

Start Accessing the Brain for College Success.

Eric Jensen Learning offers clear, practical, cutting-edge solutions to learning using the latest neuroscience research. Every one of Eric Jensen's trainings combines clear, compelling research in easy-to-understand language with practical strategies that can be implemented immediately. He offers a variety of workshops about the brain and learning. (www.jensenlearning.com)

Knowledge of how the brain learns is important information for NWFSC students to be successful in their classes.

- The brain is closely involved in and connected with everything students do in college;
- Any disconnect is a recipe for frustration and potentially, a disaster;
- Three words best describe how the brain learns: engagement, strategies and principles;
- The brain must be engaged in academic classes to learn information;
- Strategies that are learned in SLS are based on real science and help students to be successful in their college classes;
- Principles which are presented in classes have patterns and connections; the brain seeks to identify patterns and connections for learning to occur.

Brain Principle One

Research has confirmed that exercise and movement support learning and are critical to academic success.

- Science has proven that individuals can grow new neurons throughout their lifetimes (neurogenesis);
- These neurons are highly correlated with memory, mood and learning;
- This process can be regulated by everyday behaviors, which includes exercise.

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- The optimal physical activity is voluntary gross motor, such as power walks, playing games (not on the computer), running, dance, aerobics, team sports and swimming;
- Movement helps the brain to make more efficient connections;
- These connections support academic learning;
- Bottom line, exercise helps the brain to learn better.

Practical applications: Physical activity is important to learning. It raises the good chemicals for thinking, focus, learning and memory (noradrenalin, dopamine and cortisol). Students need 30-60 minutes of physical activity per day to lower stress response, boost neurogenesis (growth of new brain cells) and boost learning. Additionally, walking while studying notes on index cards raises the good chemicals for thinking, focus, learning, and memory. So, students need to get out of the chairs or beds and start moving.

Bruel-Jungerman E, Laroche S, Rampon C.(2005) Eur J Neurosci. New neurons in the dentate gyrus are involved in the expression of enhanced long-term memory following environmental enrichment. Jan;21(2):513-21.

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Pereira AC, Huddleston DE, Brickman AM, Sosunov AA, Hen R, McKhann GM, Sloan R, Gage FH, Brown TR, Small SA. (2007) An in vivo correlate of exercise-induced neurogenesis in the adult dentate gyrus. Proc Natl Acad Sci U S A. Mar 27;104(13):5638-43.

Ratey, J. (2008) Spark: The revolutionary new science of exercise.

Brain Principle Two

Social conditions influence the brain in multiple ways never known before.

- College behaviors are highly social experiences, which become encoded through a sense of reward, acceptance, pain, pleasure, coherence, affinity and stress;
- In fact, poor social conditions, isolation or social “defeat” are correlated with fewer brain cells!

Nobody knew this occurred in brain cells five or ten years ago.

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Practical college application: Students should not randomly group for social experiences for more than 10-20% of the school day if the brain is to be influenced in a positive way to build a community of learners.

- Targeted, planned, diverse social groupings with mentoring, teams and buddy systems (study groups) help increase brain cells;
- Students should work to strengthen pro-social conditions;
- Teacher-to-student relationships matter as much as student-to-student relationships.

Students should form study groups to review material that is covered in classes. Additionally, students should contact instructors as soon as problems of understanding class content come up during the semester.

Citations: Champagne FA, Curley JP. (2005) How social experiences influence the brain. *Curr Opin Neurobiology*. Dec;15(6):704-9.

R. M. Sapolsky (2005) The Influence of Social Hierarchy on Primate Health Science, April 29; 308(5722): 648 – 652.

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Brain Principle Three

The brain changes! All students should know that the brain can and does change every day. In fact each student's brain is changing in school. The ability of the brain to rewire and remap itself is called neuroplasticity.

- Students can influence this process through skill building, reading, meditation, exploring the arts, exploring career possibilities, and building critical thinking skills which increase student success;
- The evidence is compelling that when the correct skill-building strategies are used by students, positive and significant changes can be produced in the brain in a short period of time;

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- Without understanding the principles of how the brain changes, students can waste time and money and can be unsuccessful in their classes;
- Neuroscience is exploding with discoveries about the brain being extremely malleable;
- Outdated beliefs stated that IQ was a result of either genes or experience;
- Research has proved that it can be a hybrid of both! New research has explored the mechanisms for epigenetic (outside of genes) changes;
- Students can upgrade their capacity for memory, processing, sequencing, attention and impulsivity regulation by applying research based strategies to study.

