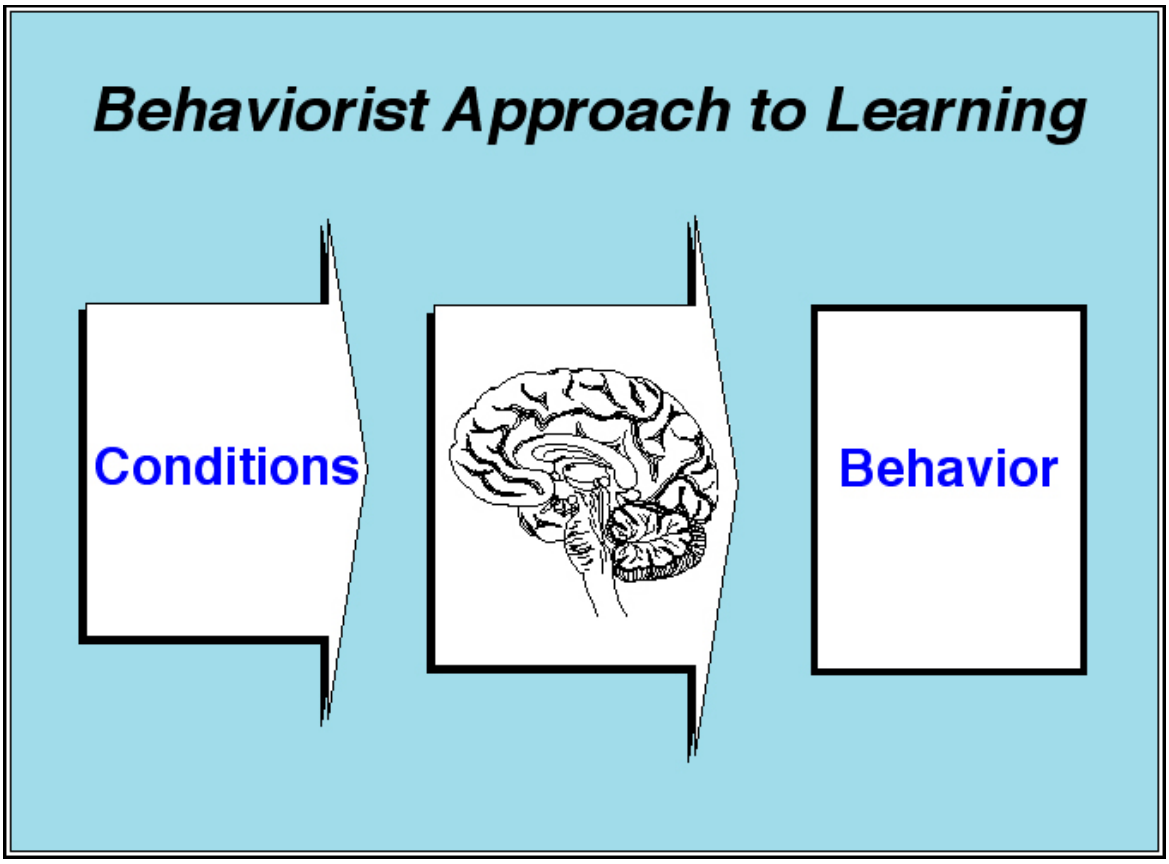


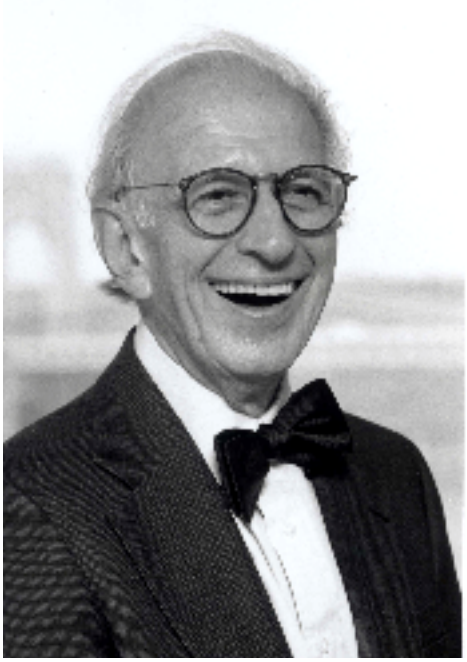
Teaching has been a folklore profession. We knew certain things seemed to work better than others but we didn't have a clue why. We learned from Watson and Skinner that if we set up certain conditions, something happens in the brain and at the other end we get behaviour. We didn't have a clue what went on in the brain but we knew that if we changed the conditions, we got a change in behaviour. The good news is that with all of the brain research being conducted today, we are developing a scientific basis for the art of teaching. We now understand why certain things work and other things don't work. Dr. Max Cynider from the UBC Brain Research Centre says that "About 90% of what we know about the human brain has been discovered in the last 5 years."

Imagine what will be happening in the next 5 or 10 years!

You have approximately 100 billion neurons in your brain. Each of these neurons has between 5,000 and 50,000 connections to other neurons. (One quadrillion connections between neurons in the cortex)

Mounting evidence suggests that glial cells, overlooked for half a century, may be as critical to thinking and learning as neurons are. The brain has 8 times as many glial cells as neurons. They are the catering service for the neurons and they seem to be the cells that help neurons migrate to where they are supposed to be. Neurons are formed in the base of the brain and migrate up to where they will spend the rest of their lives.

Types of Brain Research Useful To Trainers



Dr. Eric Kandel

Single Cell Research

Dr. Eric Kandel has been very interested in knowing what goes on in the brain as we learn, remember, forget something. What happens in the neurons? It was very difficult to study a human brain as it learns, so Dr. Kandel looked around the animal kingdom for a less complicated brain. The *Aplysia* sea slug was an ideal animal to study. It had only 20,000 neurons and they were huge. Each sea slug's brain is almost identical to every other sea slug's brain - probably because they have a rather limited culture. Human brains are all very different. He taught the sea slug something, dissected its brain, compared it to other sea slugs brains that had not been taught the new skill to see what happens as the brain learns. What he found was that as we learn, we grow new connections among the neurons. A newborn baby has relatively few connections. An adult has an incredible number. Dr. Kandel received the Nobel Prize for his work with *Aplysia* in 2001.

Knowing what happens in single cells of the brain helps us in understanding addiction and mental illness. The chart on the next page lists a few of the neurotransmitters that scientists know of at the present time. It also lists the similar drug or "duplicate key" for that neurotransmitter. If you saw the movie *Awakenings* with Robert deNiro and Robin Williams, you will remember people who had too little dopamine in the brain. They gave them L-Dopa, a drug that helps the brain manufacture dopamine. These people, instead of just sitting around, not moving, began to move around and communicate with other people. They gave them too much and they developed symptoms of schizophrenia. (Too much dopamine - schizophrenia, too little - Parkinson's)

"Getting Stupid" Discover Magazine March, 2001

When people are under the age of 25, they can do serious damage to the brain by taking part in binge drinking.

