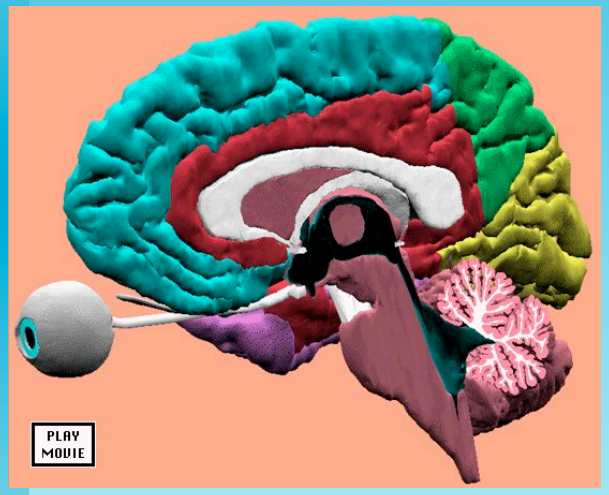
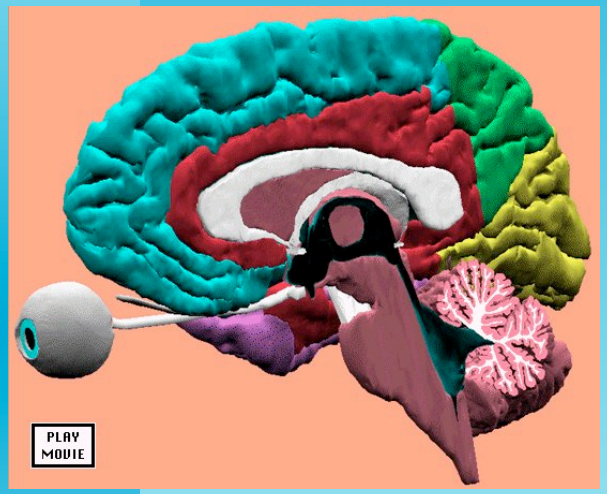
BRAIN – BASED LEARNING



By Drina Madden

BRAIN – BASED LEARNING

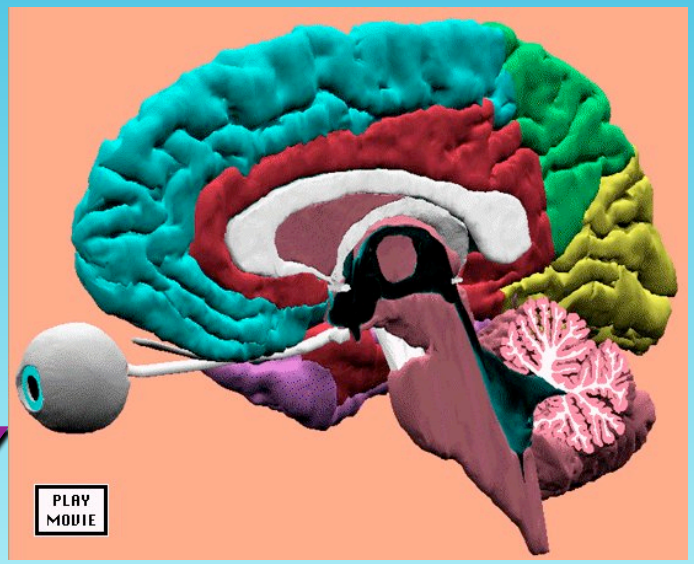


Developmental Foundation

Learning Environment

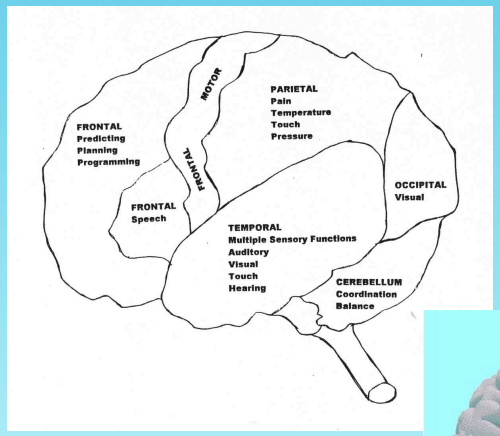
DEVELOPMENTAL FOUNDATION

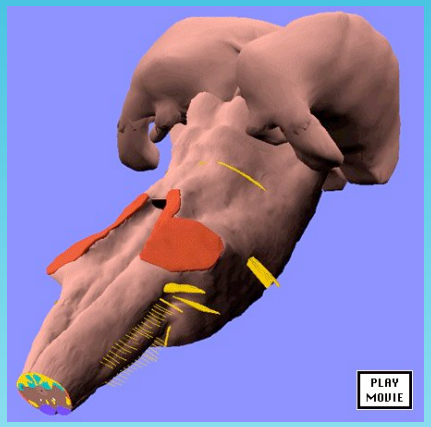
- ***4 EMOTIONAL INTELLIGENCE***
- ***3 TERTIARY***
- ***2 SECONDARY***
- ***1 PRIMARY***

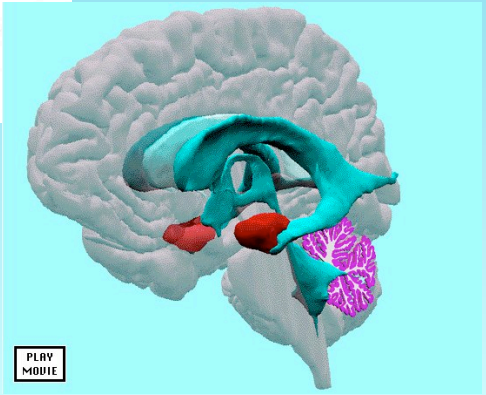


PRIMARY BRAIN

- **Attention/survival**
- **Prenatal through preschool**
- **Brain Pathways**
  - **Brain Stem**
  - **Primary cortex**
  - **Cerebellum**
  - **Limbic/mood**
    - **Amygdala**
    - **Hippocampus**

