



Impact of the Cognitive Sciences On Teaching

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Behaviorist Approach to Learning

Conditions



Behavior

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 leading and 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."

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) Scientists now know that we grow new neurons every day of our lives. If we use them, we keep them. If we do not bother to continue to learn, we lose them. What these new neurons are used for will depend upon what we spend time on each day. If they are used to think about fear and anger, they will be used to reinforce those feelings. Watching hours of Nancy Grace may not be the best thing for the brain.

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

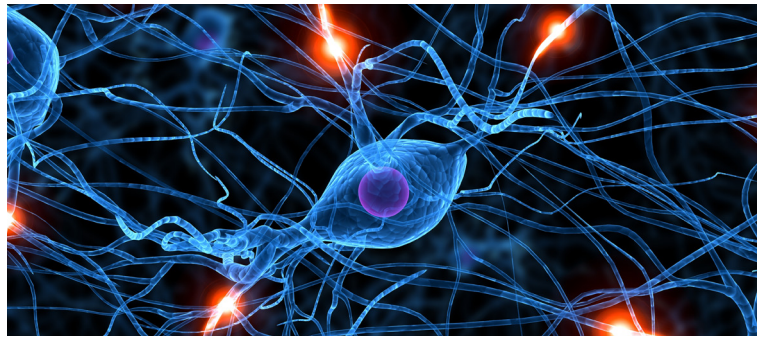
Single Cell Research



Dr. Eric Kandel

You grow about 10,000 new neurons every day. Over a four month period, each new neuron connects with about 5000+ other neurons.

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.



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 techniques 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. These imaging techniques have led to the explosion of knowledge about the brain in the last few years.

