

How the Brain Learns: Implications for Teaching and Learning

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The Wright Family Story

One day the Wright family decided to take a vacation. The first thing they had to decide was who would be left at home since there was not enough room in the Wright family car for all of them. Mr. Wright decided that Aunt Linda Wright would be the one left at home. Of course this made Aunt Linda Wright so mad that she left the house immediately yelling, "It will be a right cold day before I return."

The Wright family now bundled up the children, Tommy Wright, Susan Wright, Timmy Wright, and Shelly Wright, got in the car and left. Unfortunately, as they turned out of the driveway, someone had left a trash can in the street so they had to run right around and stop the car. They told Tommy Wright to get out of the car and move the trash can so they could get going. Tommy took so long that they almost left him in the street.

Once the Wright family got on the road, Mother Wright wondered if she had left the stove on. Father Wright told her not to worry, he had checked the stove and she had not left it on. As they turned right at the corner, everyone started to think about the other things that they might have left undone.

No need to worry now, they were off on a right fine vacation. When they arrived at the gas station, Father Wright put gas in the car and then discovered that he had left his wallet at home. So Timmy Wright ran home to get the money that was left behind. After Timmy had left, Susan Wright started to feel sick. She left the car saying that she had to throw up. This of course got Mother Wright's attention and she left the car in a hurry. Shelly Wright wanted to watch Susan get sick, so she left the car, too. Father Wright was left with Tommy Wright who was playing a game in the backseat.

With all this going on, Father Wright decided that this was not the right time to take a vacation, so he gathered up all the family and left the gas station as quickly as he could. When he arrived home, he turned left into the driveway and said, "I wish the Wright family had never left the house today."

Agenda

Welcome, Overview, Opening Activity, Agenda

How the Mind Processes Information

- Sensory Memory
- Role of Emotions
- Short Term Memory
- Long Term Memory

Implications for Lesson Planning

Reflections, Feedback, Personal Next Steps

Outcomes

Participants will have the opportunity to:

- Examine how the mind processes information
- Identify and discuss attributes of powerful learning experiences
- Discuss and practice brain compatible teaching strategies
- Review a variety of approaches to promoting brain compatible teaching practices
- Reflect upon personal next steps

“The more we understand the brain, the better we’ll be able to design instruction to match how it learns best.”

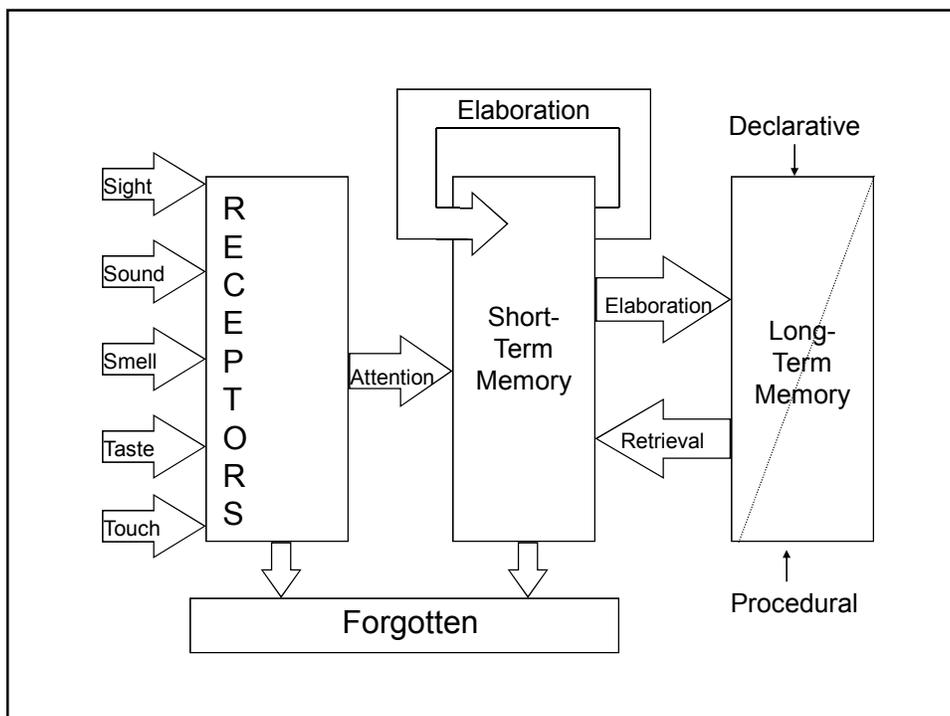
-Wolfe, P., Brain Matters, ASCD, 2001.