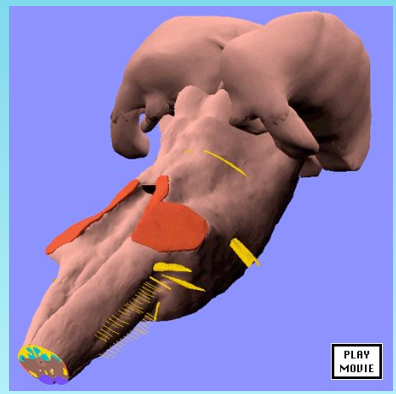




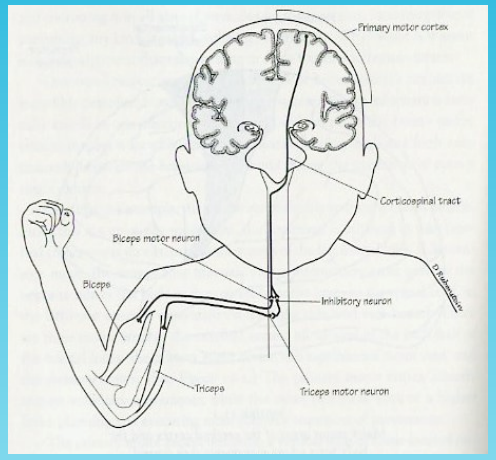


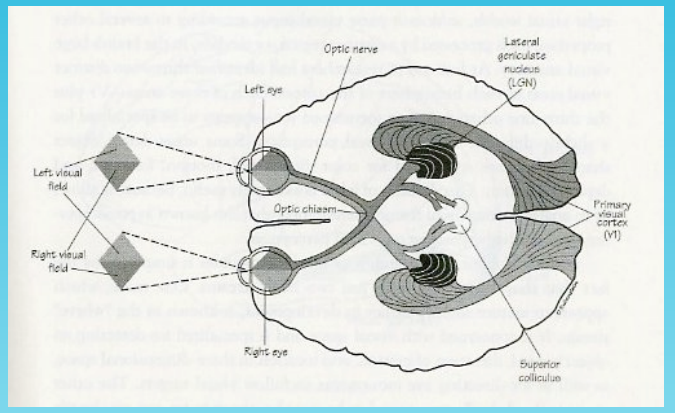
PRIMARY BRAIN

- **ATTENTION**
  - **Bottom up**
    - **Brain chemicals**
    - **Electricity**
    - **Formation**
- **Mood**
  - **Begin link to brain stem**

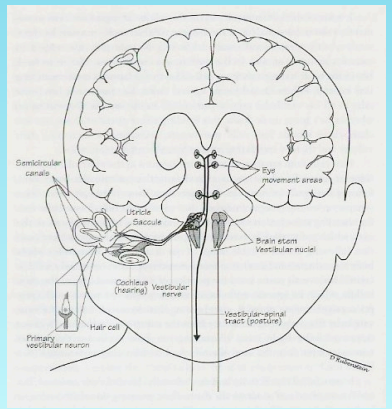


PRIMARY BRAIN





- **Early childhood memory**
  - **A whole new world**
  - **Initial sensory input**
    - One sense at a time

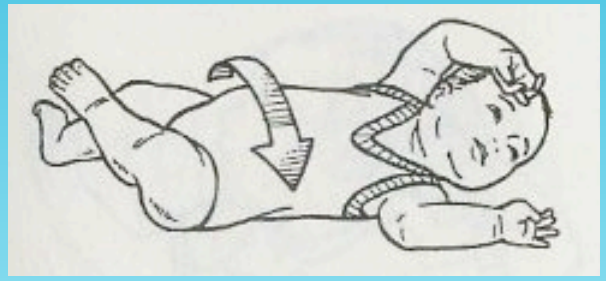


PRIMARY BRAIN

- **Reflexes - Survival**
  - **Begin in utero**
  - **Primitive reflexes end by one year after birth**

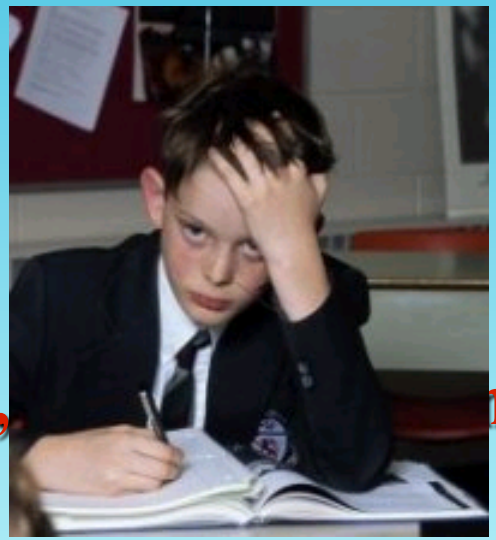
PRIMARY BRAIN

- **Reflexes – immature development - cause problems**
  - **Attention problems**
  - **Hyperactive**
  - **Hypoactive**
  - **Sensitivity issues**
  - **Motor problems**
  - **Memory problems**



