?

Can you list the three \_\_\_?

## Instructional Strategies:

- Highlighting
- Rehearsal
- Memorizing
- Mnemonics

# Understand (Comprehension) Level

- Translating, interpreting and extrapolating
- Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas.

## Verbs:

classify	defend	demonstrate	distinguish
explain	express	extend	give example
illustrate	indicate	interrelate	interpret
infer	judge	match	paraphrase
represent	restate	rewrite	select
summarize	translate		

## Model Questions:

State in your own words.

What does this mean?

Is this the same as \_\_\_?

Select the best definition.

What would happen if \_\_\_?

Explain what is happening.

Explain what is meant.

Read the graph (table).

This represents....

Is it valid that \_\_\_?

Show in a graph, table.

How would you summarize?

How would you classify the type of \_\_\_?

Which are facts?

What does this mean?

Give an example.

Condense this paragraph.

State in one word.

What part didn't fit?

What expectations are there?

What are they saying?

What seems to be \_\_\_?

What seems likely?

Which is the best answer?

How would you compare \_\_\_? Contrast \_\_\_?

What facts or ideas show \_\_\_?

## **Instructional Strategies:**

- Key examples
- Emphasize connections
- Summarize
- Paraphrase
- STUDENTS explain
- STUDENTS state the rule
- “Why does this example \_\_\_?”
- Create visual representations (concept maps, outlines, flow charts, organizers, analogies, pro/con grids)
- Metaphors, rubrics, heuristics

# Applying Level

- Knowing when to apply; why to apply; and recognizing patterns of transfer to situations that are new, unfamiliar or have a new slant for students.
- Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.

## Verbs:

apply	build	choose	construct
develop	experiment with	interview	make use of
model	organize	plan	solve
utilize	dramatize	explain	generalize
judge	paint	prepare	produce
select	show	sketch	use

## Model Questions:

Predict what would happen if \_\_\_

Choose the best statements that apply...

Judge the effects...

What would result?

Tell what would happen.

Tell how, when, where, why

Tell how much change there would be.

Identify the results of

How would you use \_\_\_?

What examples do you find to \_\_\_?

How would you organize \_\_\_ to show \_\_\_?

What approach would you use to \_\_\_?

What other way would you plan to \_\_\_?

Can you make use of the facts to \_\_\_?

What elements would you choose to change \_\_\_?

What questions would you ask in an interview with \_\_\_?

How would you solve \_\_\_ using what you've learned?

How would you show your understanding of \_\_\_?

How would you a What facts would you select to show \_\_\_?

How would you apply what you learned to develop \_\_\_?

## **Instructional Strategies:**

- Modeling
- “Mindful” practice—NOT just a “routine” practice
- Part and whole sequencing
- Authentic situations
- “coached” practice
- Case studies
- Simulations
- Algorithms

# Analyzing Level

- Break down into parts, forms
- Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations.

## Verbs:

analyze	categorize	classify	compare
differentiate	distinguish	identify	infer
point out	select	subdivide	survey
assume	conclusion	contrast	discover
dissect	divide	examine	function
inspect	list	motive	relationships
simplify	take part in	test for	theme

## Model Questions:

Why do you think \_\_\_?

What motive is there?

What inference can you make?

How would you classify?

Can you identify the different parts?

What is the relationship between \_\_\_?

What is the function of \_\_\_?

What is fact? Opinion?

What statement is relevant?

Make a distinction.

The least essential statements are \_\_\_.

What literary form is used?

What is the theme?

Can you list the parts?

What conclusions can you draw?

How would you categorize?

What evidence can you find?

Can you distinguish between \_\_\_?

What ideas justify?

What assumptions?

What does the author believe? Assume?

State the point of view of \_\_\_.

What inconsistencies, fallacies?

What persuasive technique?

## **Instructional Strategies:**

- Models of thinking
- Challenging assumptions
- Retrospective analysis
- Reflection through journaling
- Debates
- Discussions and other collaborating learning activities
- Decision-making situations

# Evaluating Level

- According to some set of criteria, and state why
- Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria

## Verbs:

agree	appraise	assess	award
choose	compare	conclude	criteria
criticize	decide	deduct	defend
determine	disprove	dispute	estimate
Evaluate	explain	importance	influence
interpret	judge	justify	mark
measure	opinion	perceive	prioritize

## Model Questions:

Which is more important, moral, better, logical, valid, appropriate?

Find the errors.

Do you agree with the actions? Outcome?