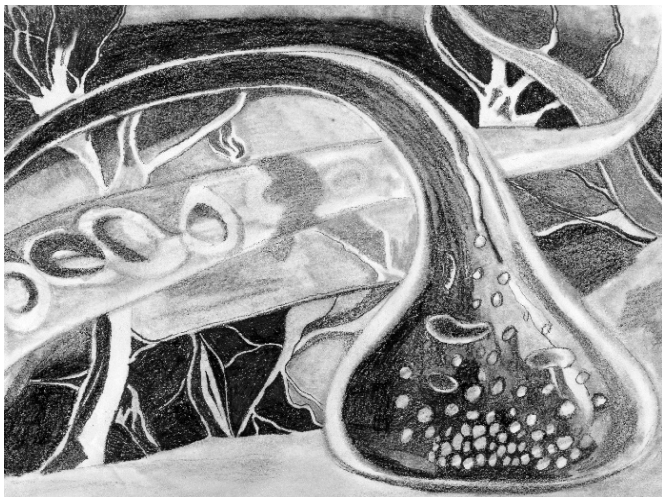
Binge drinking is defined as —

- for a male, 5 or more drinks
- for a female, 4 or more drinks

in one session at least once in a two week period.

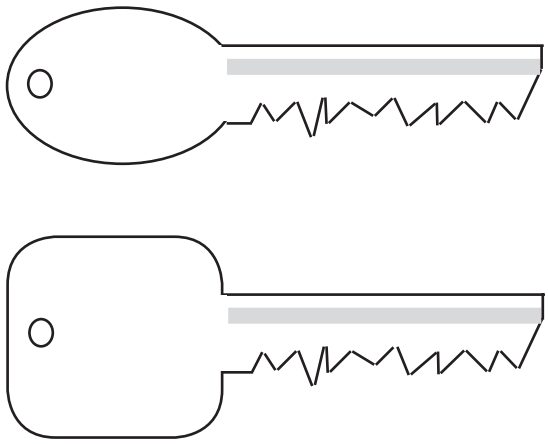
Young binge drinkers appear to be more susceptible to damage in the following 2 areas:

- the hippocampus
  - responsible for learning
  - puts memory into long term storage
- the prefrontal cortex
  - behind the forehead
  - the brain's chief decision maker
  - voice of reason, moral decision maker
  - executive control area of brain



Drawn by Chris King

Neurotransmitters leave one neuron and fit into receptor sites on another neuron, passing on the message from one neuron to another. Then they are sucked back up into the original neuron (recycled). Scientists know of more than 100 neurotransmitters but believe there are many yet to be discovered.



A Drug is like a
Duplicate Key for Neurotransmitters

During pregnancy, 250,000 new neurons are grown every minute especially during the first 28 weeks. It is important that nothing interfere with the migration of those neurons. Fetal alcohol syndrome can result if mothers drink during this period.

Neurotransmitter	Similar Drug
Acetylcholine	Nicotine
Dopamine	Cocaine
GABA (Gamma-aminobutyric acid)	Alcohol
Endorphine	Morphine
Norepinephrine	Caffine
Serotonin	Prozac

Video on “holes” in the brain — The Epidemic Continues: Kids, Drugs & Alcohol
Magic Lantern Communications Ltd.

The Young Adult Brain

Dr. Michael De Bellis, U of Pittsburgh Medical Centre used MRI to compare hippocampi of 14-21 year old young people who abused alcohol with those who did not. Those who drank more and had been drinking longer had smaller hippocampi (roughly 10% smaller.) That's a lot of brain cells.

The younger a person is when he or she starts to drink, the more likely he or she will become an alcoholic. 40% of the people who started to drink before age 15 became alcoholics compared to only 10% of those who began drinking at age 20 to 21.

Many scientists believe that adolescence is the worst time to expose the brain to alcohol, drugs or a steady dose of violent video tames. Dr. Jay Giedd from the National Institutes of Health has found that the brain's grey matter was thickening significantly in early adolescence. Brain thickening generally happens when tiny branches of brain cells bloom madly — this is called overproduction or exuberance. During periods of exuberance, the brain is highly receptive to new information — especially about survival skills. Prior to this, it was believed exuberance occurred only in younger brains. Now it has been found in teenage brains.

The teenager's increase in ability to resist temptation is linked to development of the prefrontal cortex which controls working memory, inhibition, impulse control. They have the passion and the strength but no brakes and they may not get good brakes until they are 25. Parents and teachers should talk through possibilities and options with teenagers — they have to function like a surrogate set of frontal lobes, an auxiliary problem solver. If you just tell them what to do, you can lose them. The best approach is to help them reason out the consequences of their behaviour.

The amygdala that helps prevent those "meet me outside" responses is filled with testosterone receptors. It grows faster in teenage boys than girls. This may help to explain fights in grades 6 & 7. The hippocampus is littered with estrogen receptors. It grows faster in girls than boys. This may help to explain why girls in grades 6 and 7 are better at memorizing spelling words.

The cerebellum is the most sexually dimorphic part of the brain. It is 14% larger in boys than in girls. This may explain why boys are better at spatial skills.

Teenagers appear to be on different time clocks than their parents and younger siblings. Most adults and little children are awake and ready for school or work at 8am. Researchers have found that teenagers in most cases are not ready for school until 10am.When we start school at 7am. students may sleep through math and English classes before 10am.

Two very good books on the Teenage Brain are the following:
The Primal Teen — What The New Discoveries About The Teenage Brain Tell Us About Our Kids by Dr. Barbara Strauch. (2003)
The Adolescent Brain — Reaching for Autonomy by Dr. Robert Sylwester (February, 2007)

Stress

Stress can kill neurons in the hippocampus by releasing cortisol which in normal quantities assists memory. In too heavy a dose, it kills the neurons. Three or more stressful incidents in a year (being fired, divorced, financial, etc.) triple the death rate of socially isolated middle-aged men. However, they have no impact whatsoever on the death rate of men who cultivate many close relationships.

Many studies have shown that people in groups often "catch" feelings from one another. The more cohesive the group, the stronger the sharing of moods, emotional history and even hot buttons. Cardiac care units where the nurses' general mood was "depressed" had a death rate among patients four times higher than on comparable units. (Schneider, 1995)

We like variety and change in our lives. Without it we become bored. However, in periods of rapid change, we can become very stressed. The stress reaction in the body can be very damaging.
We all need stress to live. When we are under stress, physiological changes take place that prepare us to flee or fight. This response is appropriate when we are in physical danger. It may be very damaging if the stress response is prolonged.