PRIMARY BRAIN

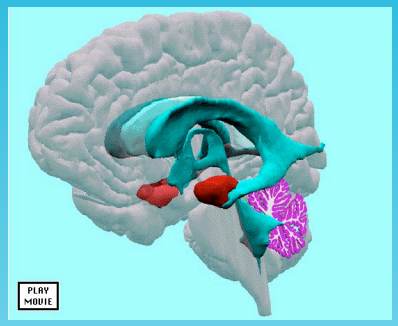
- **Immature reflex development impedes learning**
  - **Input is difficult**
  - **Output is impeded**
    - **Attention**
    - **Memory**
    - **Eye movement – reading, ng**
    - **Hand control - writing**
    - **Posture – writing, reading**
    - **Spatial awareness for math and writing**
    - **Organization**



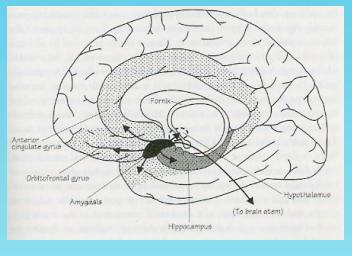
PRIMARY BRAIN

- Primary brain can take over physical parts of advanced, learned skill
  - Frees upper brain to
    - Focus attention
    - Observe
    - Discover ways to impr
      - Handwriting
      - Driving
      - Sports

SECONDARY BRAIN



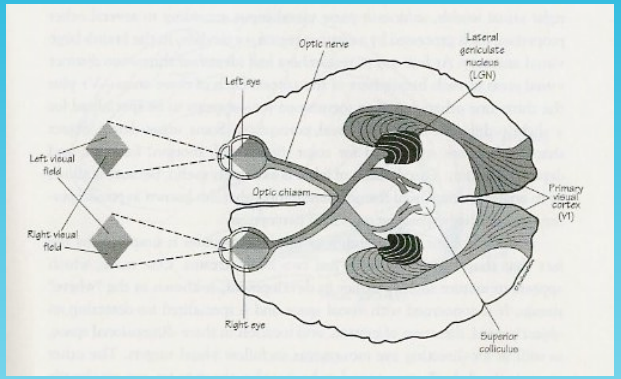
- **Emotional/cognitive – limbic**
- **Preschool to Primary grades**
- **New brain pathways**
  - **Multi-sensory cortex**
  - **Cross midline (corpus collosum)**
  - **Mood connections**
    - **Linked to lower (amygdala & hippocampus)**
    - **Linked to higher brain (cortex)**



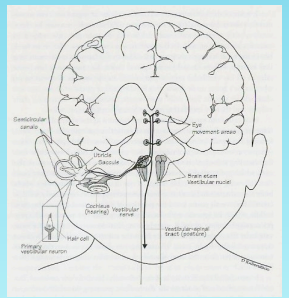
SECONDARY BRAIN

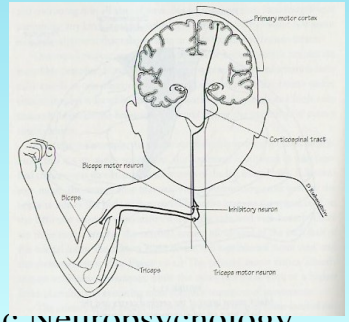
- Attention
  - Top down
  - Some bottom up emerging
- Mood is strongly connected
  - Affects all relationships
  - Increases awareness of world & need to relate emotionally

SECONDARY BRAIN



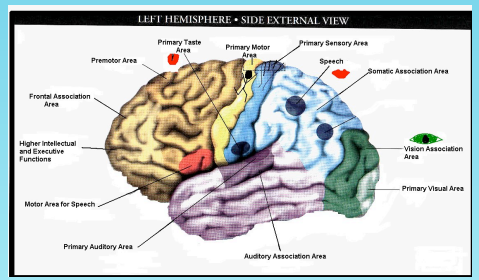
- **Memory**
  - **Past & present**
  - **Multisensory connections**
  - **Concrete/real**



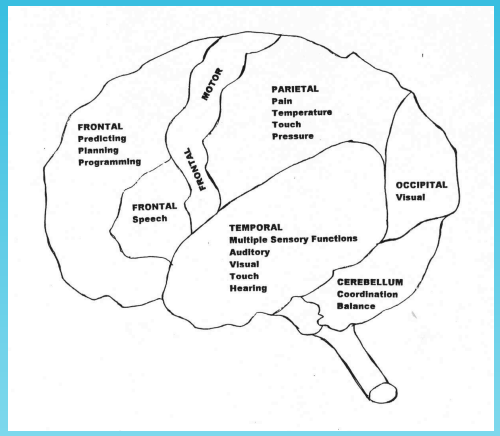


SECONDARY BRAIN

- **Relates directly to temporal (language) lobes and <u>right</u> hemisphere**
  - **Dreaming, Intuition and Creativity**
  - **Reading**
  - **Writing**
  - **Math**
  - **Beginning reasoning**



TERTIARY BRAIN

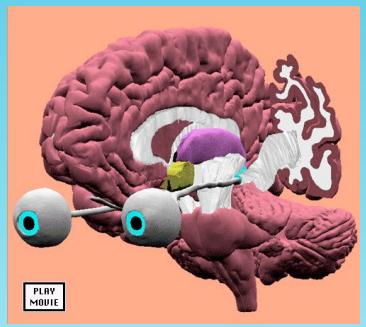


- **Language and Thinking**
- **Upper Middle school**

  Upper grades
- **New brain pathways**
  - **Cortex + limbic + brain stem**
  - **Higher cortex can control brain stem responses**
  - **Mood**
    - **Enhances connections**
    - **Short-circuits connections**