What is your opinion of \_\_\_?

How would you prove \_\_\_? Disprove \_\_\_?

Would it be better if \_\_\_?

Why did they (character) choose \_\_\_?

What would you recommend?

How would you rate the \_\_\_?

What would you cite to defend the actions?

How could you determine \_\_\_?

What choice would you have made?

What judgment would you make about \_\_\_?

How would you justify?

What data was used to make the conclusion?

How would you compare the ideas \_\_\_? People?

Can you assess the value or importance of \_\_\_?

Based on what you know, how would you explain \_\_\_?

What information would you use to support the view \_\_\_?

## **Instructional Strategies:**

- Challenging assumptions
- Journaling
- Debates
- Discussions and other collaborating learning activities
- Decision-making situations

## Creating (Synthesis) Level

- Combining elements into a pattern not clearly there before
- Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions.

### Verbs:

choose	combine	compose	construct
create	design	develop	do
formulate	hypothesize	invent	make
make up	originate	organize	plan
produce	role play	tell	adapt
build	change	delete	discuss
elaborate	estimate	happen	imagine
improve	maximize	minimize	modify
original	predict	propose	solution
solve	suppose	test	theory

### Model Questions:

What changes would you make to solve \_\_\_?

What would happen if \_\_\_?

Can you propose an alternative?

How could you change/modify the plot/plan?

What could be done to minimize (maximize)?

What could be combined to improve (change) \_\_\_?

Suppose you could \_\_\_ what would you do \_\_\_?

How would you estimate the results for \_\_\_?

How would you adapt \_\_\_ to create a different \_\_\_?

Can you construct a model that would change\_?

How would you improve \_\_\_?

Can you elaborate on the reason?

Can you invent?

What way would you design \_\_\_?

How would you test \_\_\_?

Can you formulate a theory for \_\_\_?

Can you predict the outcome if \_\_\_?

What facts can you compile?

How else would you \_\_\_?

Propose an alternative.

## **Instructional Strategies:**

- Modeling
- Challenging assumptions
- Reflection through journaling
- Debates
- Discussions and other collaborating learning activities
- Design
- Decision-making situations

# Movement

## Research on Movement

- ❖ Specific types of movement can stimulate the release of the body's natural motivators, such as noradrenalin and dopamine, which wake up learners and help them feel good, maximize their energy levels, and improve their storage of information and retrieval.
- ❖ Physical performance is probably the only known cognitive activity that uses 100 percent of the brain (Jensen, 2008).
- ❖ Movement not only assists with reading, gets the blood and glucose to the brain, and provides lots of fun during learning but it also assists with our strongest memory system procedural memory (Sprengr, 2007).
- ❖ Movement not only enhances learning and memory but it also causes neural connections to become stronger (Hannaford, 2005).
- ❖ Allows Brain Breaks.



## Movement in the Classroom

- ❖ Use a variety of movement to allow students to get up and discuss information
- ❖ Stepping Stones
- ❖ Vote with Your Feet
- ❖ Carousel
- ❖ Each student selects or is assigned an energizing partner, another student in the classroom who sits at a distance. Both students are provided with opportunities to stand and meet with one another to discuss any assigned task.
- ❖ Use students to be counters for addition or subtraction problems. Example:  $7 + 3 = 10$  have student come to the front of the room and then add three more students to the original seven. All students can then count the total number of student standing.
- ❖ Have class to be divided into two groups each person in the group be assigned a poster with a digit 0-9. The group solves the math problem when the problem is solved they must go to the front of the classroom as quickly as possible each taking their digit and arrange themselves in order of the answer.
- ❖ Following a discussion of the properties of matter, students pretend to be the molecules in solids by standing rigidly packed together; in liquids by moving around one another but not apart; and in gases, by moving almost independent of one another and far apart.

# Graphic Organizers

## Research on Graphic Organizers

- ❖ It is a way for the brain to remember things better when it is broken into parts or sequence.
- ❖ Graphic Organizers are great for both sides of the brain. The left hemisphere loves the verbiage and the right hemisphere loves the pictures.
- ❖ There is a connection between the left and right hemispheres when you use graphic organizers.
- ❖ Graphic Organizers VS Supplemental Aids
- ❖ Graphic Organizers do not contain wording, numbering, or symbols. (Venn Diagram)
- ❖ Supplemental Aids is a resource that includes information to assist a student in recalling content (Multiplication Chart)
- ❖ Graphic organizers not only gain the attention of students but can also improve comprehension, meaning, and retention (Sousa, 2007).
- ❖ Graphic organizers are powerful tools for instruction since they enable students to organize data into segments or chunks that they can comprehend and manage (Gregory & Parry, 2006).