Concentrate on your goals. This will help reduce stress because your sense of mission will move you forward. Have a look at Victor Frankel's book - *Man's Search for Meaning*. He believes that one of the problems of modern day life is that a lot of people have failed to choose to have meaning in their lives so they are unhappy and anxious.

Frankel says, "There is no meaning to life. The only meaning to life we can have is the meaning we choose to give it." People who find their meaning by being "celebrities" without any substance, will often act out in bizarre ways. Those who choose to dedicate their lives to important things are usually very happy people. If you find meaning in your life, the meaning will carry you through even in periods in your life when you have tremenedous stress.

Confucius said, "If you devote your life to seeking revenge, first dig two graves."

Dr. Dean Ornish, MD, says "Forgiveness reduces the stress of the state of unforgiveness, a potent mixture of bitterness, anger, hostility, hatred, resentment and fear (of being hurt again).When I talk about forgiveness, I mean letting go, not excusing the other person or reconciling with them or condoning the behaviour, just letting go of your own suffering."

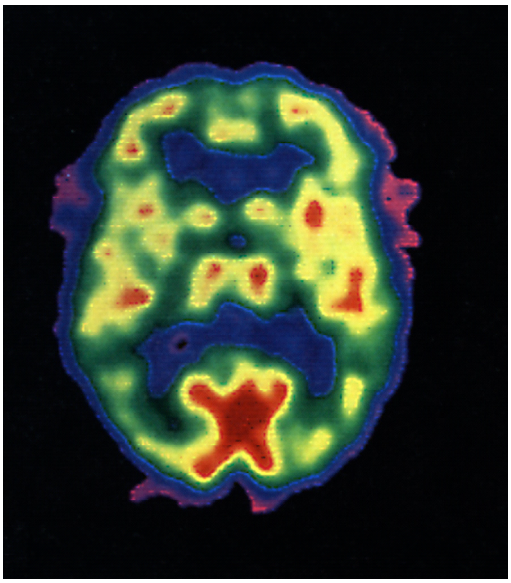
To see an excellent 18 minute video on Dr. Ornish's idea about health and how you can reduce your risk of sudden death from heart attack, stroke, etc. go to
http://www.ted.com/index.php/talks/dean_ornish_on_healing.html

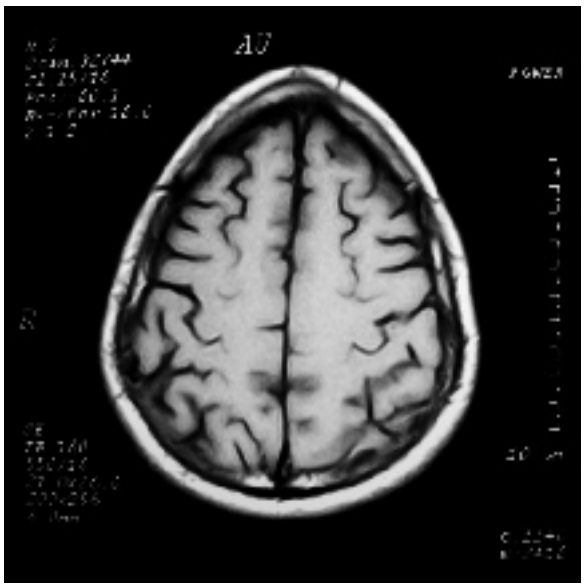
If you are not already a fan of www.ted.com, be sure to have a look. It is a tremendous site. The thinkers of the world are given 18 to 20 minutes to tell you about their best ideas. You will love it.

For more information on the effects of stress on the human brain, see *Why Zebras Don't Get Ulcers* by Dr. Robert Sapolsky (2005) (He gives all kinds of ideas on how to reduce stress, live longer and happier and he does it all in a very interesting, very humourous way. You will love this book.

Brain Imaging Research

The incredible increase in our knowledge of the brain recently has come about largely because of the new technologies that allow scientists to study the brain using brain imaging technologies including the following: PET - Positron Emission Tomography, MRI - Magnetic Resonance Imaging, SQUID Superconducting Quantum Interference Device, SPECT - Single-photon Emission Computerized Tomography, BEAM - Brain Electrical Activity Mapping and others.