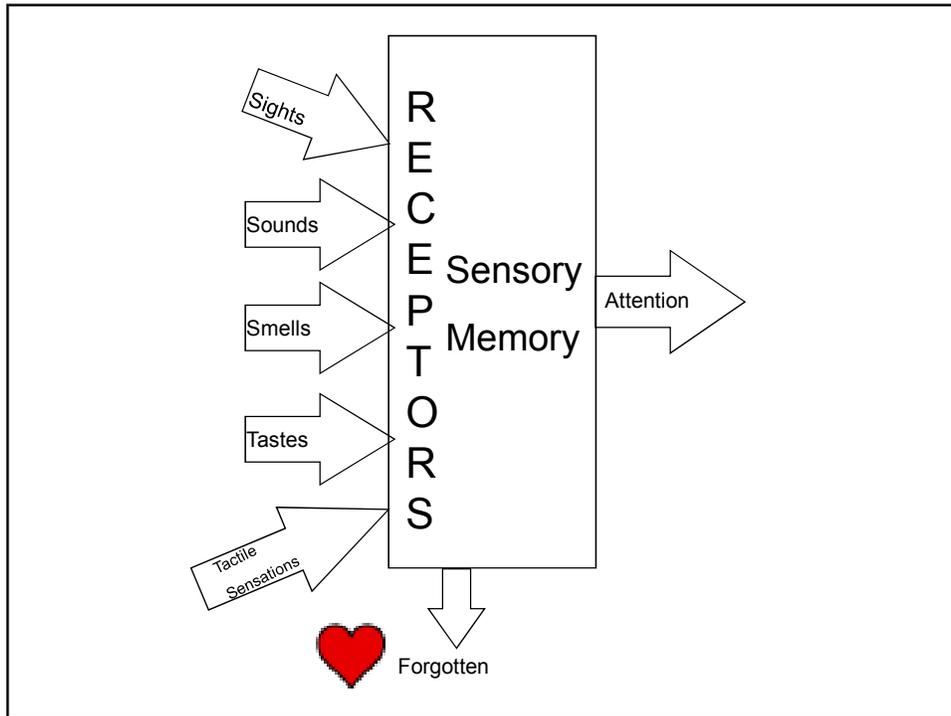


How the Mind Processes Information



- Sensory Memory
- Role of Emotions
- Short Term Memory
- Long Term Memory

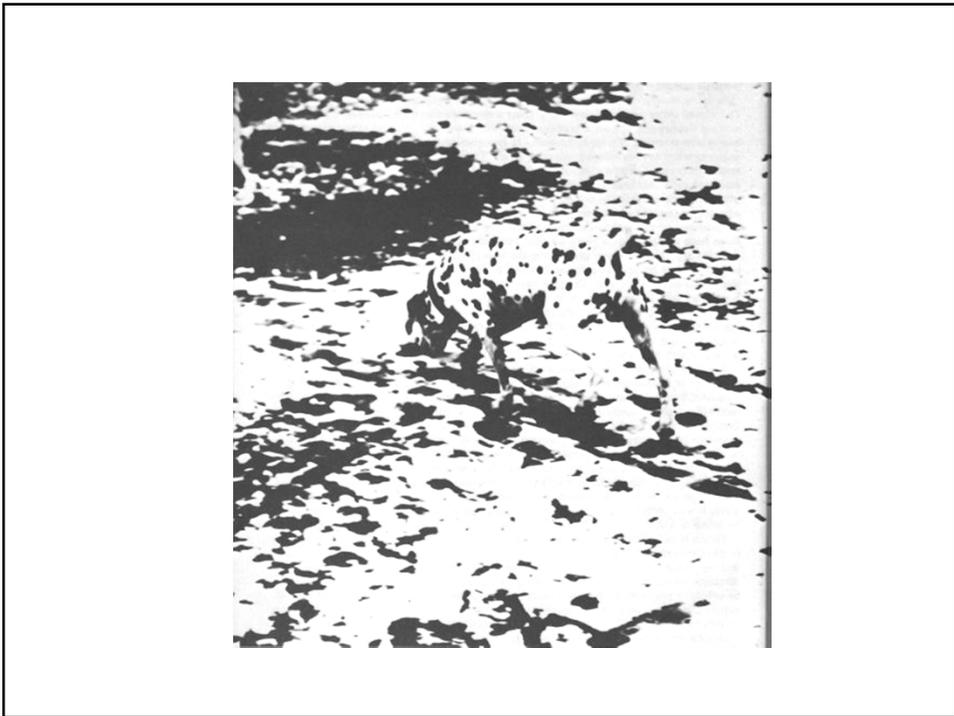
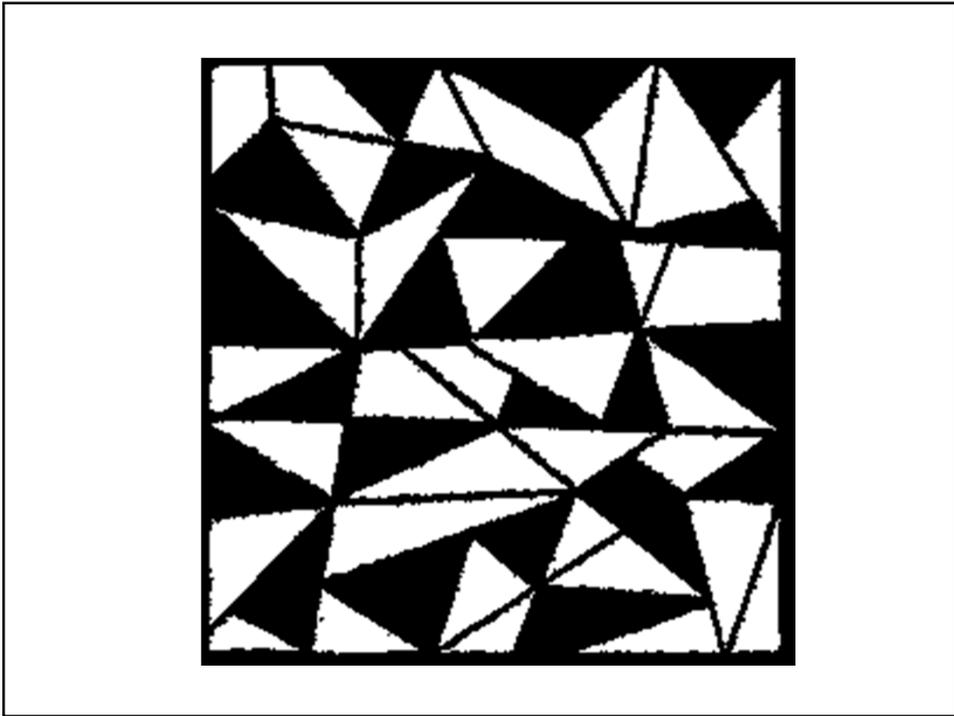




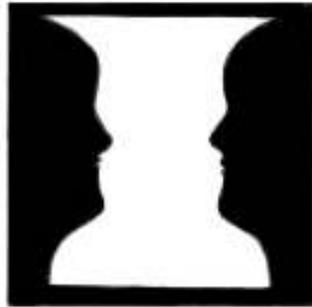
Experiment	Implications for Classroom Practice



Which one is most like the real one?