## Graphic Organizers in the Classroom

- ❖ The key is to use them. (see section on graphic organizers)
- ❖ <http://www.dryeraseboard.com>

# What is the Concept?

What I KNOW about:

- ✓
- ✓
- ✓

What I WANT to know or WONDER about:

- ?
- ?
- ?

How might I FIND OUT about...

- 
- 
- 

What have I LEARNED about...

- 
- 
-

# Visuals

## Research on Visuals

- ❖ Studies indicate that the brain's capacity for long-term memory of pictures is limitless.
- ❖ 90% of the brain's sensory input comes from visual sources; it stands to reason the one of the most powerful influence on learners behavior is concrete visual images.
- ❖ Linking verbal and visual images increase the student ability to store and retrieve information (Ogle, 2000).
- ❖ Since the eyes hold nearly 70% of the body's sensory receptors, humans take in more information visually than through any of the other senses.
- ❖ Visual learners acquire information most easily when they can see or read it. They prefer illustrations, pictures, diagrams, maps and charts.
- ❖ Visual can often help to communicate a teacher's message in a more powerful way than words because visual can be taken in quickly and remembered by the brain (Allen, 2008).



## Visuals in the Classroom

- ❖ Parking Lot
- ❖ Math Wall
- ❖ Word Wall
- ❖ Sequencing Activities
- ❖ Pass the Plate
- ❖ Flash Light Tag
- ❖ Vocabulary Words with pictures (Student or Teacher Created)
- ❖ Vocabulary Cartoons <http://www.vocabularycartoons.com/>
- ❖ Timelines
- ❖ Facilitate lecture or discussion by writing key words and phrases or drawing pictures on the board or an overhead projector to emphasize key points.
- ❖ Bring in a picture or real artifact that students can see to clarify a concept being taught.
- ❖ As you lecture, provide students with a visual by filling in a semantic map or an appropriate graphic organizer emphasizing the lecture's main ideas and key points. Place the map or organizer on the board or an overhead.

# Visualization and Guided Imagery



## Research on Visualization and Guided Imagery

- ❖ A picture in your mind creates a memory you can find (Sprenger, 2007).
- ❖ Coaches have been aware for a long time that when athletes mentally rehearse their performance, they perform better than when they do not use imagery (Sousa, 2006).
- ❖ The image is the greatest instrument of instruction. If the majority of classroom time was spent ensuring that students are forming proper images, the instructor's work would be indefinitely facilitated. (Dewey, 1938)
- ❖ Practicing visualization can help the brain access important information and pre-expose it to meaningful data (Jensen, 2008).
- ❖ Sousa (1995) relates that one reason today's students have such a difficult time comprehending when they read is because, in today's visual world, students have little opportunity to use their imaginations.
- ❖ The strategy of visualization provides opportunities for students to use their imaginations to facilitate both vocabulary development and comprehension across the curriculum.
- ❖ College student's retention of Spanish vocabulary was increased from 28% to 88% when the students linked a word's sound to the image of a concrete English noun.
- ❖ Visualization improves recall and problem solving when used following the learning of a task and before and during the application of new tasks.

## Visualization and Guided Imagery in the Classroom

- ❖ WWI Activity of Visualization - "Allied Moving Truck on FIRE"
- ❖ As students read a novel or content-area passage, they visualize the scenes or events using each of their senses. They answer the following question: What do you see, hear, feel, touch, and taste as you visualize the passage you are reading?
- ❖ Students work in groups of individually to create visual images that link a word to its definition. The more absurd the visual image, the easier it is for the brain to remember.
- ❖ Students read through the sequence of steps in a lab they are getting ready to complete. They then visualize and provide an illustration for each step in the lab to facilitate their understanding of the lab procedures.
  - Students visualize the key idea in a paragraph of text and then draw an image to represent the idea.