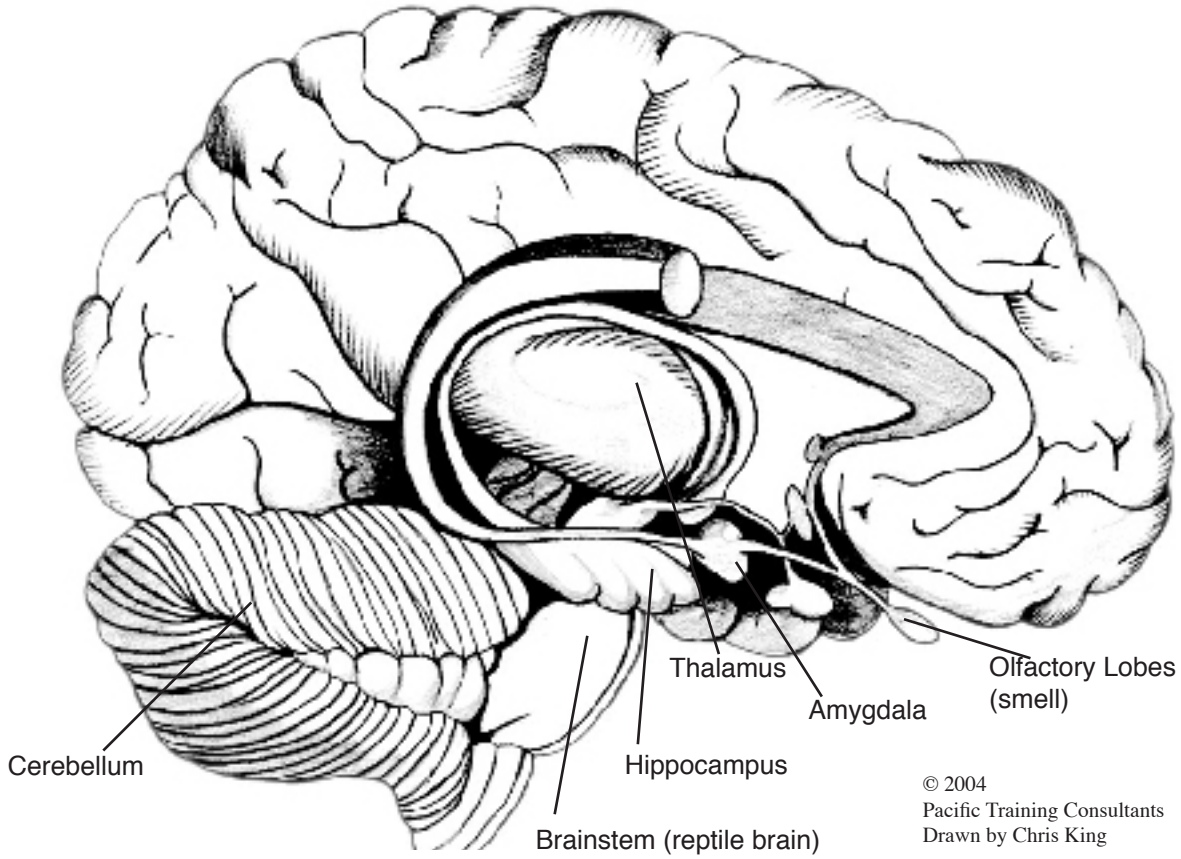


In the last few years, scientists have been able to conduct brain scans as a person thinks and see the results in real time. They can learn more in one afternoon using these brain imaging techniques now than they were able to learn in 20 years of inferential work with primates in the past. These imaging techniques have led to the explosion of knowledge about the brain in the last few years.

In the future, these images will be used to tell if someone is telling the truth or not. They can presently be used to diagnose all kinds of brain disorders, depression, schizophrenia, psychopathology, cancer, etc.

Serious Brain Injury Research

Phineas Gage and Henry M. are two people who have helped scientists learn a great deal about what happens when we damage parts of the brain.
Henry M. had the hippocampus removed from each side of his brain. He lost the ability to put things into long term memory. He now lives in a world of a few minutes. From his operation scientists learned one of the functions of the hippocampus — memory formation.
The amygdala is involved in memory formation and our emotions. This is why our memories and emotions are so interconnected.When you want to learn things get emotionally involved. Where were you September 5, 2001? Where were you September 11, 2001? (Flashbulb Memories)



Psychopathology

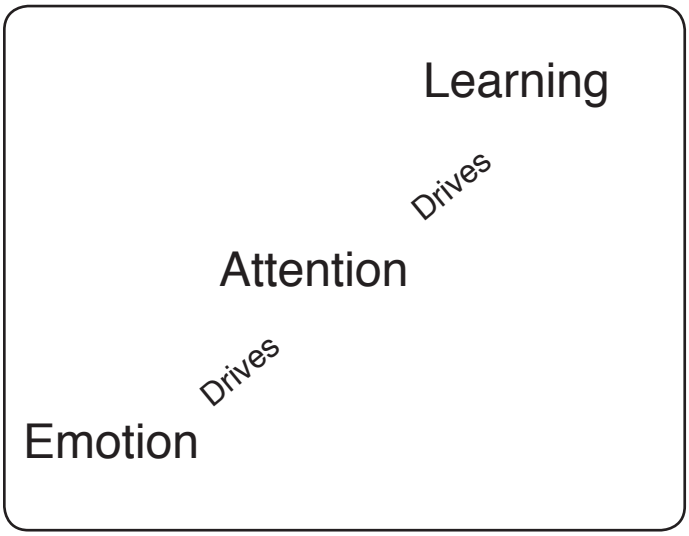
What causes psychopathology? A psychopath is a person who has no conscience, no empathy for others. Dr. Robert Hare from UBC has written very interesting books *including Without Conscience, The Psychopaths Among Us, and Snakes In Suits, When Psychopaths Go To Work*. Dr. Martha Stout has a similar book *The Sociopath Next Door*. Both authors say that psychopathology has a genetic link. Dr. Stout believes that people are born with the genetic predisposition to be psychopathic. However, she believes that whether or not a person has these genes turned on, depends on the culture in which he or she grows up. Dr. Stout says that in cultures (Buddhist, etc.) where the culture is not about "me", but about "we" or "oneness with others and nature", the rates of psychopathology are much lower than they are in the countries where the culture is very much about "me". Psychopaths are often attracted to certain professions where they have power and can manipulate others easily. How can we make sure Canada remains a "we" centred culture as much as possible?

What do we attend to?

We attend to things that involve

- emotion
- meaning

Anything that captures learners' attention and gets their minds engaged, has the potential to produce learning. If there is no attention and no engagement, there will be no learning. It is biologically impossible to learn anything unless you pay attention to it.



What information coming into the brain takes priority?

Information coming into the brain that affects survival takes priority over all other information coming into the brain.

Next, information that generates emotion takes priority.

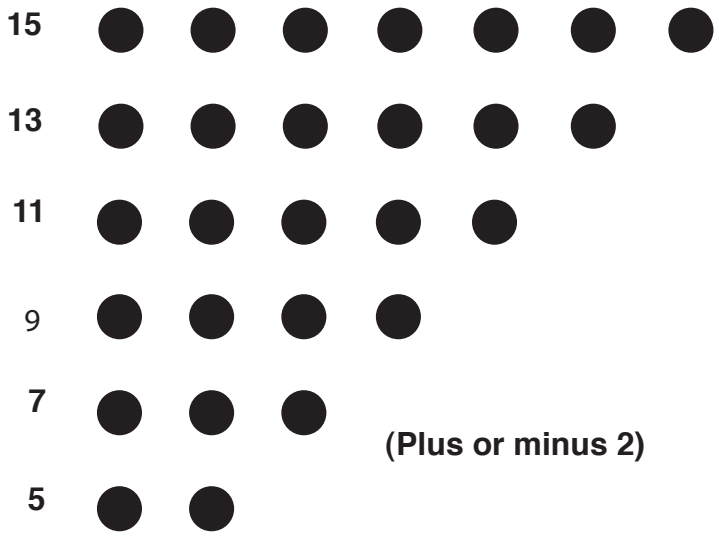
Finally, information for new learning receives priority if the survival and emotional concerns are taken care of. Maslow was right!

I think educators ought to be interested in the brain because they teach brains. If you're an instructor, you have about 30 of them in your room, and I can't imagine somebody who would teach a room full of brains who wouldn't be interested in brains. New developments are helping us to understand the teaching and learning process in ways we couldn't have imagined before this. . .If you're involved in the development and maintenance of a brain, you need a kind of knowledge that is more than folklore knowledge.

— Robert Sylwester, ASCD Interview, 1997

Memory - Space

The capacity of short-term memory appears to develop with age. The number of spaces increases by one unit every other year beginning at age three.