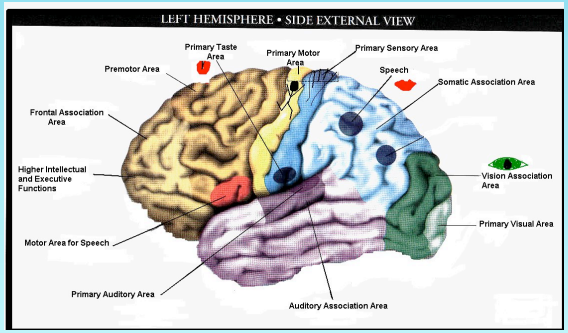
TERTIARY BRAIN

- **Attention/Executive Function**
  - **Top down AND bottom up**
  - **Organization and planning.**
- **Mood**
  - **Limbic connections remain immature**
  - **Some top down control**



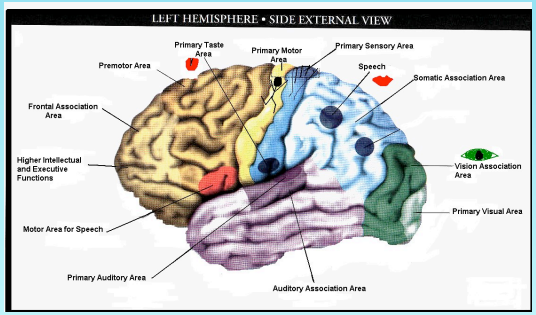
TERTIARY BRAIN

- **Memory**
  - **Past, present and future**
  - **Connects to reasoning**
- **Abstract reasoning grows**



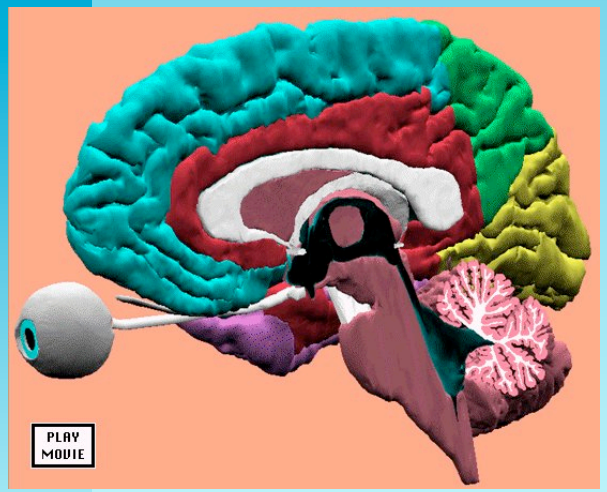
TERTIARY BRAIN

- **"Brain Levels" affect one another**
  - **Idea from level 2 or 3 can change perception from level 1**



TERTIARY BRAIN

Relies upon firm foundation of
Primary



And

Secondary

Brain

PREFRONTAL BRAIN

- **Emotional Reasoning**
- **Older Teens**
- **Past, present, future**
  - **PLUS EMOTION**
- **Abstract reasoning complete**
- **Full brain operation**

PREFRONTAL BRAIN

- **Most fragile**
  - ***Earlier***

    foundations

    must **be completed**

    or

    tumbles

    d

    own

PREFRONTAL BRAIN

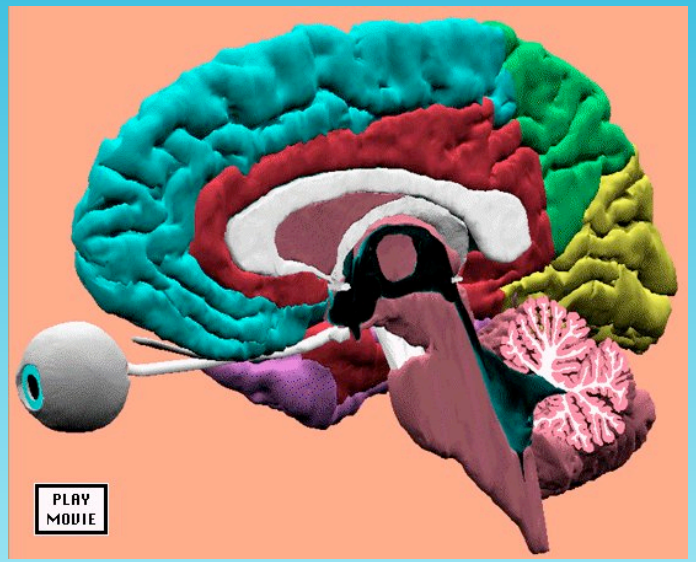
- **Strong foundation =**
- **Strong**
  - **Full brain responses**

PREFRONTAL BRAIN

- **Person can monitor and control**
  - **Level 4**
  - **Level 3**
  - **Level 2**
  - **Level 1**

PREFRONTAL BRAIN

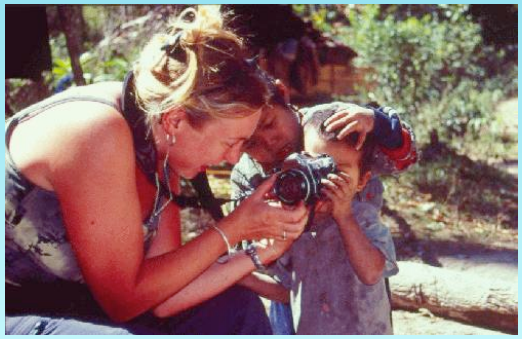
- ***Weak foundation =***
  Weak links to full brain