Two Faces?

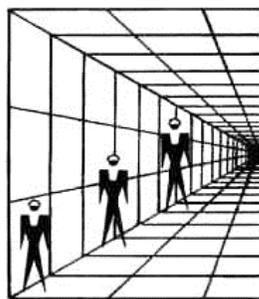


A Vase?

An old woman?

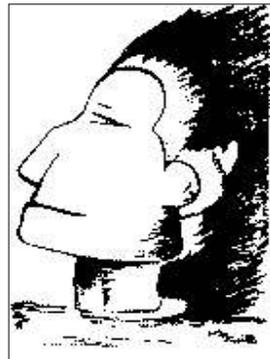


A young woman?

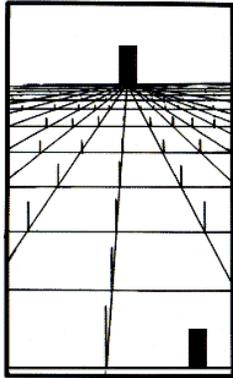


Which man is the tallest?

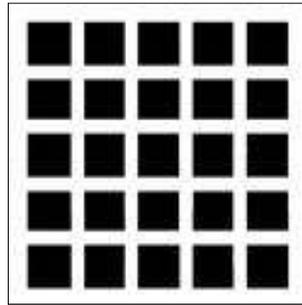
A head?



A person in a parka?



Which rectangle is larger?



Are there gray spots at the intersections?

A young woman?



A grouchy old clown?

Musician?



A girl's face?

Promoting Attention

It's been said that "in small ways we can make big differences in learning." The following simple tips will help learners focus their attention.

- Provide advance organizers
- Post outcomes or key results areas
- Use bracketing
- Eliminate distractions
- Ask for expectations
- Generate previous experiences that relate to the lesson
- Consider using K W L charts (What do you KNOW? What do you WANT to know? and after the lesson: What have you LEARNED?)
- Use one to three minute pauses

Promoting Attention

Provide activities that are:

- ✓ **engaging**
- ✓ **meaningful**
- ✓ **provide an "emotional hook"**
- ✓ **interesting**
- ✓ **related to academic standards/Common Core**

Magic Math

- Pick a whole number.
- Multiply by 2.
- Add 10.
- Divide by 2.
- Subtract number you started with.
- Is your answer 5?

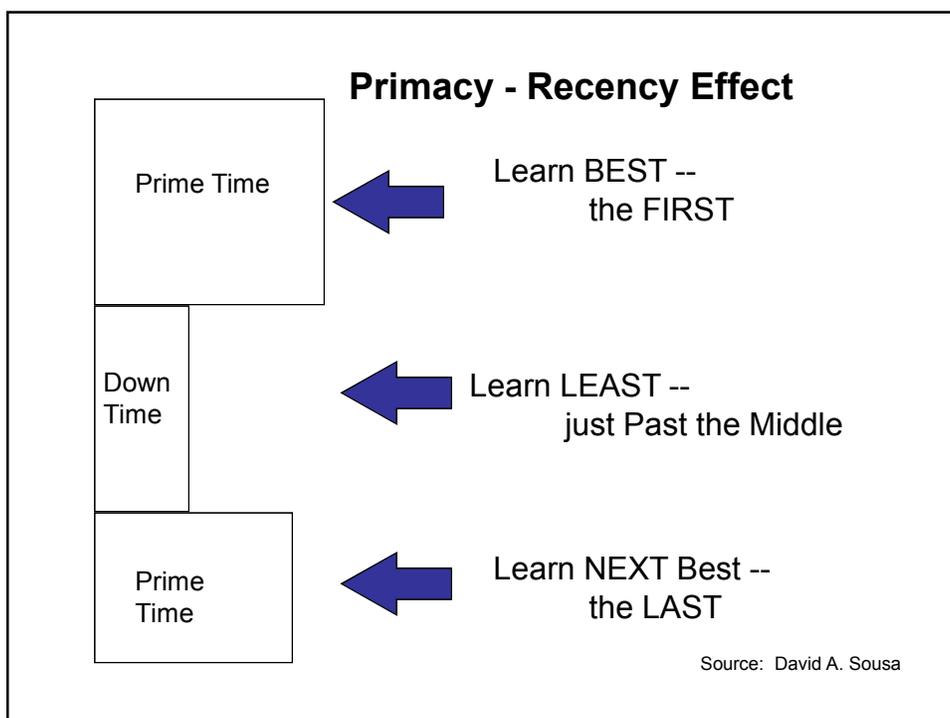
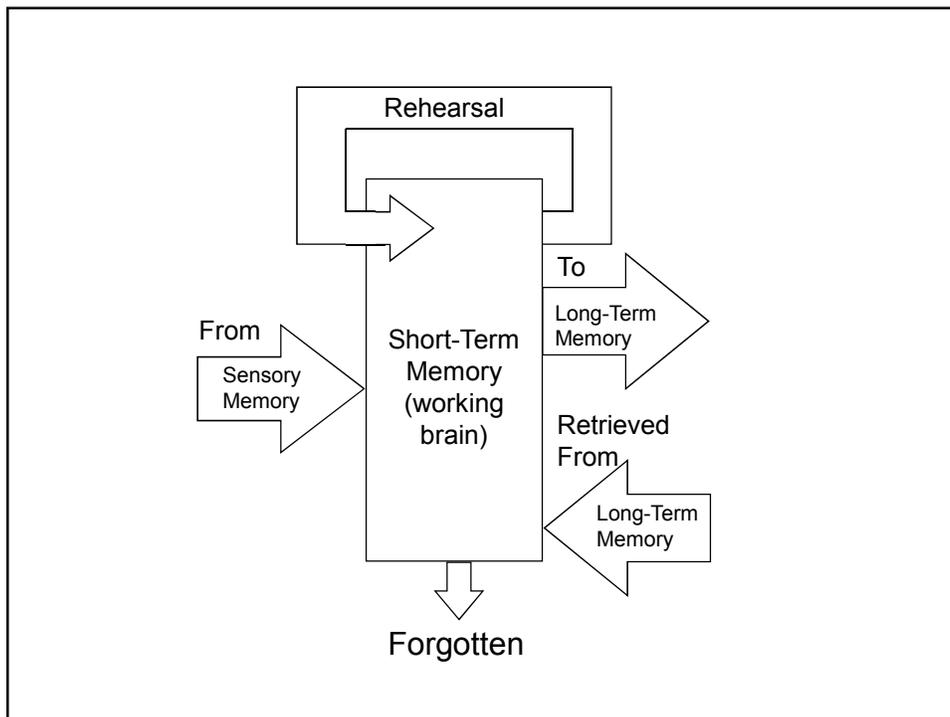
EMOTION