(Plus or minus 2)

Adults can work with 7 bits of information, plus or minus two, at one time.

The Cocktail Party Effect

The mind can pay attention to only one train of thought at a time. Don't let your students or kids fool you. They cannot listen to their Ipod, watch television, chat with 3 friends in chat rooms and do their homework well all at one time. If they attempt this, recent research shows they will store the homework info. in the wrong place and in the wrong way. They will find it difficult to use the new information in a mindful way.

Proceedings of the National Academies of Science, August 1, 2006

Chunking

A chunk is any coherent group of items of information that we can remember as if it were a single item. For example, if we have a chunk of letters that have meaning, they can be remembered as easily as a single letter (but carry much more information).

"The difference between novices and experts in a field appears to be that experts tend — because of a great deal of experience in a field — to organize information into much larger chunks, while novices work with isolated bits of information."

Benjamin Bloom

When you want to move something from short term to long term memory, think of all the ways you could

Describe it
Use it
Define it
Explain it

This will create rich, logical, emotional connections in your brain.

In order to place things into memory, they must have meaning and emotion.

Meaning

What meaning do you construct from this picture?

If you had never had any experience with the object you see, would you likely see it?

Our job as teachers is to help students experience things so they can construct meaning from them.

The Trivial Pursuit Model of Education

- **Overwhelming emphasis on factual knowledge**
- **Tests focus on facts and procedures**
- **Textbooks contain little "language of thinking"**
- **Emphasis is on "coverage"**
  (Remember the Battle of Hastings?)

Mindful Learning

A mindful approach to any activity has 3 characteristics: the continuous creation of new categories; openness to new information; and an implicit awareness of more than one perspective. Mindlessness, in contrast is characterized by an entrapment in old categories; by automatic behaviour that precludes attending to new signals; and by action that operates from a single perspective.

Being mindless, colloquially speaking, is like being on automatic pilot.

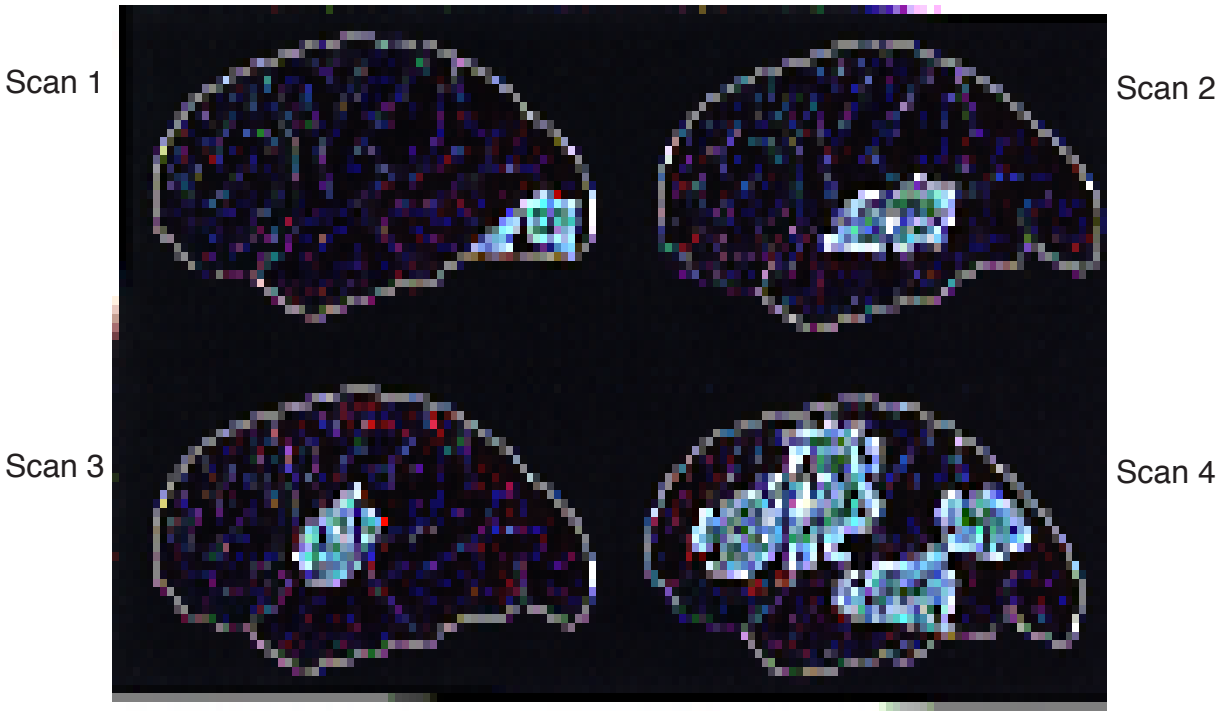
The Power of Mindful Learning

Cognitive Rehearsal Theory

"Research in Cognitive Psychology has found that if information is to be retained in memory and related to information already in memory, the learner must engage in some sort of cognitive rehearsal, restructuring, or elaboration of the material. For example, writing a summary or outline of a lecture is a better study aid than simply taking notes, because the summary or outline requires the student to reorganize the material and sort out what is important in it." (Slavin, Robert *Cooperative Learning — Theory, Research and Practice,* 1990)

One of the most effective means of elaboration is explaining the material to someone else. By asking your students to turn to their neighbour and explain what you just explained to them, you allow them to cognitively rehearse or process the information. This helps the person who is receiving the information as well as the person giving the information.

A number of studies have been carried out where students were asked to take one of two roles — recaller or listener. In some cases, students were asked to read and elaborate on some material while their partners were asked to actively listen. Students who were listening learned more than students who worked on their own. But students who were taking the role of elaborator learned the most of all.



Scan 1 - Student reading a textbook
Scan 2 - Student listening to a teacher
Scan 3 - Student recalling info. from past student
Scan 4 - Student teaching another

Unfortunately in many classrooms, too often the teacher's brain is like scan 4 and the students' brains are like scan 2. We need to increase the amount of time students are

Why Is Change So Hard For People?

In the last 20 years scientists have moved beyond the behaviourist model and the humanistic model of leadership to a new, far more accurate view of human nature and behaviour change which is based on an understanding of psychology (study of human behaviour) and neuroscience (study of the anatomy and chemistry of the brain).

The old reward and punishment approach (behaviourism) or the person-centred (humanistic) approach have not been very reliable in producing lasting changes in behaviour in high-functioning, smart employees. The new insights gained from neuroscience are capable of helping employees change behaviour more effectively than the old approaches.