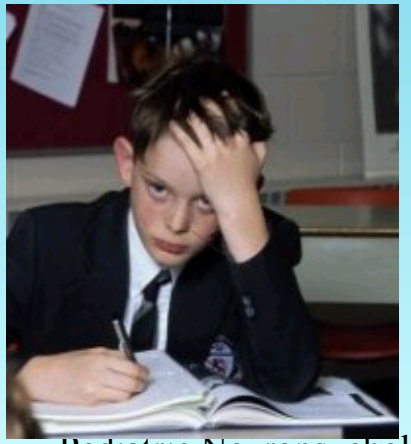


LEARNING ENVIRONMENT

LEARNING IS A MIND-BODY EXPERIENCE

- ***ATTENTIONAL STATES***
- ***EMOTIONAL EASE***
- ***MEMORY AND RECALL***





ATTENTION
in the classroom

- **Strong understructure**
- **Clear, new stimuli**
- **Emotional safety**

ATTENTION in the classroom

- **Give learner MORE CONTROL**
  - **Engage them in creating**
    - **Classroom rituals**
    - **Projects**
    - **Rules**
    - **Procedures**
    - **Consequences**

ATTENTION in the classroom

- **Ensure success**
  - Teach through multiple learning styles
  - Repeat
  - Use concrete visuals – 85%
- **Provide curriculum choices**
  - Sense of freedom
  - Individual expression
  - Individual choice

ATTENTION in the classroom

- **Encourage pursuit of life-like projects**
  - **Engage curiosity**
  - **Engage natural passions**
- **Incorporate guest speakers and field trips**

ATTENTION in the classroom

- ***Provide novelty***
  - **Be:**
    - **Courageous**
    - **Funny**
    - **Different**
- **Encourage group work**

ATTENTION in the classroom

- **Give plenty of "down time"**
  - **Allows for personal meaning**
  - **Learning goes internal**
    - **Walk, stretch, classroom clean-up, doodle or just rest**
    - **Seatwork or homework IS NOT "DOWN TIME"**
  - **Eyes upon you doesn't mean Attention is paid**

ATTENTION
in the classroom

- **Encourage pleasure in their work**
  - **Celebrate new learning**
  - **Post jokes or funny cartoons**
- **Allow for movement**
- **Play music**

ATTENTION in the classroom

- **Adjust the environment**
  - **Color**
    - **Orange and yellow are best for learning**
    - **Dark colors lower stress – blue most tranquilizing**
  - **Light**
  - **Visual distractions**
  - **Auditory distractions**
  - **Temperature**
  - **Plants**

EMOTIONAL STATE

- **Attention** and **mood** go hand-in-hand

Up

- **Mood /** = **attention /**

- **Mood** = **attention**

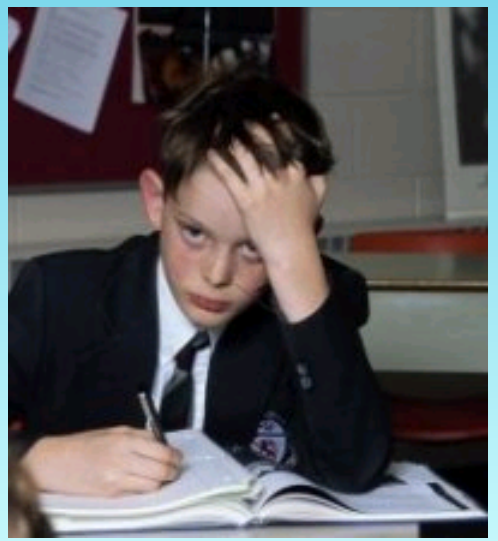
\ down

EMOTIONAL STATE

- **Our emotional state is an integral part of our learning**

EMOTIONAL STATE

- **Caregiver's emotional state**
  - **Influences child's state**
  - **Influences child's development in general**



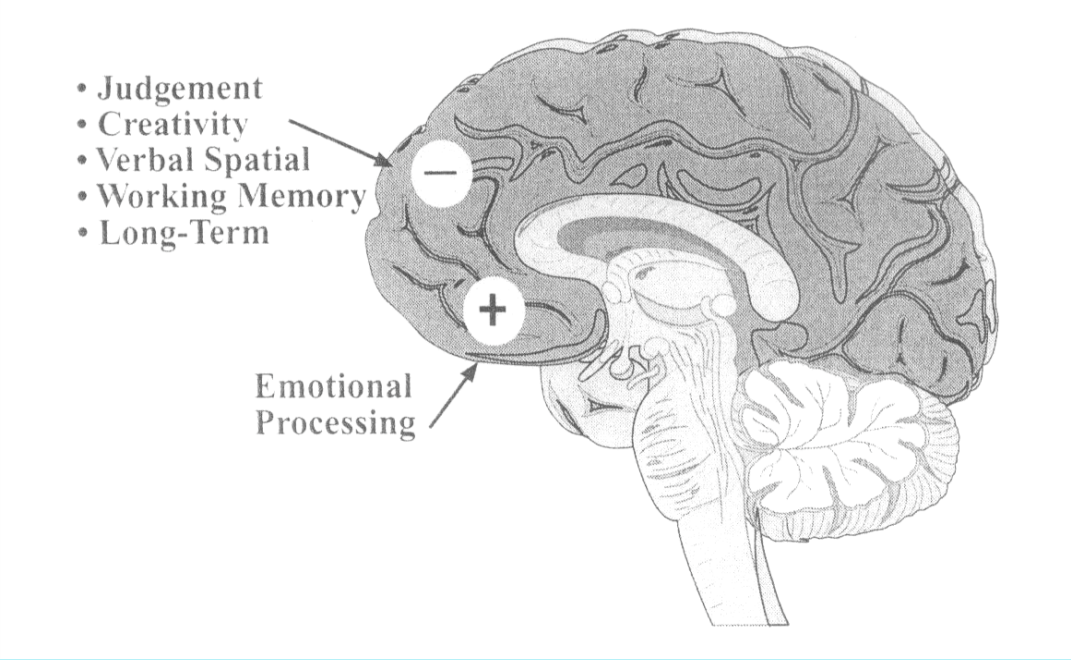
EMOTIONAL STATE

- **Fear or anger shifts attention and energy to lower levels**

- **Reacts on a primitive level**
  - **Insecure**
  - **Anxious**
  - **Tense**
  - **Think one thing - feel another**