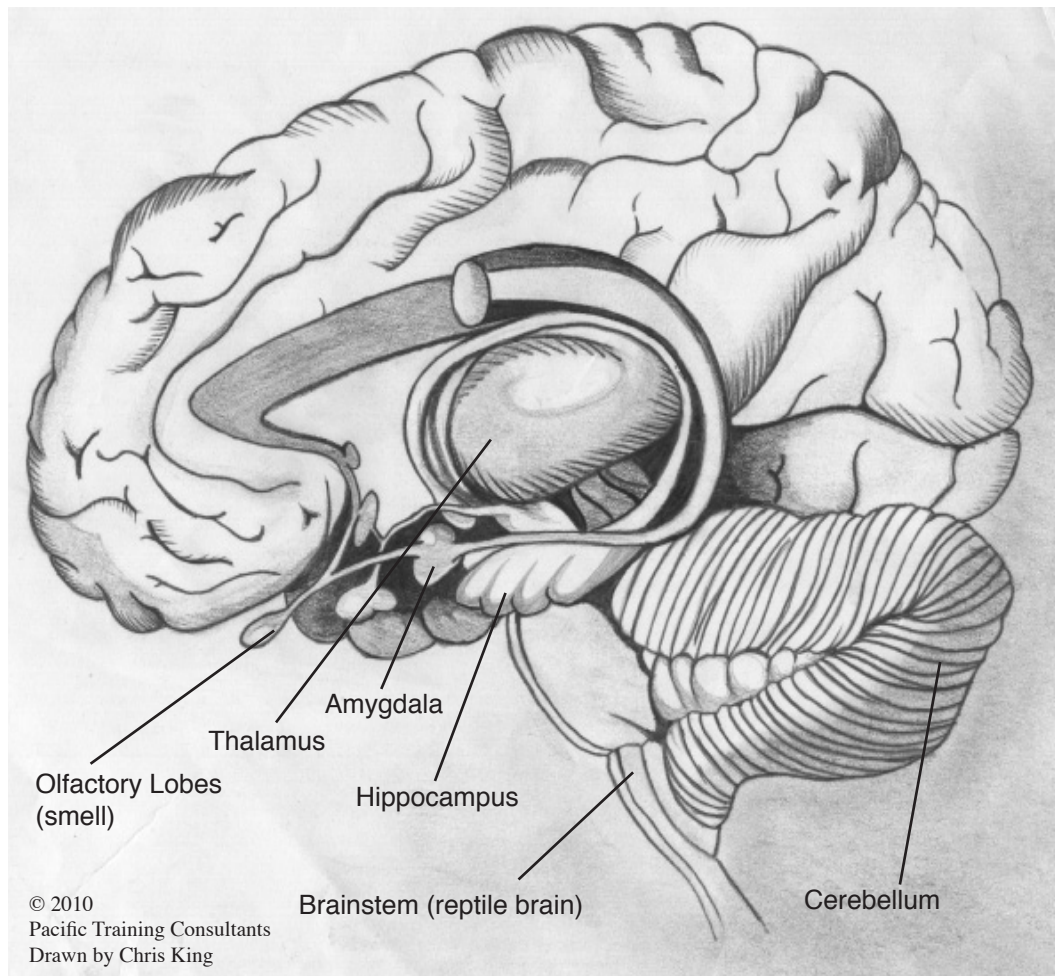


Serious Brain Injury Research

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

A psychopath has no conscience, no empathy for others. Check out Dr. Robert Hare's book - *Snakes In Suits, When Psychopaths Go To Work*. Dr. Martha Stout has a similar book *The Sociopath Next Door*. Dr. Stout believes that some 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. She 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?

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)

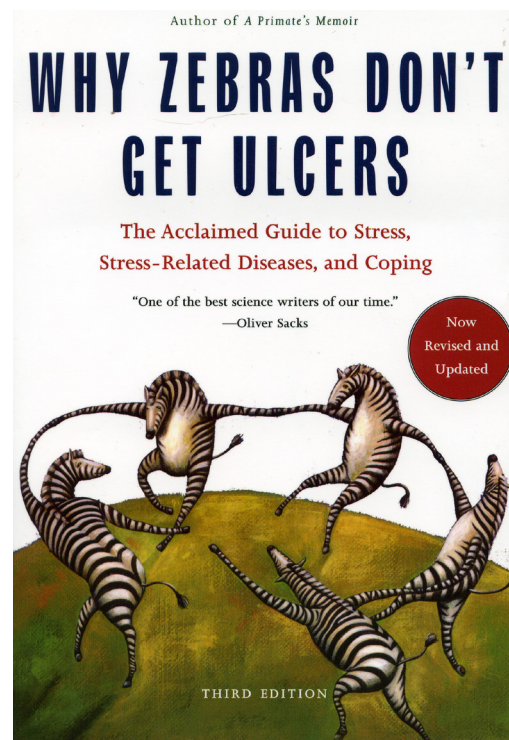
We like variety and change in our lives. Without it we become bored. However, in periods of rapid change, we can become very stressed. The stress reaction in the body can be very damaging.

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.

Adults who are 60 or older, who love their work and in the eyes of their peers are excellent at what they do, whatever the occupation — have one thing in common. They see their work as something greater than themselves. This quality has been called a sense of mission, a belief that one’s work contributes to something transcendent. For some, it is connected to a spiritual belief, for others to a social contribution or to the beauty of the work itself. To have this quality for ourselves we need to realize and question the worth of what we do, to inform our faith with reason.

For more information on the effects of stress on the human brain, see *Why Zebras Don’t Get Ulcers*

by Dr. Robert Sapolsky (2005)

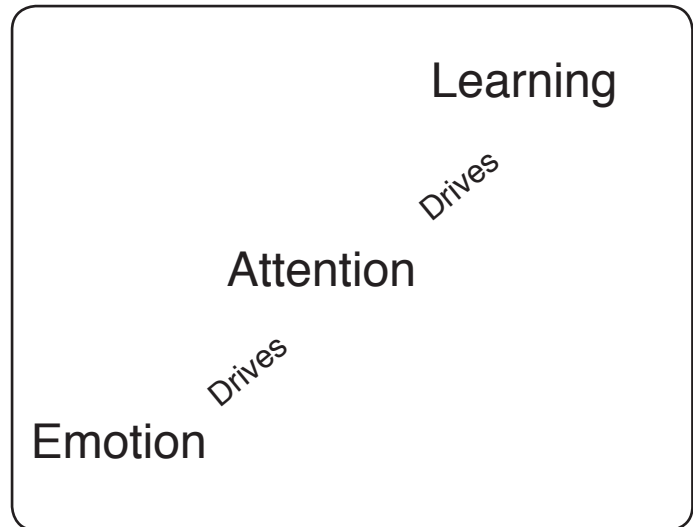


What do we attend to?

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.

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!

Empathy

Frans de Waal is doing some very exciting research on empathy and how it develops in animals. You can see his TED talk at ...

http://www.ted.com/talks/frans_de_waal_do_animals_have_morals.html

He believes humans are not the only animals who have empathy and compassion for others. He believes that all the great apes, and many other mammals can feel empathy for others. Dogs, dolphins, elephants etc. can express empathy for others species.