In business, industry and government we all need to be able to bring about change in our organizations and in our own lives. We need to help our staff to change their behaviours to meet new situations. But changing behaviour is hard for people, even when their lives depend upon it. A 45 old man had a lung removed as a result of cancer. Two weeks after he was out of the hospital, he went back to smoking and died 2 years later when his only remaining lung also developed cancer. Have you ever been told by your doctor to lose weight, change your diet or exercise? Did you do it?

Many research studies on people who have undergone coronary bypass surgery found that only one in nine of these people, on average, chooses to adopt a healthier lifestyle. All of them are told they must change their lifestyles - lose weight, change diet, stop smoking, exercise, etc. or their lives will be at greater risk. But eight out of nine even though they clearly see the value of the changes, don't follow through. (Alan Deutschman, *Change or Die*) Eighty percent of the health care budget in the United States (and probably Canada as well) is consumed by five behavioural issues — too much smoking, drinking, eating and stress, and not enough exercise. Why do people find change so difficult even when their lives depend upon making the changes?

Leading change, whether you are in health care, business, industry or government is a tremendous challenge. John Kotter, Harvard Business School professor, says that when organizations want to bring about change, "The central issue is never strategy, structure, culture or systems. The core of the matter is always about changing the behaviour or people."

Kotter believes that "Behaviour change happens mostly by speaking to people's feelings. This is true even in organizations that are very focused on analysis and quantitative measurement, even among people who think of themselves as smart in an MBA sense. In highly successful change efforts, people find ways to help others see the problems or solutions in ways that influence emotions, not just thought."

Howard Gardner in *Leading Minds: An Anatomy of Leadership* writes "A leader is an individual (or, rarely, a set of individuals) who significantly affects the thoughts, feelings, and/or behaviors of a significant number of individuals. Most acknowledged leaders are 'direct.' They address their public face-to-face. But I have called attention to an unrecognized phenomenon: indirect leadership. In this variety of leading, individuals exert impact through the works that they create. Whether direct or indirect, leaders fashion stories: principally stories of identity. It is important that a leader be a good storyteller, but equally crucial that the leader embody that story in his or her life. When a leader tells stories to experts, the stories can be quite sophisticated; but when the leader is dealing

with a diverse, heterogeneous group, the story must be sufficiently elemental to be understood by the untutored, or 'unschooled,' mind." (Howard Gardner, *Leading Minds*)

When we look at great leaders, they all had a story. Martin Luther King said, "I have a dream". They all inspired us with a story that we could relate to and which involved our emotions.

When we are learning new habits, skills or attitudes, the prefrontal cortex of the brain is engaged. When you are asked to do something a little different at work, it is this prefrontal cortex that is activated. It takes this new information, policy, procedure and matches it against the old way of doing it.

For things that you have been doing the same way for a long time, the basal ganglia is activated. You hardly pay attention to this routine activity. However, when we are asked to change something, this new information is placed into working memory which is processed in the prefrontal cortex. It can only hold a certain amount of information and it tires easily. Therefore, things that you do over and over again, are pushed down into the basal ganglia the habit-centre of the brain. This allows your prefrontal cortex to process new information more efficiently.

When managers want to bring about a change in the organization, they have to realize that much of they do is so routine that the basal ganglia is taking care of it. Trying to change a routine, habit, behaviour in employees requires a lot of work for the prefrontal cortex. It requires the person who is making the change to pay attention to the new procedure or behaviour. This often makes people feel uncomfortable and they prefer to avoid change if they can.

There is a second reason that change is difficult for people. Our brains are very good at detecting "errors" — changes in the normal way of doing things. The area of the brain that detects these errors is the orbital frontal cortex which is found just above your eyes. The orbital frontal cortex has strong connections to the emotional brain. You have an amygdala (almond shaped) structure in the brain which is the seat of emotion. When these errors are detected, the orbital frontal cortex can activate the fear centre in the amygdala which can cause people to act emotionally and impulsively.

How Can We Lead Change?

Neuroscientists know that whether or not a person changes behaviour has a lot to do with where the person focuses his or her attention.

If you took psychology classes a few years ago, you were probably taught that we lose about 100,000 neurons a day throughout our adult life. These neurons die off all the time. You also were taught that you can't grow any new neurons during your lifetime. Both of these ideas are false. You do lose some neurons but not that many. The good news is that you grow new neurons as well. Some researchers estimate that you grow about 10,000 a day. Each of these neurons grows about 10,000 new connections to other neurons over the course of about four months. What these neurons are used for depends on what we focus on. If you focus on fear, anger, etc. these neurons are used to reinforce these feelings. If you focus on learning new skills, these neurons help you adapt and learn the new skills, knowledge or attitudes. So what you focus on becomes very important over a lifetime. If you are an accountant and you focus on finances all day, your brain is wired up to see the world in

a certain way. However, if you are a safety trainer, your brain focuses on issues related to safety and you see the world through very different eyes than the accountant, a person in human relations, a maintenance engineer or a lawyer would see it.

We all have mental maps of how we see the world. If a manager sees employees as lazy, incompetent people who need threats in order to produce good work, this view or mental map of the situation will shape his or her approach to leadership. In order to change behaviour we need to deliberately try to create moments of insight where people can see things differently. When we reach a new insight, a new way of seeing the world, we create new connections in the brain. We rewire our brains to allow us to try new behavours. If a customer service representative seems customers as a pain in the neck, but suddenly has an insight that these people really just want to solve problems and need information to do so, they can use this new mental map to change their behaviour very quickly. So as leaders, we need to work on helping people gain insights which create new mental maps.

When people attend courses, they may become excited about new ideas but when they go back to the job, relatively few things may be translated into action. However, with follow up coaching, researchers have been able to show that there can be dramatic changes in people's behaviour. Researchers often talk about *attention density*. When we are studying for an exam, we are often better off to spend 30 minutes a day over 5 days prior to the exam, rather than spend 150 minutes the night before the exam. In the long run, we remember more when we pay attention to what we are trying to learn over a period of time, rather than cramming it into one period.

Mindful learning takes place when we try to deeply understand a new idea. When we pay attention to it and try to understand it at a deep level, we create rich connections in the brain that help us to use the new information and see connections to other ideas.

There are three tasks that managers have which are among the most important things they do.
1. Hire well
2. Manage performance well
3. Help employees with their careers and learning plans.

To bring about change, you have to attend to the work of the employee, not as a cop trying to catch them doing something bad, but as a cheerleader, a nurturer of champions. By paying attention to their work, you put attention on the things you expect them to do and this "attention density" helps bring about the changes you need in the organization.

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Types of Memory

Procedural Memory

Habits, Motor Skills, Conceptual Skills

- **driving a car**
- **typing and "keyboarding"**
- **decoding and computing**

Does <u>not</u> involve conscious thought (except when first learning)

Rote rehearsal works in helping people to develop procedural memories.