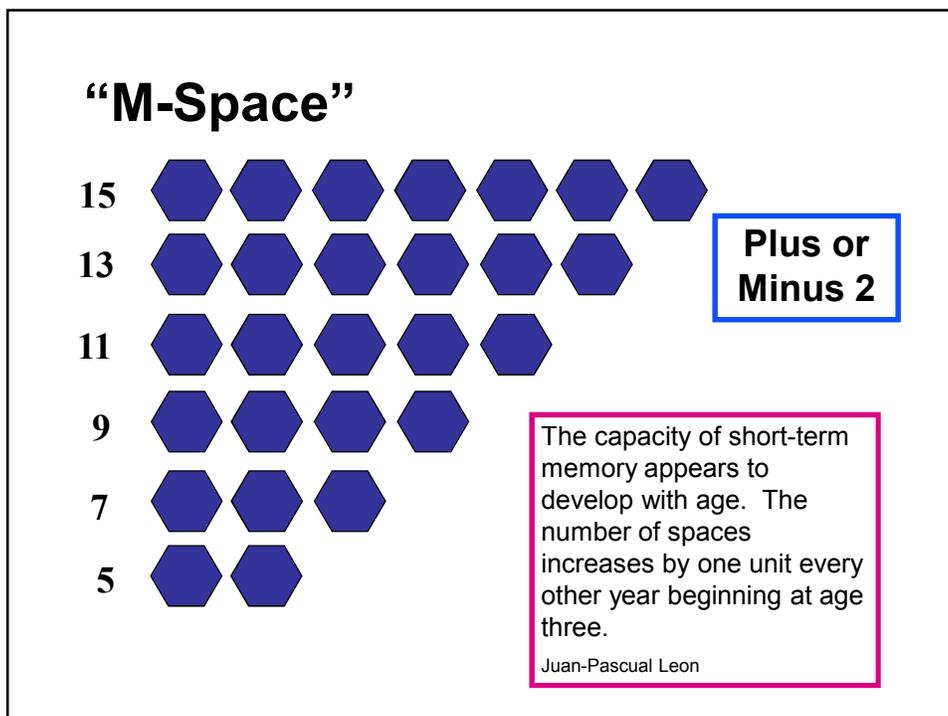
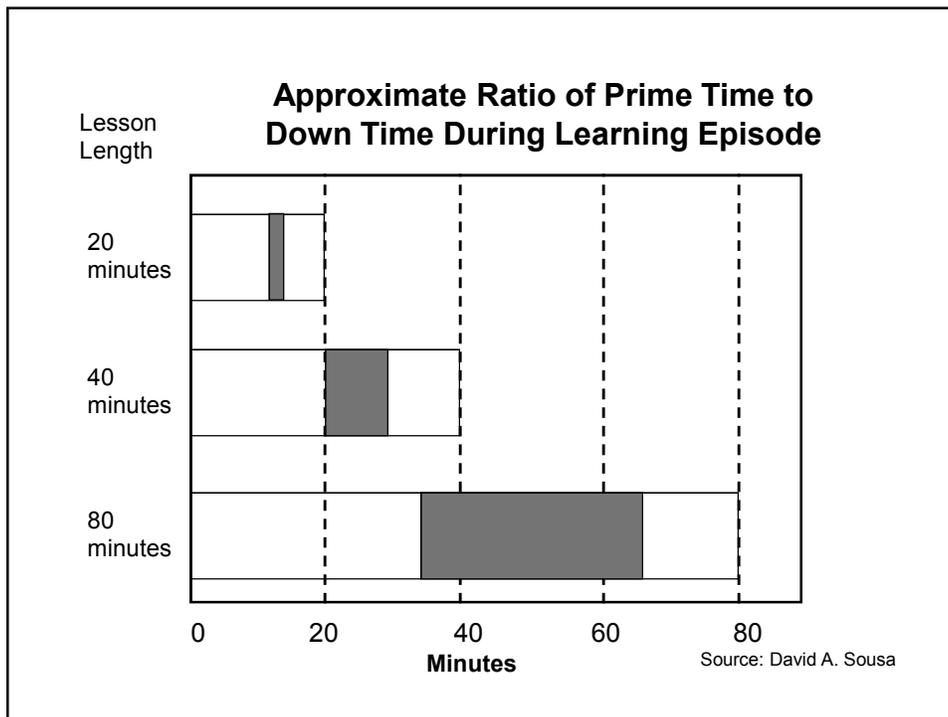
drives