# Metaphors, Analogies & Similes



## Research on Metaphors, Analogies & Similes

- ❖ The brain is constantly searching for connections and patterns. People who think metaphorically can see connections where others cannot.
- ❖ Metaphors, analogies, and similes use spatial intelligence. They engage the visual and auditory learning styles. Helps make connections between the known and the unknown.
- ❖ Metaphors must be used deliberately across the curriculum (Gardner).
- ❖ Making associations forms new connections between neurons and encodes new insights similar to a tree growing new branches (Sousa).
- ❖ Creating and analyzing metaphors to enhance meaning and higher-order thinking skills is teaching strategy that involves left hemisphere skills. (Sousa)
- ❖ When students use metaphor and analogy, two "semantic transformations," to explain a concept, content become more coherent (Jensen, 2009).
- ❖ Creating metaphors and creating analogies are two of the four types of tasks students should use to identify similarities and help them develop knowledge (Marzano, 2007).
- ❖ Metaphors link abstract, difficult to understand concepts with personal experiences and promote a sense of creativity.
- ❖ Comparing, contrasting, classifying, and using metaphors are all instructional strategies that increase student achievement.
- ❖ Metaphors can make otherwise forgettable concepts memorable, placing them easily and quickly into the brain (Deprter, Reardon, & Singer-Nourie, 1999).

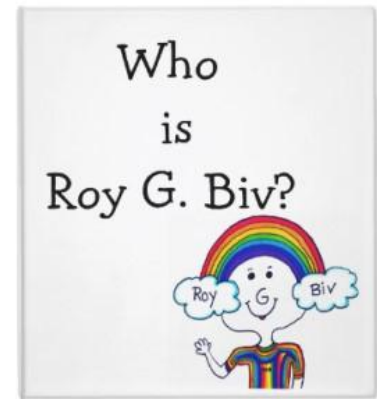
## Metaphors, Analogies & Similes in the Classroom

- ❖ Example Simile: A main idea and details are like a table with legs
- ❖ Whenever possible, introduce a new or difficult concept by comparing it to a concept that students already know and understand. Example: rouge means red, which is similar to the makeup of rouge, which women wear.
- ❖ Read *I'm as Quick as a Cricket* by Audrey Wood. Students think of ways they are like animals and write a story using the following pattern: I'm as \_\_\_\_\_ as a \_\_\_\_\_.
- ❖ Compare the concept of main idea and detail to a table with the following simile. *A main idea and details are like a table with legs. A tabletop cannot stand alone and, therefore, supported by legs. The tabletop is like a main idea in a story. The main idea also cannot stand alone and is supported by important details in the story.* Have students draw a tabletop supported by 4 legs. Read a short story or article and have the students write the main idea on the tabletop and one supporting detail on each of the 4 legs.
- ❖ Have students create analogies that show how two sets of ideas or concepts are related.
- ❖ Have students write metaphors that symbolize their understanding of two unrelated concepts. They explain the relationships between the two concepts to a partner. Example: Life is a journey. The brain is a computer.
- ❖ Students pretend to be detectives and look for metaphors, analogies, and similes in narrative and expository texts. Post a list of the examples students find and periodically ask students to explain the relationship that exist between the two concepts.
- ❖ Use metaphors to compare two unrelated concepts. Students fill in the blank. If \_\_\_\_\_ were a \_\_\_\_\_, it would be \_\_\_\_\_ because \_\_\_\_\_. Example if the brain were a piece of jewelry it would be a chain because it has many links.

# Mnemonics

## Research on Mnemonics

- ❖ Mnemonic tools work because they provide the brain with powerful cues for recalling chunks of information (Jensen).
- ❖ According to research, people who use mnemonic devices learn two to three times more than those who learn normally (Jensen).
- ❖ Mnemonics help activate the creation of stronger neuro-lins in the hippocampus, which are essential to short-and long-term memory (Jensen).
- ❖ Learning is increased twofold to threefold when people rely on mnemonic devices rather than their regular learning habits (Markowitz & Jensen, 2007).
- ❖ Mnemonic devices should be used only after students have had an opportunity to thoroughly process the information, even if their understanding is incomplete (Marzano, 2007).



## Mnemonics in the Classroom

- ❖ HOMES for Great lakes
- ❖ List the directions: Never Eat Soggy Waffles; North, East, South, West
- ❖ List the order of Operations in Math: Please Excuse My Dear Aunt Sally; Parentheses, Exponents, Multiplication, Division, Addition, Subtraction.
- ❖ What are the musical notation for the treble clef notes: Every Good Boy Does Fine / FACE; This mnemonic is used in musical notation to help students remember those treble clef notes on the lines (E, G, B, D, F) and those on the spaces (F, A, C, E).
- ❖ After being given numerous examples, students create slogans or phrases to help them understand and remember information that is difficult to recall.
- ❖ After given examples, have students to create own analogies, acrostic sentences, or acronyms to help them remember information.