Neurons that fire together, wire together. Practice makes permanent.

Declarative Memory

Semantic

Our general knowledge:

- **people, places, things**
- **What we learn in school: facts, concepts**

Acquired by learning

Episodic Memory

Our life experiences

- **specific events**
- **when and where**

Reconstructed over time. Details are not necessarily accurate.

"My memory of events improves with age, whether they happened or not."
Mark Twain

Mindful, elaborative rehearsal works well in helping people to develop semantic memories.

Think of the **best** teacher you have ever known.
Describe the key features or attributes of that person.
What impact did these attributes have on you?

(e.g. kind and thoughtful, knew her stuff, interesting.)

Characteristic	Type of Skill or Attribute		
	Technical	Intellectual	Emotional

Think of the **worst** teacher you have ever known.
Describe the key features or attributes of that person.
What impact did these attributes have on you?

(e.g. dishonest, didn't know the content, confusing, mean)

Characteristic	Type of Skill or Attribute		
	Technical	Intellectual	Emotional

Frames of Mind: The Theory of Multiple Intelligences
Howard Gardiner

Forms of Intelligence	Low/pathological	Normal Range of Human Ability	Gifted
Time/Sequence			
Linguistic			
Musical			
Logical/Mathematical			
Naturalistic			
Space/Place			
Spatial			
Bodily-Kinesthetic			
Personal/Social Awareness (Emotional Intelligence)			
Intrapersonal			
Interpersonal			
Existential			

Emotional Intelligence

Emotional Intelligence (EQ) is a much better predictor of a person's success in life than a person's IQ (Intelligence quotient) The subscales of emotional intelligence outlined by Dr. Reuven BarOn are as follows:

Intrapersonal

- Self-regard
- Emotional Self-Awareness
- Assertiveness
- Independence
- Self-Actualization

Interpersonal

- Empathy
- Social Responsibility
- Interpersonal Relationship

Adaptability

- Reality Testing
- Flexibility
- Problem Solving

Stress Management

- Stress Tolerance
- Impulse Control

General Mood

- Optimism
- Happiness

Dr. Reuven BarOn's emotional intelligence (EQi) test is available from MHS, 65 Overlea Blvd. Suite 210, Toronto, Ontario Canada, M4H1P1. Phone 1-800-268-6011. www.mhs.com

Emotional intelligence skills can be learned throughout the lifetime.
EQ usually peaks when people reach their 50's but it can increase throughout a lifetime.
The EQ Edge by Stephen Stein is an excellent resource for ideas on developing EQ.

We are hired for our qualifications.
We are promoted for our performance.
We are fired for our lack of interpersonal skills.

The Mankato Nuns

This group of nuns in Mankato, Minnesota are incredibly bright well up into their 90's and 100's. They are the world's largest group of brain donors. Dr. Snowden found that among the first 100 brains he dissected of these nuns, 44 had Alzheimer's. but only 4 of them had shown any symptoms of the disease while they were alive.

Use it or lose it is something that all neuroscientists agree on.

How to Make Your Dendrites Grow

1. Do puzzles. Crossword puzzles are great for you.
2. Try a musical instrument - new one if you already play.
3. Fix something.
4. Try the arts.
5. Dance, exercise. (Mice that exercised grew 20 to 30% more new neurons than those who did not)
6. Go out with friends or find new playmates.
   Date provocative people. (better yet, marry one of them)
   Be socially involved.
7. Turn off the TV or watch TV with others and discuss it.
8. Stock your life with rich experiences of all kinds.
9. Play with toys. Lots of them. Different ones.
10. Skip bingo. Play bridge or chess instead.
11. Learn to roll with the punches. Learn to forgive and forget.
12. Stay physically healthy. Manage stress - too much kills dendrites.
13. Keep your job. Don't retire, ever. If you must retire, look upon retirement as an opportunity to begin a new life.
14. Become an expert in something — anything.
15. Search for truth rather than settle for a good fantasy - challenge your brain. Newness and challenge are tremendously important.

Have a look at the 30 suggestions made by Richard Restak in his book Older and Wiser - How to Maintain Peak Mental Ability For As Long As You Live.

The more levels of education you have, the more likely you are to engage in mentally stimulating activities, and that's actually good for your brain. A study of more than 1000 people from age seventy to eighty showed that four factors seem to determine which oldsters maintain their mental agility:

- education, which appears to increase the number and strength of connections between brain cells.
- Strenuous activity which improves blood flow to the brain.
- Lung function, which makes sure the blood is adequately oxygenated.
- The feeling that what you do makes a difference in your life. Give your life meaning.

The brain is designed to process knowledge and information just as the digestive system is designed to process food or the lungs process oxygen. If food, oxygen or knowledge is cut off, the organism dies. It's that simple.

Richard Restak
Older and Wiser — How To Maintain Peak Mental Ability For As Long As You

The iBrain — How Is Technology Changing The Brain?

Dr. Patricia Greenfield, UCLA distinguished professor of psychology and director of the Children's Digital Media Center, Los Angeles, published a research report in the January issue of *Science*. Her findings indicate the following:

- reading for pleasure which has declined among young people in recent decades, enhances thinking and engages the imagination in a way that visual media such as video games and television do not.
- if we want to develop a variety of skills, no one media is good for everything. We need a balanced media diet. Each medium has costs and benefits in terms of what skills each develops.
- schools such make more effort to test students using visual media - ask them to prepare visual presentations (*Powerpoint* or *Keynote)*, for example. "As students spend more time with visual media and less with print, evaluation methods that include visual media will give a better picture of what they actually know" said Greenfield. "However most visual media and real-time media that do not allow time for reflection, analysis or imagination — those do not get developed by real-time media such as televison or video games. Technology is not a panacea in education, because of the skills that are being lost.
- Reading develops imagination, induction, reflection and critical thinking, as well as vocabulary. Reading for pleasure is the key t developing these skills. Students today have more visual literacy and less print literacy.
- She found that students who were given access to the internet during class and encouraged to use it during lectures did not process what the speaker said as well as students without access.
- Students who watched CNN without the news crawl across the bottom of the screen remembered significantly more facts than students who watch it with the distraction of the crawling text.
- Multitasking prevents people from getting a deeper understanding of the material.
- Certainly cab drivers, pilots, etc. need to be able to multitask, however, if you are trying to learn something that requires deep, sustained thought, multi-tasking is detrimental.
- Greenfield is concerned that 85% of video games contain violence. Multiple studies of violent video games have shown that they can produce many negative effects, including aggressive behaviour and desensitization to real-life violence.
- Surgeons who perform laparoscopic surgery (tiny camera inserted in the incision) and were good at videogames made 47 percent fewer errors and performed 39% faster in laparoscopic tasks than the worst video game players.