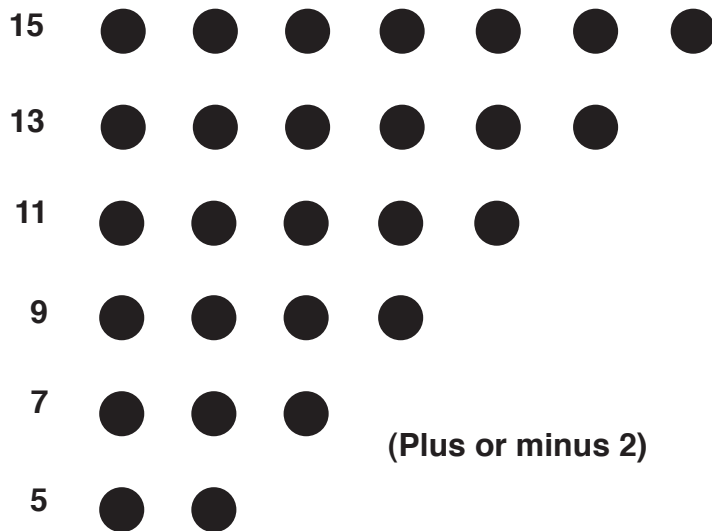
He believes that the fundamentals of morality are reciprocity, fairness and empathy, compassion. His TED talk is fascinating and very entertaining. His latest book is entitled *The Age of Empathy, Nature's Lessons For A Kinder Society*.

I think educators ought to be interested in the brain because they teach brains. If you're an instructor, you have about 30 or more 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

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.



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.



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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.

UBC study found clickers resulted in:

- 17% increase in A's
- 13% decrease in C's and D's
- 80% pass rate instead of 60%
- 87% said lectures were more engaging
- 34% increase in attendance

The Power of Mindful Learning
by Ellen Langer

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.

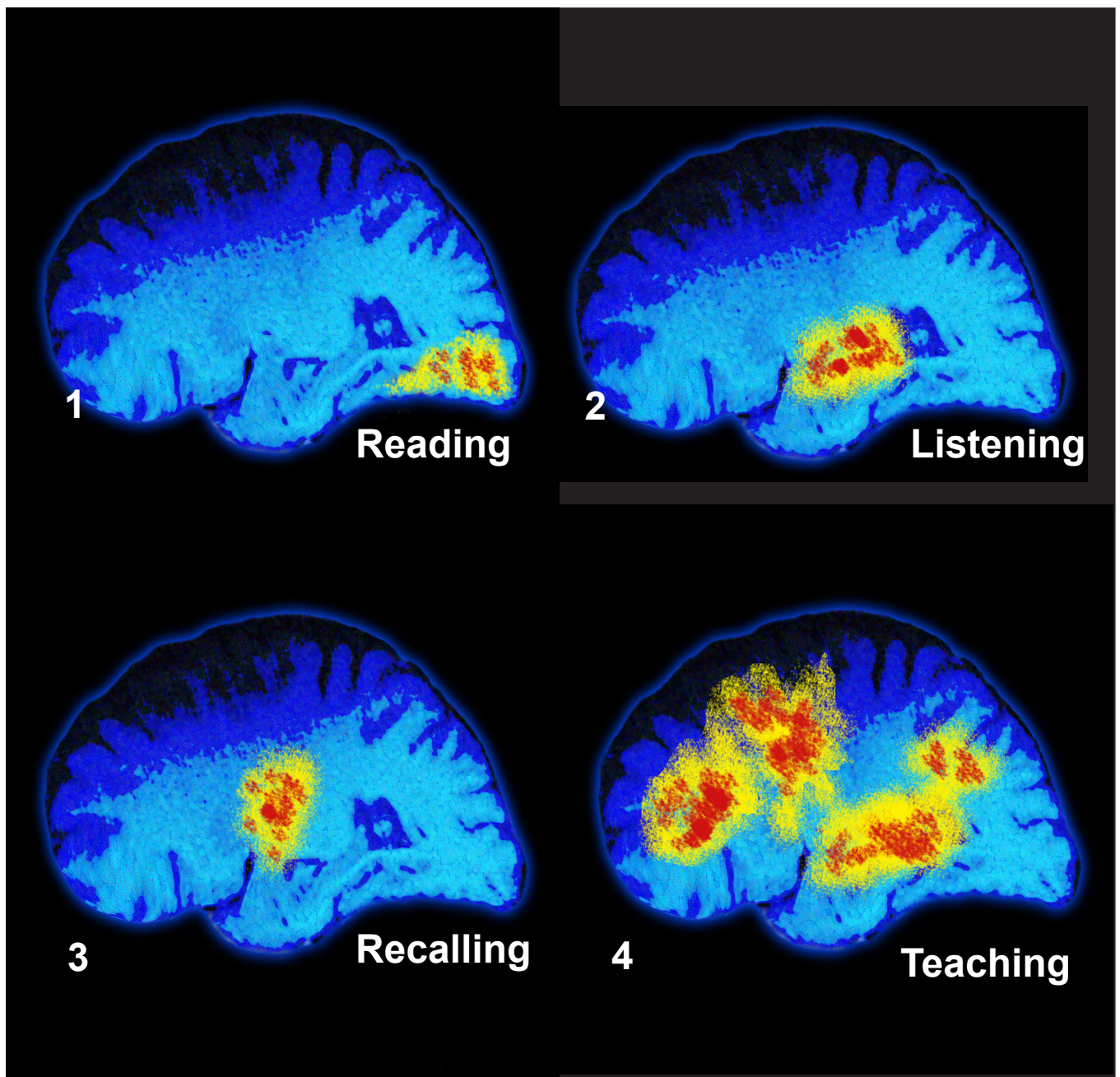
A number of studies have been carried out where students were asked to take one of two roles — recaller or listener. In some cases, students were asked to read and elaborate on some material while their partners were asked to actively listen. Students who were listening learned more than students who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