# Games

## Research on Games



- ❖ Allowing learners to redesign any game that they already know, such as *Wheel of Fortune*, *Are you Smarter than a 5<sup>th</sup> Grader*, *Jeopardy*, *Who Wants to be a Millionaire*, *Ball Toss* provides the brain connections necessary for better understanding of the alterative content (Jensen).
- ❖ Even adults are activating the brain when they participate in Jeopardy shows (Jensen).
- ❖ Play is the brain's link from the inner world to reality and the foundation of creativity.
- ❖ Play speeds up the brain's maturation process since it involves the built-in processes of challenge, novelty, feedback, coherence, and time.
- ❖ The effectiveness of a game is enhanced when students actually help to design or construct it (Wolfe).
- ❖ When students develop a game's content as well as play the game, the amount of time they are exposed to and involved with the content is doubled (Allen, 2008).
- ❖ Students not only learn more when playing a game but their participation in class and their motivation for learning math increases (Posamentier & Jaye, 2006).

## Games in the Classroom

- ❖ Student Made Game Boards
- ❖ Pass the Plate
- ❖ Jeopardy
- ❖ Wheel of Fortune
- ❖ Concentration
- ❖ Who am I?
- ❖ Ball Toss
- ❖ Create own Game Board and have students create cards
- ❖ \$20,00 Pyramid
- ❖ Bingo
- ❖ Who Wants to be a Millionaire

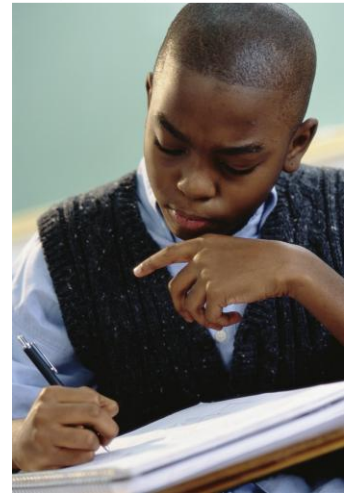
## 10 Characteristics of a Brain-Compatible Classroom

1. Positive Environment
2. Visual Aids
3. Music (30% of the time)
4. Relevant Lessons
5. Procedures and Routines
6. Students Talking about Content
7. Students Moving to Learn  
Content
8. Positive Expectations
9. High Challenge and Low Stress
10. Content Taught in Chunks with  
Activity

# Journals

## Research on Journals

- ❖ Writing Journals students should be encouraged to talk and write about their ideas, to understand the underlying concepts being taught and to put those concepts into their own words.
- ❖ Writing for a purpose. Students should be involved in the total process of reading and writing and should read literature and write for various real-life purposes
- ❖ Journal writing assists the brain in making meaning out of the new information it acquires (Jensen, 2007).
- ❖ Writing enables the brain to reverse the reading process. Rather than responding initially to external visual stimuli, during the writing process, the brain starts with internal thoughts, chooses appropriate vocabulary to express those thoughts, and then produces the symbols for the words in writing (Wolfe & Nevills, 2004).



## Journals in the Classroom

- ❖ As vocabulary is taught, students are engaged in quik writes, which requires then to take only a few seconds and write a synonym or antonym for the vocabulary word being taught. As information is presented, students are continuously engaged by writing key words or phrases the teacher wants them to remember.
- ❖ After the reading of a story or poem, students respond in writing in one of the following ways: (1) write another ending for a story (2) using the book as a model, write an original story patterned after the author's style; (3) pretend to be a major character and respond in writing as to how you would have handled the situation differently.
- ❖ Students use quik writes and reinforce the writing process in all content areas. For example, write the three causes of the Civil War. You have two minutes. Write an essay describing the steps in the process of long division.
- ❖ Teach the writing process.