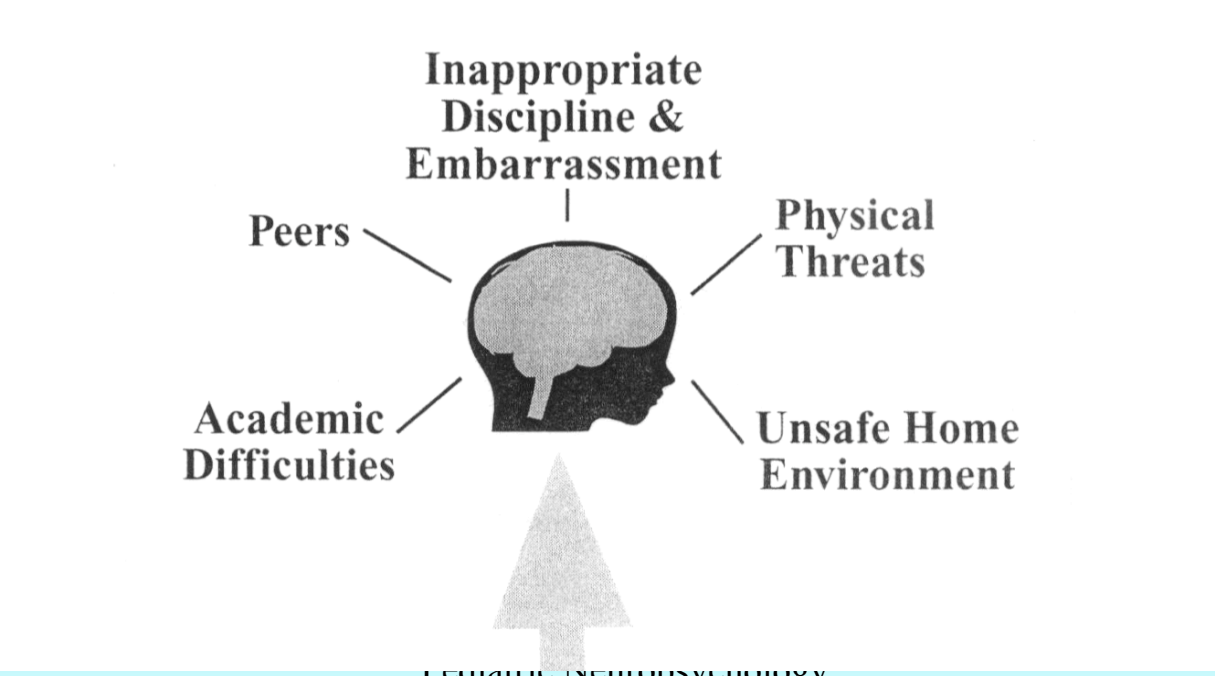
EMOTIONAL STATE

- **Negative emotions cause lowered learning**



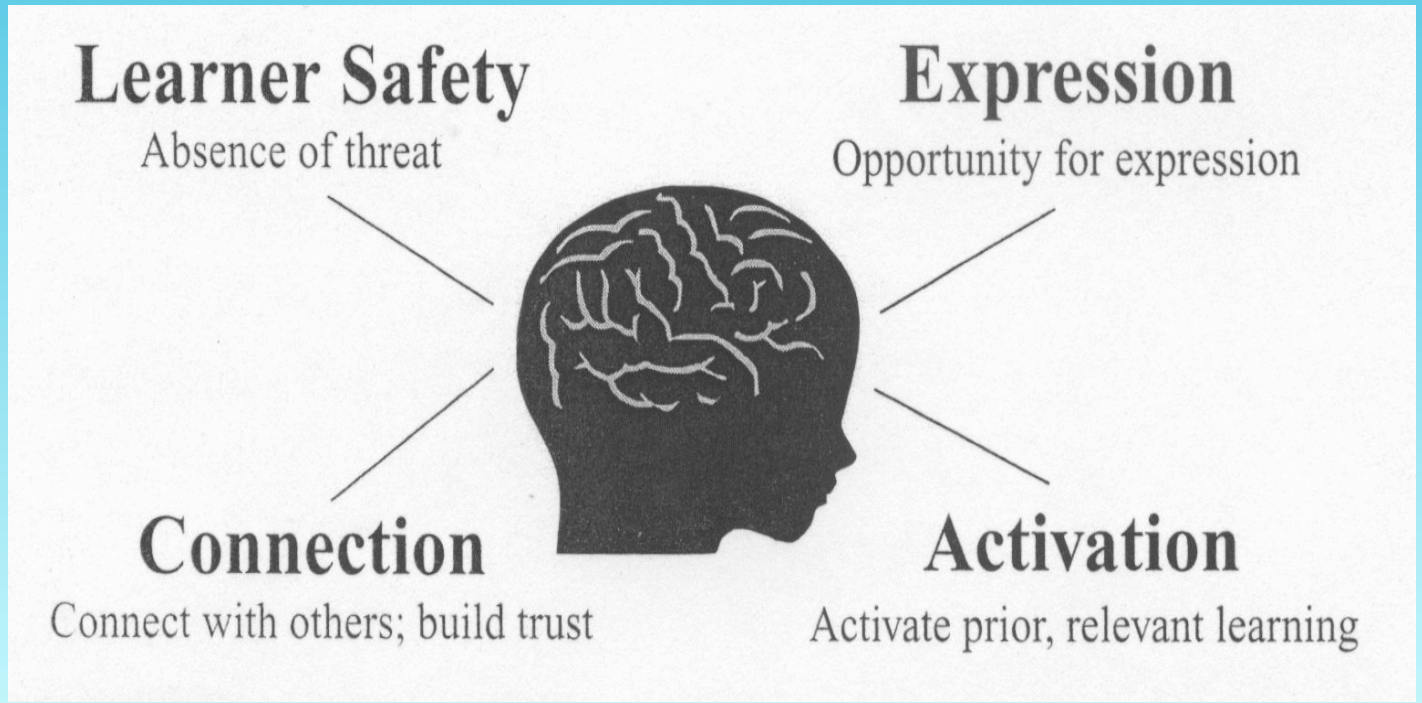
EMOTIONAL STATE

- **Distress and threat interfere with learning**
- **25-40% of students have outside stress issues**



EMOTIONAL STATE

- **Positive Learning Environment**



EMOTIONAL STATE

- **Role of positive emotions in learning**
  - **Binds learning**
  - **Intensely activates long term memory**
  - **Facilitates faster and better decisions**
  - **Helps determine what's real, what believe and feel**

EMOTIONAL STATE in the classroom

- **Deal with students gently and personally**
- **Acknowledge and include in the learning process**
  - **Emotions**
  - **Feeling**
  - **Beliefs**
  - **Cravings**
  - **Problems**
  - **Attitudes**
  - **Skills**

EMOTIONAL STATE in the classroom

- **Create an optimal learning environment**
  - **Establish positive and productive rituals**
  - **Set a tone of teamwork**
  - **Encourage participation**
  - **Maintain an absence of threat and high stress**

EMOTIONAL STATE in the classroom

- **Ensure success**
  - **Teach to all learning styles**
    - **Visual = 85 %**
    - **Auditory = 10 %**
    - **Tactile = 5 %**

EMOTIONAL STATE in the classroom

- **Ensure success**
  - **Be aware of gender differences**
    - **Females**
      - **Fine motor skills**
      - **Computation tests**
      - **Multitasking**
      - **Spelling**
      - **Use of verbal memory**