ATTENTION

drives

LEARNING





Rehearsal

Rehearsal performs two functions:

1. Maintains information in short-term memory.
2. Mechanism by which we transfer information to long-term memory.

There are two types of rehearsal:

1. **Rote Rehearsal** -- deliberate, continuous repetition of material in the same form in which it entered short-term memory.
2. **Elaborative Rehearsal** -- elaborating or integrating information, giving it some kind of meaning -- creating chunks of reminders.

Rehearsal Strategies

- Visualization
- Creating a story
- Mnemonics
- The Link System
- Acting Out a Process
- Role Play
- Create a Model
- Develop a Song, Rap, Poem, or Skit
- Interactive Notebooks
- Split-Page Note-taking
- Quick Writes
- Create Questions
- Jigsaw Activities
- Think, Pair, Share
- Games
- Reciprocal Teaching
- Develop a Graphic

Multiple Intelligences

“We can increase our students’ learning and problem solving abilities if we increase their repertoires of problem solving tools by actively encouraging them to use all facets of intelligence” (Parry and Gregory, 1998).

Eight Types of Intelligence

Linguistic- reading, writing, speaking, listening

- Think-pair-share
- Write a commercial
- Oral reports
- Chorale reading
- Dramatization
- 1-2-4 tasks
- Speeches
- Journal writing

Eight Types of Intelligence

Logical/Mathematical- working with numbers and abstract patterns

- Graphic organizers
- Experimentation
- Investigations
- Timelines
- Crossword puzzles
- Problem solving

Eight Types of Intelligence

Visual/Spatial- working with images, mind mapping, visualizing, drawing

- Mind maps
- Murals
- Videos
- Graphic organizers
- Puzzles
- Drawings
- Pattern blocks
- Making models

Eight Types of Intelligence

Musical- rhythm, melody, patterned sound, song, rap, dance

- Creating rhymes, raps, rhythms
- Performing music
- Listening to music
- Putting a story to song
- Movement explorations to music

Eight Types of Intelligence

Body/Kinesthetic- processing information through touch, movement, dramatics

- Role play
- Mimes
- Dance
- Lip syncs
- Skits
- Charades
- Sign language

Eight Types of Intelligence

Interpersonal- sharing, cooperating, interviewing, relating

- Jigsaw activities
- Cooperative tasks
- Peer counseling
- Peer mediation
- Debates
- Study buddies
- Tutors
- Class meetings
- Sharing

Eight Types of Intelligence

Intrapersonal- working alone, self-paced instruction

- Metacognition
- Reflection
- Poetry
- Goal setting
- Logs/journals
- autobiographies

Eight Types of Intelligence

Naturalist- spending time outdoors, sorting, classifying, noticing patterns

- | | |
|--|--|
| <ul style="list-style-type: none"> • Spend time in the outdoors • Take nature walks • Go camping, backpacking • Go canoeing • Visit tidepools | <ul style="list-style-type: none"> • Visit wildlife habitats • Spend time in a zoo, aquarium, or museum • Grow plants • Chart and graph • Construct ecosystems • Log and predict weather |
|--|--|

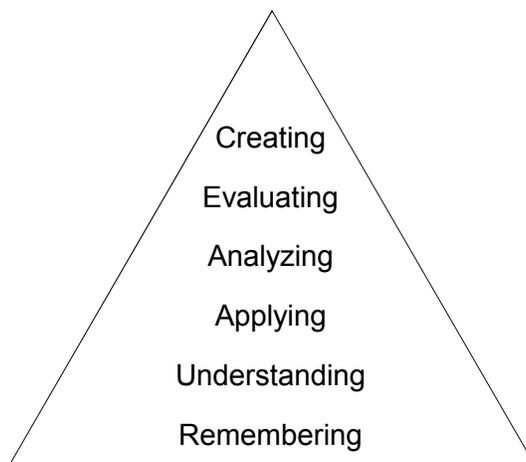
How Are You Smart?

<p>Verbal/Linguistic Intelligence</p> <ul style="list-style-type: none"> -I like to tell jokes, tell stories or tales. -I like to read. -I often listen to radio, TV, tapes, or CDs -I write easily and enjoy it. -I quote things I've read. -I like crossword and word games 	<p>Intrapersonal Intelligence</p> <ul style="list-style-type: none"> -I know about my feelings, strengths and weaknesses. -I like to learn more about myself -I enjoy hobbies by myself -I enjoy being alone sometimes. -I have confidence in myself. -I like to work alone. -I think about things and plan what to do next.
<p>Logical Mathematical Intelligence</p> <ul style="list-style-type: none"> -I solve math problems easily. -I enjoy math and using computers. -I like strategy games. -I wonder how things work. -I like to use data in my work. -I like using logic to solve problems. -I reason things out. -I like to use data in my work, to measure, calculate and analyze. 	<p>Visual Spatial Intelligence</p> <ul style="list-style-type: none"> -I shut my eyes and see clear pictures. -I think in pictures. -I like color and interesting designs. -I can find my way around unfamiliar areas. -I draw and doodle. -I like books with pictures, maps, and charts. -I like videos, movies and photographs.