- ❖ Give students a variety of opportunities to express their ideas in writing. These could include but are not limited to graphic organizers, posters, scripts for plays, and book jackets.
- ❖ Allow students a time daily to write in a personal journal regarding topics of choice including descriptions of incidents that have happened at home, personal reflections on class assignments, or feelings and emotions expressed. Journals are not graded and students can indicate whether or not they want the entry read by the teacher by either leaving the page unfolded if it is to be read or folding the page lengthwise if it is not to be read.
- ❖ Author's Chair

# Manipulatives, Experiments, Labs, and Models



## Research on Manipulatives, Experiments, Labs, and Models

- ❖ Many students possess what Howard Gardner calls the bodily-kinesthetic intelligence. This type of intelligence includes not only expertise in physical skills, but specific haptic or tactile capabilities as well.
- ❖ These students usually excel with hands-on strategies such as manipulatives, conducting experiments, and construction models.
- ❖ Implicit learning, which includes body and hands-on learning, is lasting independent of age, easy to acquire, cross-cultural, and independent of measures of intelligence (Jenson, 2001).
- ❖ Manipulatives are valuable resources for assisting even high school students in accelerating their mathematics ability (Curtain-Phillips, 2008).
- ❖ When students use manipulative over a long period, they make gains in verbalizing their thinking, discussing ideas, taking ownership, and gaining confidence in independently finding answers to problems (Sebesta & Martin, 2004).

## Manipulatives, Experiments, Labs, and Models in the Classroom

- ❖ Activity Card Exchange
- ❖ Labs in Science
- ❖ Tiles to demonstrate understanding of a concept that was taught
- ❖ Base Ten Blocks
- ❖ Geometric Shapes
- ❖ Use of White Boards
- ❖ Thumbs up/down
- ❖ Five Fingers: Completely understand; One finger: Don't Understand

- ❖ Math manipulative: tiles, blocks, fraction pieces, counters, Cuisenaire rods, clocks, geometric figures, play or real money.
- ❖ Have students practice spelling or content-area vocabulary words in number of tactile ways including the following: writing the word in the air, in shaving cream spread on the desk, forming them with clay or other materials, or using magnetic alphabet letters to build the words.
- ❖ Students construct models which show their understanding of a concept previously taught. Example: construct a model of the solar system; build adobe huts that show how Native Americans once lived, etc.
- ❖ Involve all students in the lesson; Have students use their hands to show agreement or disagreement with an answer or levels of understanding of an answer by doing one of the following; thumbs up : agree,; thumbs down: disagree; five fingers: completely understand or one finger: don't understand: pat head: understand or scratch head: don't understand

# Technology

## Research on Technology



- ❖ Technology is not an option but a necessity if students are to be prepared for present and future occupational success.
- ❖ Computer technology is crucial for actively engaging students in conducting research, accessing information, and using resources to problem-solve or answer questions.
- ❖ Computer technology can be used very effectively to assist in teaching vocabulary.
- ❖ Students of all ability levels can use technology "to process, demonstrate, and retain and share information and communication" (Karten, 2009).
- ❖ The International Society of Technology lists the following skills as essential for all students to have: knowledge of data bases, word processing, CD-ROM searches, e-library use, online maps, spreadsheets, Internet searches, desktop publishing, presentation and hypermedia software, and e-mail (Barr & Parrett, 2007).
- ❖ Assistive technology (AT) is a device AND a service
- ❖ AT should be considered a tool to access the curriculum, not as an end goal (e.g. to use AT in the classroom)
- ❖ AT needs to be considered for each student with an IEP
- ❖ [www.texasat.net](http://www.texasat.net) or <http://udl2009.wikispaces.com/> for further information on Assistive Technology consideration, implementation, etc.

## Technology in the Classroom

- ❖ Stepping Stones
- ❖ SMART Board
- ❖ Document camera (ELMO)
- ❖ TI-73 or TI-83/84 graphing calculator
- ❖ Internet
- ❖ Word Processing
- ❖ Spreadsheet
- ❖ PowerPoint
- ❖ Digital Camera
- ❖ You Tube: Video

- ❖ Email
- ❖ Distance Learning
- ❖ Palm Pilots
- ❖ Teachertube.com; Free Streaming videos
- ❖ Wingclips.com; Movie Clips
- ❖ Mylearningtub.com; Grammar Rock and Multiplication Rock Videos
- ❖ Teacherdomain.org; Video resources that have downloadable files
- ❖ Go to Google.com click n images, type in the information you are looking for. Example: photosynthesis, political cartoons, Romeo & Juliet, Math, etc...
- ❖ Have students use a word processing program to produce a paper on assigned topic.
- ❖ Students use Excel to produce charts and graphs accompanying an assigned project.
- ❖ Students work in cooperative groups to produce a PowerPoint presentation, which will be shown to and evaluated by classmates.
- ❖ Students correspond with a pen pal in another part of the world via e-mail. Each e-mail will adhere to an appropriate form and be grammatically correct.
- ❖ Students access the Internet to locate information related to an assigned topic. Student s list the Web sites accessed in the bibliography of the report and incorporate appropriate information in the body of the paper.
- ❖ Brainpop.com
- ❖ [www.kbears.com](http://www.kbears.com)
- ❖ [www.funbrain.com](http://www.funbrain.com)
- ❖ [www.apples4theteacher.com/science](http://www.apples4theteacher.com/science)
- ❖ [www.teach-nology.com](http://www.teach-nology.com)
- ❖ [www.whyville.net](http://www.whyville.net)
- ❖ <http://www.lumosity.com/k/improve-memory>