      - **Appreciation of depth and perceptual speed**
      - **Reading body language/facial expressions**
      - **Habit formation and maintenance**
      - **Most spatial tasks**
      - **Tie right and left brain ideas together**

EMOTIONAL STATE in the classroom

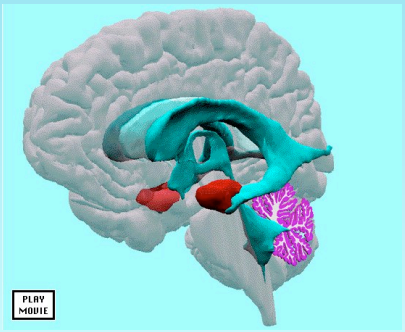
- **Ensure success**
  - **Be aware of gender differences**
    - **Males**
      - **Targeting skill**
      - **Working vocabulary**
      - **Extended focus and concentration**
      - **Mathematical reasoning and problems solving**
      - **Navigation with geometric properties of space**
      - **Verbal intelligence**

EMOTIONAL STATE in the classroom

- **Ensure success**
  - **Repetition**
  - **Duration of themes/units**
    - **Newer concepts need more time**
    - **Complexity needs more time**
    - **Plan for elaboration**
    - **Use textbooks as supplements**
  - **Use self-assessment tools**

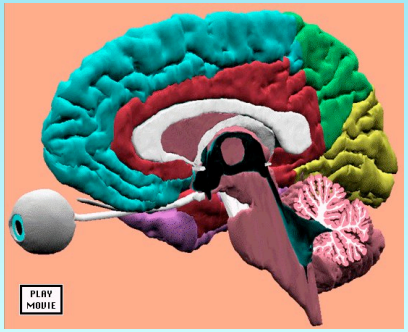
MEMORY AND LEARNING

- **Memory pathways**
  - **Short-term to long-term**
    - **Hippocampus = new memory**
    - **Medial temporal lobe = forms and organizes**



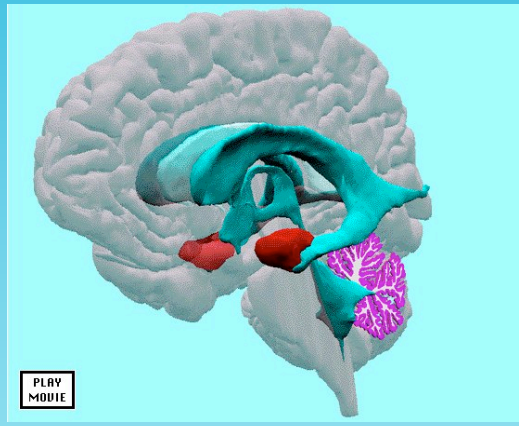
MEMORY AND LEARNING

- **Declarative knowledge – language-based**
  - **Working memory = prefrontal cortex**
    - – Helps us use information
    - – Utilizes a neuronal network
  - **Episodic memory = hippocampus**
    - – Store and replay events
  - **Semantic memory = Stored throughout cortex**
    - – Raw facts and data