<p>Interpersonal Intelligence</p> <ul style="list-style-type: none"> -People ask me for advice. -I prefer team sports. -I have many close friends. -I like working in groups. -I'm comfortable in a crowd. -I have empathy for others. -I can figure out what people are feeling. 	<p>Bodily-Kinesthetic Intelligence</p> <ul style="list-style-type: none"> -I get uncomfortable when I sit too long. -I like to touch or be touched when talking. -I use my hands when speaking. -I like working with my hands on crafts/hobbies. -I touch things to learn more about them. -I think of myself as well coordinated. -I learn by doing rather than watching.
<p>Musical Rhythmic Intelligence-</p> <ul style="list-style-type: none"> -I like to listen to musical selections. -I am sensitive to music and sounds. -I can remember tunes. -I listen to music when studying. -I enjoy singing. -I keep time to music. -I have a good sense of rhythm. 	<p>Naturalist</p> <ul style="list-style-type: none"> -I enjoy spending time in nature. -I like to classify things into categories. -I can hear animal and bird sounds clearly. -I see details when I look at plants, flowers, and trees. -I am happiest outdoors. -I like tending to plants and animals. -I know the names of trees, plants, birds, and animals.

Unique Individual Profile							
Verbal Linguistic	Logical Mathematical	Interpersonal	Musical Rhythmic	Intrapersonal	Visual Spatial	Bodily Kinesthetic	Naturalistic

The “New” Bloom’s Taxonomy



Increase in Learning Between Practice Sessions

Practice Session #	Increase in Learning (%)	Cumulative Increase (%)
1	22.918	22.918
2	11.741	34.659
3	7.659	42.318
4	5.593	47.911
5	4.349	52.26
6	3.534	55.798
7	2.960	58.754
8	2.535	61.289
9	2.205	63.494
10	1.945	65.439
11	1.740	67.179

Source: Marzano, R., Pickering, D., and Pollock, J., *Classroom Instruction That Works*, ASCD, 2001.

Practice Session #	Increase in Learning (%)	Cumulative Increase (%)
12	1.562	68.741
13	1.426	70.167
14	1.305	71.472
15	1.198	72.670
16	1.108	73.778
17	1.034	74.812
18	.963	75.775
19	.897	76.672
20	.849	77.521
21	.802	78.323
22	.761	79.084
23	.721	79.805
24	.618	80.423

Source: Marzano, R., Pickering, D., and Pollock, J., *Classroom Instruction That Works*, ASCD, 2001.

Review

Why?