## **Video Clips**

- ❖ SMART Teachertube.com Free Streaming videos
- ❖ Wingclips.com Movie Clips
- ❖ Mylearningtub.com Grammar Rock and Multiplication Rock Videos
- ❖ Teacherdomain.org Video resources that have downloadable files

# Role Play, Drama, Pantomimes, and Charades



## Research on Role Play, Drama, Pantomimes, and Charades

- ❖ Semantic memory is one of the weakest memory pathways in the brain. This is why it is possible to cram for an exam and not remember any of the information once the exam is over.
- ❖ An instructional strategy such as role play becomes increasingly important since it takes semantic information memory of words, facts, and numbers and links it with movement and places the information in more than one memory pathway.
- ❖ This cognitive-motor link is absolutely essential for retention of information.
- ❖ Role play provides students with the opportunity to organize information, create or re-create meaningful situations, and use their verbal and interpersonal skills (Gregory & Chapman).
- ❖ Role play activities promote language development and help instill confidence in all students, particularly those who are not yet language proficient (Vogt).
- ❖ Role play and stimulations, such as mock trials, are effective techniques for positively transferring new knowledge and skills from present to future application (Jensen).
- ❖ The brain-based learning strategies of role-play and simulations provide students with emotional connections to real life (Karten, 2008).
- ❖ Test scores for classes where students were involved in minidramas or vignettes were significantly higher than scores in three additional classes taught next door with traditional methods (Allen, 2008).

- ❖ Although students can find role plays or enactments very engaging, they can take a great deal of time and are not as effective if the teacher does not have students explain the important concepts enacted (Marzano, 2007).

## **Role Play, Drama, Pantomimes, and Charades** **in the Classroom**

- ❖ Allow students to create a dramatic presentation of a historical event.
- ❖ As students read a passage silently, they actually "walk" the punctuation - pausing for a comma, stopping for a period, shrugging their shoulders for a question mark, and jumping for an exclamation point!
- ❖ Following a discussion of the judicial system, students establish a peer court in which they try a classmate or historical figure for a predetermined offense. Roles of judge, jury, prosecuting attorney, and defense attorney are assigned and carried out by members of the class.
- ❖ Students create and present a commercial projecting a particular point of view or advertising a particular concept taught such as saving the rainforest.
- ❖ Students act out selected scenes from stories or novels read.
- ❖ Students are given verbs to act out while classmates try to guess the verb,
- ❖ Each student is given a card containing the name of a concept previously taught. Students take turns pantomiming the assigned concept as the class attempts to guess the name of the concept.

# Reciprocal Teaching and Cooperative Learning



## Research on Reciprocal Teaching and Cooperative Learning

- ❖ Cooperative learning is a successful teaching strategy in which students work together in small groups to help each other learn.
- ❖ The groups are made up of students different levels of ability and use a variety of learning activities to improve their understanding of a subject.
- ❖ Each member of the team is responsible not only for learning what is taught but also for helping teammates learn, thereby creating an atmosphere of achievement.
- ❖ Reciprocal teaching involves a high degree of social interaction and collaboration, as students gradually learn to assume the role of teacher in helping their peers construct meaning from text.
- ❖ In essence, reciprocal teaching is an authentic activity because learning, both inside and outside of school, advances through collaborative social interaction and the social construction of knowledge
- ❖ Reciprocal Teaching and Cooperative Learning provides opportunities for students to work in pairs or in small groups as they teach and learn from one another
- ❖ **We learn 95%** of what we TEACH someone else.
- ❖ A student struggling to make sense of an idea may understand it better when it is explained by a peer (who only recently figured it out him or herself) rather than by an adult.
- ❖ Cooperative group activities improve the learning for diverse students because they teach crucial social skills and reinforce concepts by allowing group members to discuss a variety of ideas (Algozzine Campbell, & Wang, 2009).