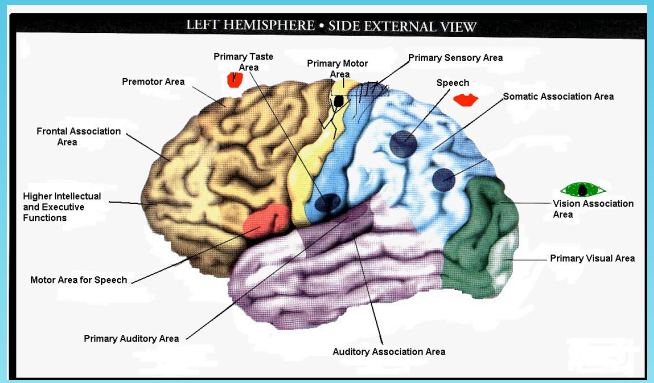
MEMORY AND LEARNING

- **Nondeclarative knowledge – how to do something**
  - **Basal ganglia**
    - Skilled behavior
    - Learned habits
- **Emotional aspects**
  - **Amygdala**
- **Motor learning with precise timing**
  - **Cerebellum**



MEMORY AND LEARNING

- **Speech/Language functioning**
  - **Receptive = temporal lobe**
  - **Expressive = frontal lobe**
- **Visual word reading**
  - **Visual cortex – words**
  - **Angular gyrus – matched with words spoke**
  - **Dyslexics – trouble with sounds/words and visual word match**



MEMORY/LEARNING in the classroom

- **Pre-expose learners to new material in advance**
  - **The more background they have, the more connections they'll make**
- **Discover student's background**
  - **Learn of their experiences**
  - **Present through all senses/styles**

MEMORY/LEARNING in the classroom

- **Help encode in memory**
  - **Down time**
  - **Emotions**
  - **Real life associations**
  - **Memory techniques**

MEMORY/LEARNING in the classroom

- **Teach thinking**
- **Questions promote better learning**
- **Give immediate, positive, dramatic feedback**

MEMORY/LEARNING in the classroom

- **Seven stage brain – based planning**
  - **1. Pre-exposure**
    - **Create a positive learning environment**
    - **Plan for movement, choice and brain wake-ups**

  - **2. Preparation**
    - **Context with real-life grounding**
    - **Begin with concrete experiences**
    - **Provide novelty**

MEMORY/LEARNING in the classroom

- **Seven stage brain – based planning**
  - **3. Initiation and Acquisition**
    - **NO to lock-step, sequential presentation**
    - **YES to initial virtual overload of ideas, details**

      complexity and meanings
    - **Follow with multiple intelligence activities**
    - **Provide choices**

MEMORY/LEARNING in the classroom

- **Seven stage brain – based planning**
  - **4. Elaboration**
    - **Presenting is not learning**
    - **Learning must be processed to own it**
      - **Provide discussion of previous material**
      - **Tie things together holistically**
      - **Have learners design an evaluation procedure**
      - **Online exploration, group mind-maps, question answer period, and/or students doing the teaching**

MEMORY/LEARNING in the classroom

- **Seven stage brain – based planning**
  - **4. Elaboration**
    - **Facilitate reviews that use all five senses**
      - **Encourage discussions**
      - **Use storyboards to present ideas**
      - **Make a video or audio tape**
      - **Create or redo a song, etc.**

MEMORY/LEARNING in the classroom

- **Seven stage brain – based planning**
  - **5. Incubation and memory encoding**
    - **Provide time for unguided reflection/down time**
    - **Have learners keep a learning journal**
    - **Provide stretching and relaxation exercises**
    - **Provide music**
    - **Ask students to discuss new learning with family and friends**

MEMORY/LEARNING in the classroom

- **Seven stage brain – based planning**
  - **6. Verification and confidence check**
    - **Functional integration only happens over time with repeated review.**
      - **Have learners present learning to others**
      - **Students interview and evaluate each other**
      - **Students write about what they've learned**

MEMORY/LEARNING in the classroom

- **Seven stage brain – based planning**
  - **7. Celebration and Integration**
    - **Provide sharing time**
    - **Play music, hang streamers and blow horns**
    - **Let class design a celebration**
    - **Invite another class, parents, principal or community guests to view projects**
    - **Incorporate the new learning in future lessons**

MEMORY/LEARNING in the classroom

- **Boost test scores**
  - Improve the original learning
  - Teach study skills
  - Review learning frequently
  - Rehearse the test
  - Teach student how to take various tests types
  - Prepare learners to manage themselves
    - Relaxation
    - Positive self-talk
    - Posture
    - Resting the eyes
    - High energy food and water before test

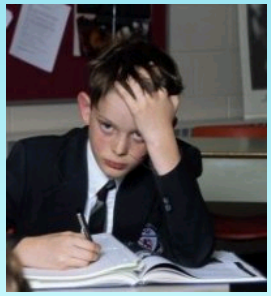
MEMORY/LEARNING in the classroom

- **Boost test scores**
  - **Tell them what they can and cannot do during the test**
    - **Walk around**
    - **Take a stretch**
    - **Chew on hard candy**
    - **Use learning aids**

  - **Discuss the test experience afterwards**
    - **Change study mode**
    - **Less stress**

MEMORY/LEARNING in the classroom

- **Brain-based discipline**
  - **Emotions can be expressed**
    - **Most discipline problems are inappropriately expressed emotions**
  - **Learners feel good**
  - **Boundaries and structure are respected**
  - **Learners learn more**
  - **Discipline problems diminish**
  - **More choice is offered**
  - **More learning is fostered**
  - **Less direct discipline is needed**
  - **Everyone wins**



LEARNING IS A MIND-BODY EXPERIENCE