In a new book (January, 2009), entitled *iBrain: Surviving the Technological Alteration of the Modern Mind*, authors Gary Small, M.D. and Gig Vorgan have said the following:
Technology has helped our brains to learn to swiftly focus attention, analyze information and almost instantaneously decide on a go or no-go action. Many of us are developing neural circuitry that is customized for rapid and incisive spurts of directed concentration.
Digital evolution may well be increasing our IQ's and our ability to multitask without errors is improving. Some computer games can increase our cognitive ability, peripheral vision and multitasking abilities."
The neural circuits that control the more traditional learning methods are neglected and gradually diminished. The pathways for human interaction and communication weaken as one-on-one people skills atrophy. However, the authors are optimistic. "We can intentionally alter brain wiring and reinvigorate some of these dwindling neural pathways, even while the newly evolved technology circuits bring our brains to extraordinary levels of potential."

Five Minds for the Future

Dr. Howard Gardner

We live in a time of vast changes that include the following:

- accelerating globalization
- mounting quantities of information
- growing hegemony of science and technology
- clash of civilizations

These changes call for new ways of learning and thinking in life.

Dr. Howard Gardner believes we need the following 5 kinds of minds:

1. Disciplinary Mind (mastery of major schools of thought (including science, math, history) and at least one professional craft.

2. Synthesizing Mind - ability to integrate ideas from different disciplines into a coherent whole and communicate it to others

3. Creating Mind - Creativity could be defined as the process of having original ideas that have value. It is the capacity to uncover and clarify new problems, questions and phenomena

4. Respectful Mind - Awareness and appreciation for differences among human beings

5. Ethical Mind - Fulfillment of one's responsibilities as a worker and a citizen

For a bibliography of the books mentioned during this presentation and links to brain sites, go to the website on the front cover.

If you know of other books or websites that would be useful to people, please send them to me.at the email address on the front cover.

Bob

Be sure to see the following websites:

http://www.ted.com
Every summer 1,000 people go to California to hear some of the smartest and most creative people in the world share their ideas. Each speaker has 20 minutes. Some that I found particularly interesting are Ken Robinson on creativity, Al Gore on Climate Change, Michael Shermer on critical thinking and many others. Topics include education, creativity, biology, technology, and many others that you will find absolutely fascinating. This is a MUST SEE site.

> If you teach math, or biology, have a look at this one.
> Margaret Wertheim: The beautiful math that links coral, crochet and hyperbolic geometry
> http://www.ted.com/index.php/talks/margaret_wertheim_crochets_the coral_reef.html
>
> If you teach business, health, biology, geography, education, see this one,
> Bill Gates: How I am trying to change the world
> Talks about “How do we make a great teacher?”
> http://www.ted.com/talks/bill_gates_unplugged.html

All of these TED sites are covered under a Creative Commons license so you can use them in your classrooms for free.

http://brainconnection.com
This site has an excellent set of resources. You will enjoy the monthly column from Bob Sylwester and others.

http://www.dana.org
This is an excellent site. Be sure to see it. There is a terrific newsletter available on line that updates brain research.

http://www.sciam.com/
Scientific American has many articles on the brain and learning.

A

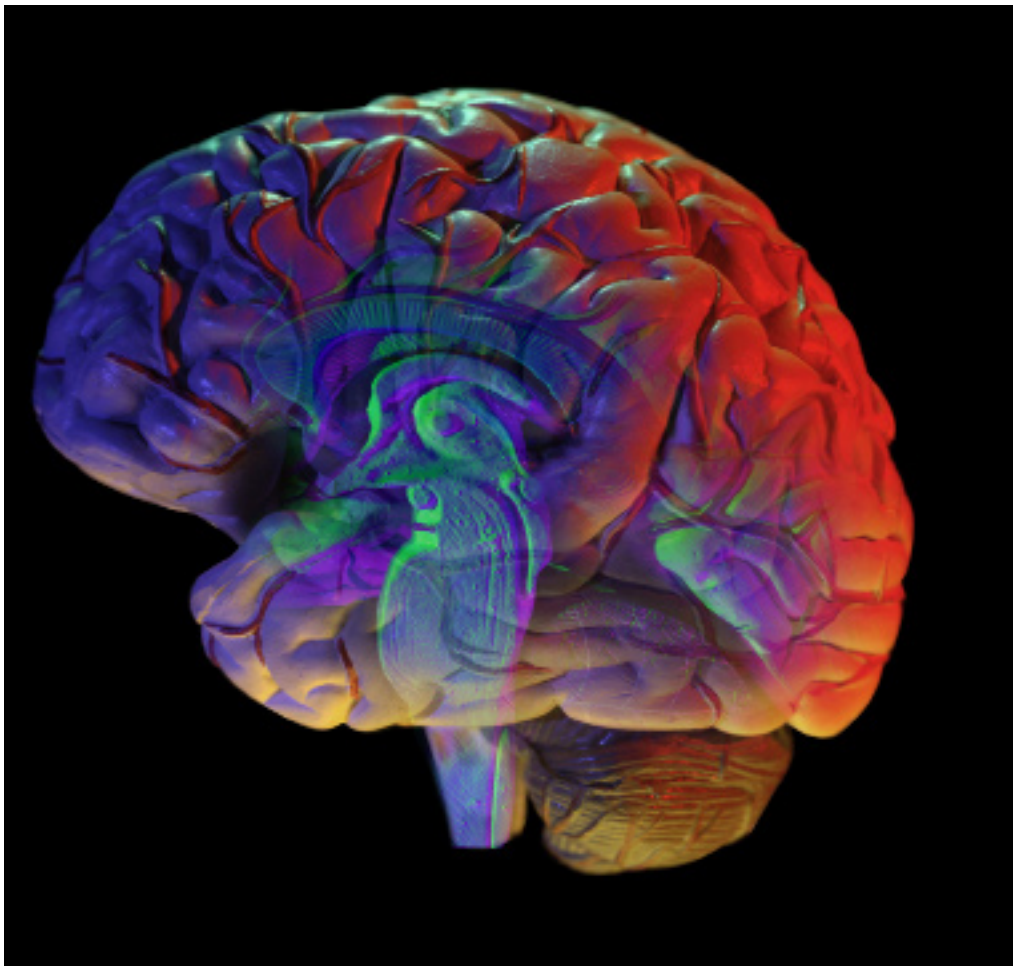
B

C

D

Please do not use this page for notes.
You will be ripping it up later.

Teaching & Learning With The Brain In Mind



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