- Review creates opportunities for practice
- Strategies for review

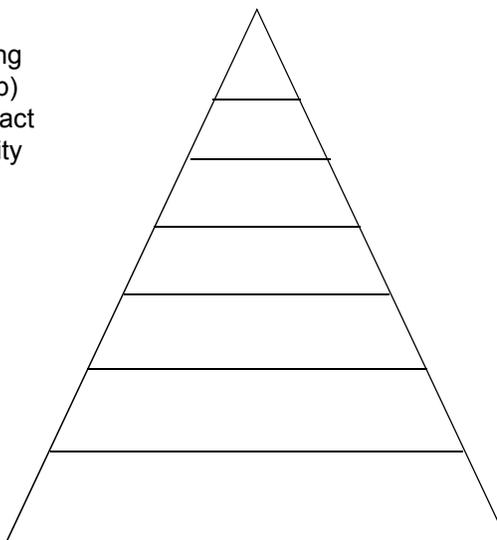
Review Strategies

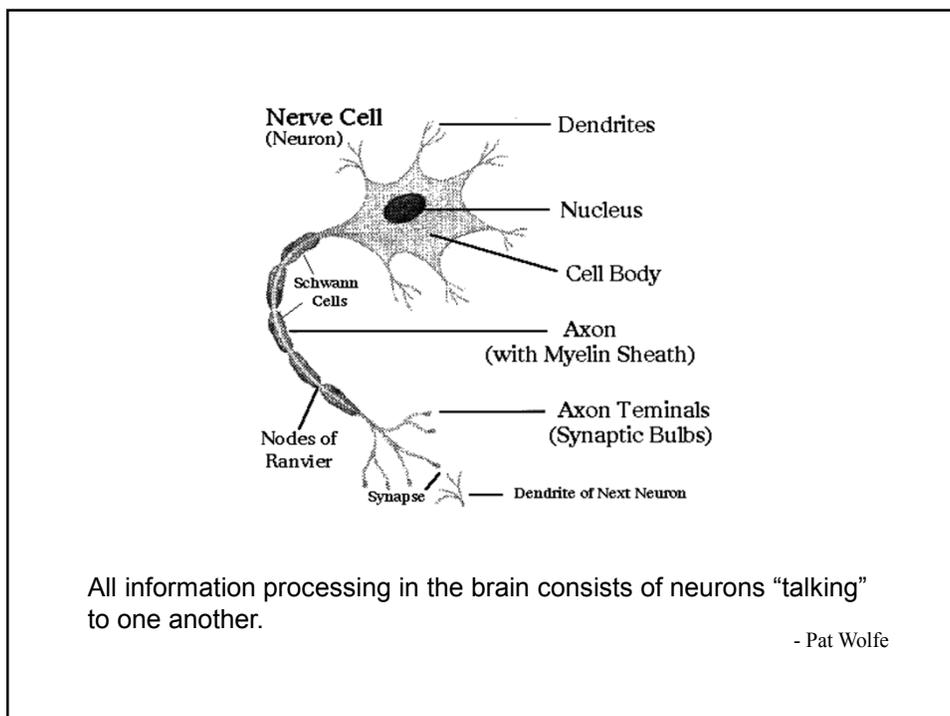
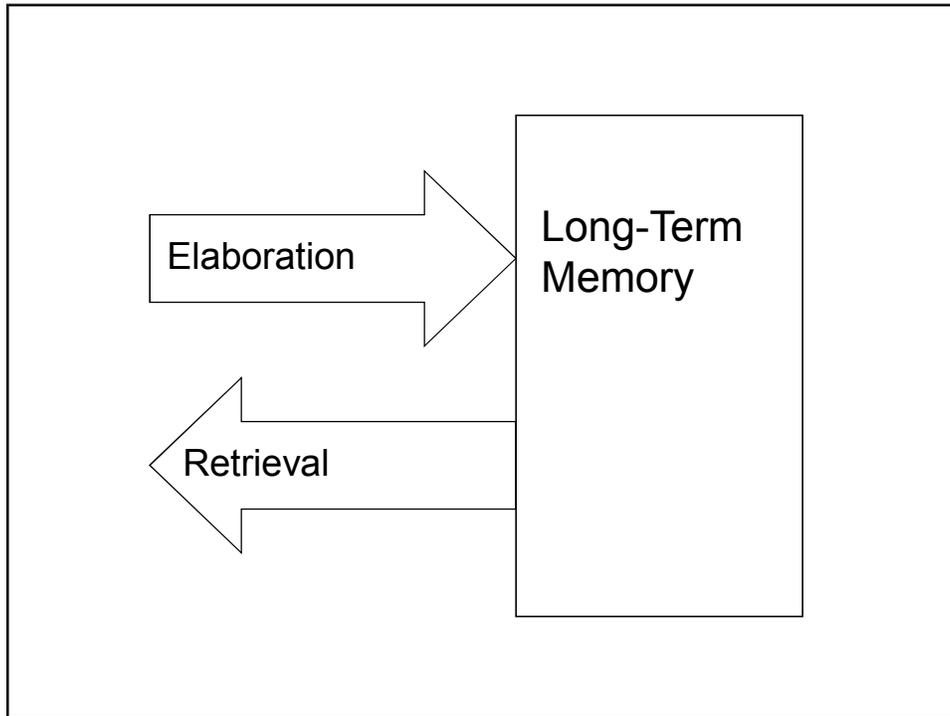
- shaping up a review
- fill in the blanks
- jeopardy
- wheel of fortune
- 20 questions
- question quadrant
- listening posts
- wallpaper task
- paper pass
- relays
- advertisement
- carousel brainstorming
- 3 x 5 card
- create a quiz

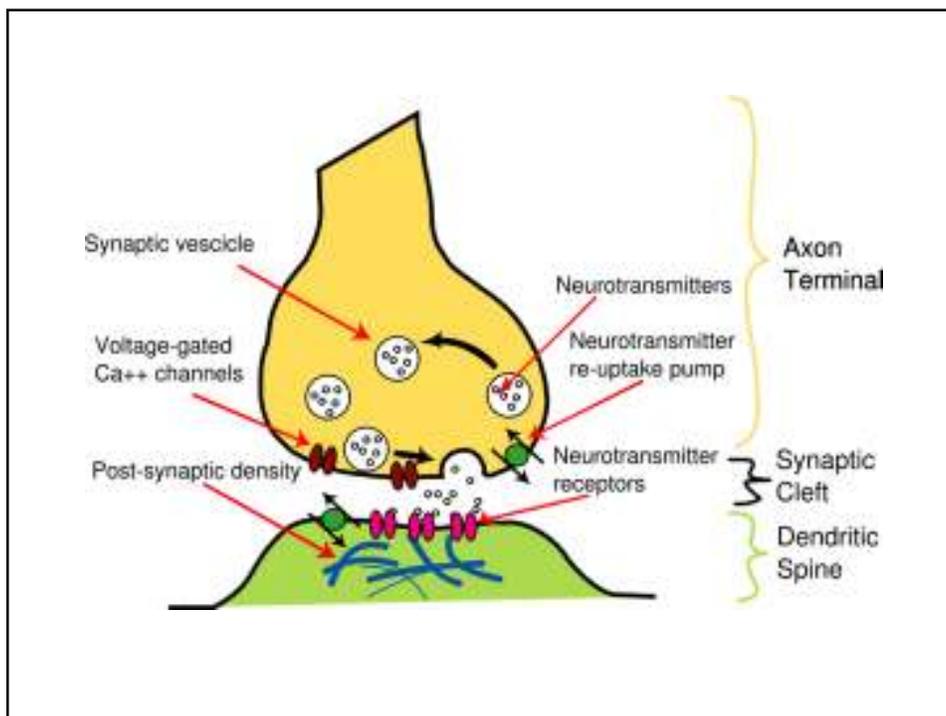
Average Retention Rates

Please arrange the following strategies from least (at top) to greatest (at bottom) impact with respect to their capacity to foster retention:

- lecture
- practice by doing
- teach others
- discussion group
- audio-visual
- demonstration
- reading