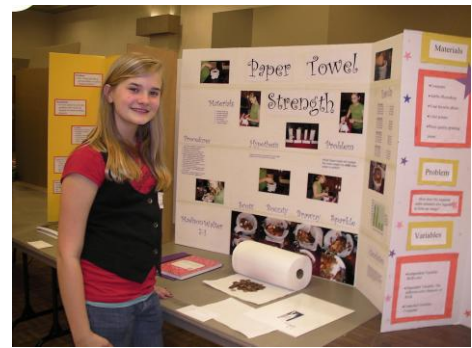
- ❖ When individuals work together they are able to agree or disagree, state various perspectives, point out and settle differences, and examine alternatives (Costa, 2008).

## Reciprocal Teaching and Cooperative Learning in the Classroom

- ❖ Group student creatively: elbow partner, energize partner, family group, heterogeneous groups, appointments, etc..
- ❖ Think-Pair-Share
- ❖ Jigsaw
- ❖ Assign Roles in group. These roles could include, but are not limited to, the following: reporter, recorder, time keeper, encourager, observer
- ❖ Other roles in groups: Mentor, Task Master, Supply Person, Peer Tutor
- ❖ Divide students in groups for research.
- ❖ Partners drill each other on multiplication facts or vocabulary words.
- ❖ Students work in pairs or small groups to compare answers on homework assignments, discuss any disparities in answers, correct their papers, and provide a written explanation of why an answer might have been changed.
- ❖ Students work in pairs to interview one another regarding a book that each read and then report to their partner's book to the class.
- ❖ Following the completion of a cooperative group activity, each group appoints a roving reporter whose job is to travel in a clockwise fashion to the other groups and report the results of the original groups work.
- ❖ Listed below are some ideas for grouping students:
  - Grouping by Birthdays- assign student roles according to birthdays
  - Counting by numbers, 1, 2, 3, 4, 1, 2, 3, 4
  - Draw straw- sort according to color of straw
  - Post cards
  - Pass out playing cards, group according to suit, highest suit is recorder ect.
  - One high student, two average students, one low student
  - Two boys and two girls
  - All boys and all girls
  - Heterogeneous grouping
  - Homogeneous grouping
  - Two high students, two low students

# Project-Based

## Research on Project-Based



❖ Project-Based and Problem -Based Instruction  
Eighty undergraduates found that it was easier to retain information if they (1) applied the new knowledge or skill within two hours after learning it (2) performed tasks in various situations using the new knowledge, and (3) received regular feedback regarding their performance

❖ Brain research is confirming what many teachers already know: When learning is linked to real-life experiences, students retain and apply information in meaningful ways (Westwater & Wolfe).

❖ Projects enable students to plan their time, develop research skills, and become responsible, independent and self-directed, as well as to think abstractly (Gregory & Chapman).

❖ When students interact with others students in a group while solving problems, both cognitive (basic), and metacognitive (higher-order) thinking skills are stimulated (Posamentier & Jaye, 2006).

❖ Engaging students physically builds problem solving skills and assists learning because information is encapsulated for later recall (Jensen, 2007).

❖ When learning is applicable to student's lives, students not only become more engaged but also they feel more responsible for finishing assignments and understand the relationship between their success in school and in the real world (Algozzine 2009).

## Project-Based in the Classroom

❖ Have students write and produce a news program which could address multiple objectives in a real world, memorable context. Objectives for this project could include the following: researching major current or historical events to determine the stories to be included in the broadcast, writing news copy that is grammatically correct with a main idea sentence in each paragraph, or broadcasting the news using appropriate public speaking skills.

❖ Following a study on the Civil War (or other topic), have student show you what they learned by creating a Civil War newspaper, that will recount the major events. Newspapers could include the following: a name, slogan, cost, index, front page feature story, additional stories, advertisements, obituaries, etc...

- ❖ Construct line and bar graphs by collecting data.
- ❖ Construct a class cookbook with favorite recipes. Then have student rewrite the recipes by cutting it in half and then doubling and tripling it.
- ❖ Build a budget. Students are given an allotted yearly income. Working in pairs or cooperative groups, student plan a budget that allows for living expenditures such as housing, utilities, food, and car. Students research the average cost of each expenditure and build a realistic monthly and yearly budget.

The resources used for this presentation included the following two books: *Worksheets Don't Grow Dendrites* by Marcia Tate, *Engage All Students through Differentiation* by Anne Benninghof and my own teaching experience and research.

~Lisa Kirby