Want to Improve your Memory?

- Pay attention. Do what you are doing while you are doing it. Be where you are when you're there. Focus on the information you want to learn and exclude everything else.
- Use as many sensory faculties as possible when you come across something you want to learn. Read it. Write it down. Say it out loud. Act it out. Use as many of your senses as possible and this will help put it into long term memory.
- Imagine an image of the new information. Use humour or action in your image.
- Use memory pegs or other systems to help you remember. Study skills books will have several suggestions.

To Remember Textbook Material Use the PQ4R Method:

1. **Preview** - Read the introduction to a chapter, the headings, the summary.
Get an idea of what it is about.
2. **Question** - Ask questions based on the headings, etc. you have just read.
3. **Read** to answer the questions.
4. **Recite** the answer in your own words
5. **Rite** out the answer under the question
6. **Review** - prior to the time you need to remember it, review your written answers from step 5. Reviewing it several times will put it into permanent memory.



Scan 1 - Student reading a textbook
Scan 3 - Student recalling info. from past

Scan 2 - Student listening to an instructor
Scan 4 - Student teaching another student

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 using their whole brain as in scan 4. Active learning, etc. can do this.

Five Kinds of Minds

By Dr. Howard Gardner

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

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

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

What are the implications for us as instructors?

Dr. 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 wrote 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 of differences among human beings.
5. Ethical Mind – Fulfillment of one's responsibilities as a worker and a citizen

***Aerobic exercise two times a week
cuts your risk of Alzheimer's Disease by
60%***

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

Types of Memory

Procedural Memory

Habits, Motor Skills,
Conceptual Skills

- driving a car
- typing and “keyboarding”
- decoding and computing

Does not 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.**

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

Adaptability

Reality Testing
Flexibility
Problem Solving

Stress Management

Interpersonal

Empathy
Social Responsibility
Interpersonal Relationship

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 Dr. 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. He believes that you can put off the onset of Alzheimer's by up to 15 years by keeping the brain active. Exercise, learning new things, keeping socially connected, watching your blood pressure and choosing your parents wisely are all things that can protect you from Alzheimer's. **Use it or lose it** is something upon which all neuroscientists agree.

Ideas from:

***The Secret Life of the Grown-Up Brain -
The Surprising Talents of the Middle-Aged Mind***
By Dr. Barbara Straugh

“If we maintain good brain health, we build better scaffolding and our capacity to adapt continues.” The idea is that if you don’t look after your knees when you are in your teens and 20’s, you will miss them when you are in your 70’s. If you look after your brain in your younger years, it will be there for you in your elder years.

Patricia Reuter-Lorenz sums it up this way, “There’s been a shift from the dismal characterization of aging as an inevitable process of brain damage and decline. Instead, the emerging story is that aging can be successful, associated with gains and losses. It is not necessarily a unidirectional process but rather a complex phenomenon characterized by reorganization, optimization, and enduring functional plasticity that can enable the maintenance of a productive and happy life.”