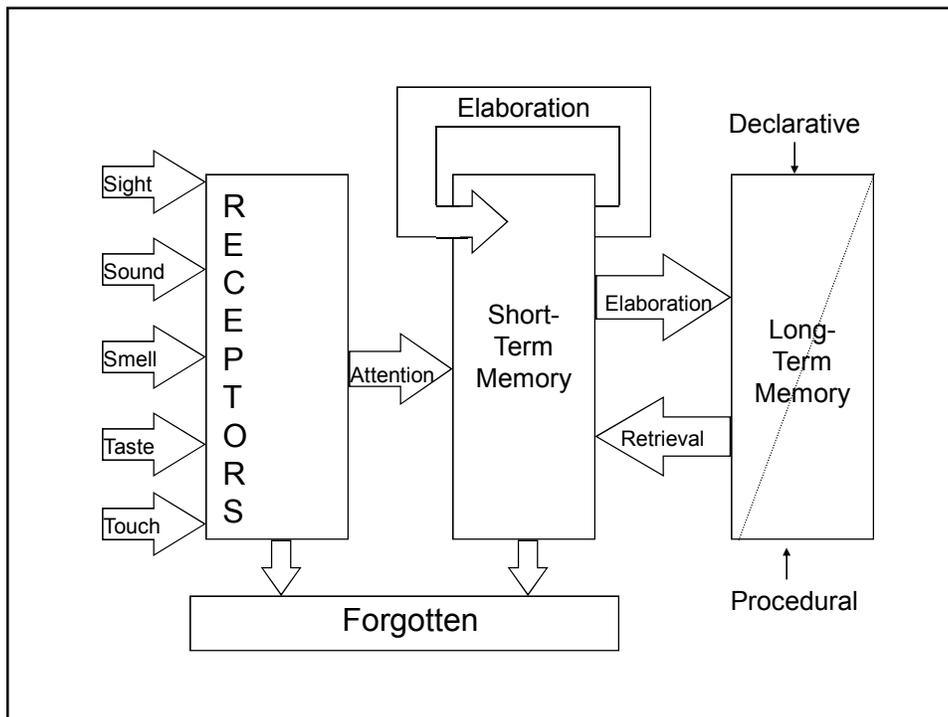




Neural Plasticity

- Environment changes the brain!
- Enriched environment- increased cell weight- increased branching of dendrites.
- Impoverished environment- decrease the size and number of cells- dendrites diminished.

Diamond, Marion. Enriching Heredity. Free Press: New York.



Reflections

- How does the mind process information?

- What role do the emotions have in the learning process?

- What are some differences between the short and long term memories?

- What are some ways to increase: attention?

retention? _____

- What are some ideas you will immediately apply in your work with students?

with other teachers? _____

- What are some ways to increase one's memory?

- What are some ways to make instruction "brain compatible"?

Brain Friendly Lesson Planning

- What will I do to focus students' attention?

- How will I activate prior knowledge that relates to this lesson?

- How will the content of the lesson be introduced, modeled and explained?

- In what ways will students have an opportunity to "rehearse"/ practice?

- How will students be asked to demonstrate mastery of that which has been taught?

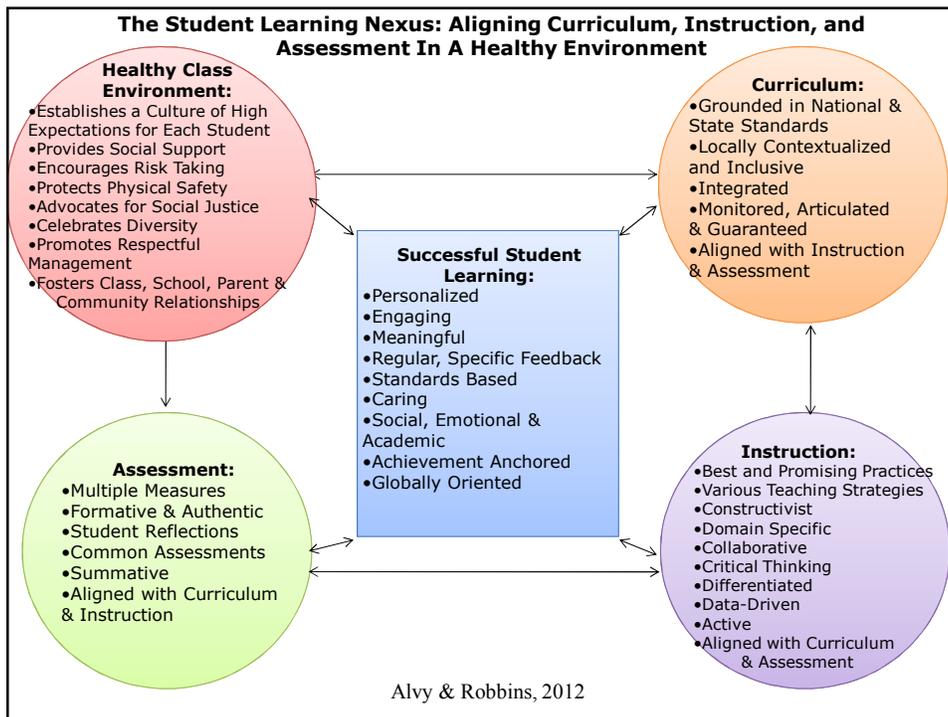
- How will students be provided opportunities to practice over time?

Examining and Analyzing Lessons

Reflecting on the Video...

Given what you know about how the brain processes information, how would you improve this lesson?

What questions might you ask this teacher so that the teacher could come up with his own suggestions to improve the lesson?



For additional information or to schedule professional development, please contact:

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Visual References

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