Some researchers suggest that because the two sides of our brains become more integrated as we age, this bilateral use of brainpower is *the* key ingredient in the power and creativity of our middle-aged brains.

Bilingual adults have smaller age-related declines in their brain function. According to Straugh, this suggests that adults who use more of their brains early on may be in better shape in a variety of cognitive tasks as they age.

Gene Cohen in *The Mature Mind* says, “The left and right hemispheres become better integrated during middle age, making way for greater creativity. The neurons themselves may lose some processing speed with age, but they become ever more richly intertwined, letting us see bigger patterns, have bigger thoughts, reaching, he believes, the level of art.”

Richard Restak wrote in *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.

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 or clients 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 a education, 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, 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 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. He goes on to say that it is important for a leader to be a good storyteller. The story must match the sophistication of the audience.(Howard Gardner, *Leading Minds*)

When we look at great leaders, they all had a story. Martin Luther King said, “I have a dream”. John Kennedy said “Ask not what your country can do for you. Ask what you can do for your country.” 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.

When you are doing things that you have done a lot, you do not have to use the prefrontal cortex, your brain pushes this thought process down into the basal ganglia. You don’t have to spend much energy on it. Your brain weights about 3 pounds, but it uses 25 percent of the energy you consume. So in an effort to conserve energy, the basal ganglia will do familiar work while the frontal lobes work on new problem solving. This allows your frontal lobes to process the new information more effectively.

When managers want to bring about a change in the organization, they have to realize that much of what 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. 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 food services manager, 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 behaviours. 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 leaders 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.

As Tom Peters says, to bring about change, you have to attend to the work of the employee, not as a cop, a naysayer, a devil's advocate, trying to catch them doing something bad, but as coach, 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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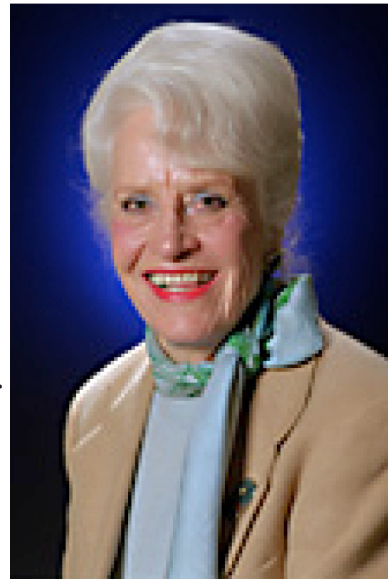
Marian Diamond has found five factors that are responsible for keeping the brain healthy and active for a lifetime.

- Optimal diet
- Exercise
- Newness and challenge
- Strong immune system
- Love and nurturing

Telomeres found on the ends of chromosomes can be damaged by stress and/or negative thinking. This can lead to a person aging faster.

To decrease your rate of aging, develop a positive attitude, exercise, meditate and use other stress reducing techniques.

Anything that is good for your heart is good for your brain!



Dr. Marian Diamond
Neuroanatomy
U. of C. — Berkley

Sleeping, Dreaming and Learning

Rats that have their sleep interrupted have difficulty remembering the same maze the next day. Rats that got a good night's sleep had no problems in remembering how to run the maze. Similar research was carried out with college students who were taught something and then tested on it later. If they were able to have a night's sleep or even a nap before testing, they did better than students who did not have sleep.

Adults and young children are awake and ready for school or work at 8am.

Teenagers, on average, don't wake up until 10am. Their circadian rhythms are different than adults.

Sleeping and dreaming are incredibly important to learning and memory.

Dr. Bob Stickgold, Director, Center for Sleep & Cognition, Beth Israel Deaconess Medical Center, Boston & Associate Professor of Psychiatry, Harvard Medical School and a pioneer in the research on memory, sleeping and dreaming has said, "Sleep plays a critical role in determining what we remember and how we remember it. Sleep not only stabilizes new memories, but also (i) enhances recently learned skills, (ii) extracts patterns and rules, (iii) integrates new information with older memories into rich networks and (iv) selectively enhances the most important aspects of memories, distilling their gist and pruning away unnecessary details. When sleep-dependent processes fail, psychiatric disorders can follow, including depression and ADHD. Indeed, PTSD may result specifically from a failure of the sleeping brain to process traumatic memories properly."

If you want to improve your memory, get more sleep!

Notes:

For a list of the books referred to in this talk or for websites that are useful to teachers and others interested in the cognitive sciences go to:

<http://instructordiploma.com/core/bob.htm>

or

<http://instructordiploma.com/bob>

Or, Phone or email me

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