Practical college application: Students should schedule 30-90 minutes a day and 3-5 times of study time per week to upgrade their skill sets. Students should practice focus skills, memory skills and processing skills. Progress requires focus, “buy-in” and at least a half hour a day of practice. The following are links to online programs that build memory and focus skills:

<http://www.soakyourhead.com>
<http://www.happy-neuron.com/games/#memory>
<http://www.neuroactiveprogram.com/EN/CBTmini/popnap.php?rez=1920&gclid=CNG-wcGgiJoCFRYiagodMDQ7LQ>
<http://www.happy-neuron.com/games/#attention>
<http://www.playattention.com/adhd/>

Citations: Ball K, Edwards JD, Ross LA. (2007) The impact of speed of processing training on cognitive and everyday functions. *J Gerontology B Psychology Science Soc Sci.* Jun;62 Spec No 1:19-31.

Draganski B, Gaser C, Busch V, Schuierer G, Bogdahn U, May A (2004) Neuroplasticity: changes in grey matter induced by training. *Nature* 427:311-312.

Jonides, J. (2008) “Musical Skill and Cognition” Pgs. 11-16. In “How Arts Training Influences Cognition” in “Learning, Arts, and the Brain: The Dana Consortium Report on Arts and Cognition” Organized by: Gazzaniga, M., Edited by Asbury, C. and Rich, B. Published by Dana Press. New York/Washington, D.C. web access: www.dana.org.

Polley DB, Steinberg EE, Merzenich MM. (2006) Perceptual learning directs auditory cortical map reorganization through top-down influences. *J Neurosci.* 2006 May 3;26(18):4970-82.

Brain Principle Four

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Chronic stress is a real issue at college for students. Recent studies suggest 30-50% of all students feel moderately or greatly stressed every day. These pathogenic allostatic stress loads (dangerous stress loads) are becoming increasingly common and have serious health, learning and behavior risks.

- Stress affects attendance, memory, social skills and cognition;
- Some stress is good; chronic or acute stress is very bad for behavior and learning.

Practical college application: Students should practice coping skills. Deep breathing exercises greatly help to reduce stress. Participation in daily physical activity also lowers stress. Joining a study group is another way to reduce stress. These activities increase sense of control over one's life, which lowers stress. All of these can reduce the impact of stressors.

Citations: Johnston-Brooks, C. H., Lewis, M. A., Evans, G. W., & Whalen, C. K. (1998, Sep-Oct). Chronic stress and illness in children: The role of allostatic load. *Psychosomatic Medicine*, 60(5):597-603.

Koomen, H. M. & Hoeksma, J. B. (2003, Dec). Regulation of emotional security by children after entry to special and regular kindergarten classes. *Psychological Reports*, 93(3Pt 2): 1319-34.

Brain Principle Five

Brain research indicates that brains are unique. How common it is to have a "healthy brain"? Of those who responded to the UCLA "healthy brain" student advertisement and considered themselves to be normal, only 32% passed the initial telephone screening process. Of those who qualified for the in-person health history and physical examinations, only 52% passed the screening procedures. Students share 99.5% of the same DNA but have unique brains because of unique life experiences and gene-expression.

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The actual study concludes by saying, "The majority of individuals who consider themselves normal by self-report are found not to be so". Almost 90% of human brains are atypical, damaged or in some way not healthy. That does NOT mean that many students have not compensated; they have.

Practical college application:

Successful students validate the differences in individuals. Students should celebrate diversity, unique abilities, talents and interests of all individuals. Students should learn the skill sets and strategies demonstrated in College Success that are needed to succeed in college.

Citations: [Mazziotta JC, Woods R, Iacoboni M, Sicotte N, Yaden K, Tran M, Bean C, Kaplan J, Toga AW;\(2009\) The myth of the normal, average human brain--the ICBM experience: \(1\) subject screening and eligibility. Neuroimage. Feb 1;44\(3\):914-22.](#)

Brain Principle Six

New evidence suggests the value of learning content in even smaller chunk sizes. Why? The old thinking was that students could hold seven plus or minus chunks of information in the brain as capacity for working memory. But that science is outdated. The new research says two to four chunks of information are more realistic.

- In addition to this shorter capacity for working memory, the hippocampus, the "holding tank" for content, has a limitation on how much it can hold;
- It is overloaded quickly, based partly on learner background and subject complexity

There are other reasons students get overloaded quickly with content. Learning and memory consume physical resources such as glucose and the brain uses this quickly with more intense learning.

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Practical college application: Students should study difficult material in small chunks, process the learning, and then rest the brain. No learning occurs when too much content is learned in too small of a time span. The brain cannot process it.

- Breaks and downtime make more sense than trying to study more content;
- The guideline: the less background the student has and the greater the complexity of the content, the shorter time to learn the chunk of content (4-8 minutes should be enough).
- The greater the background knowledge, the less the complexity of the subject, the longer the time the student can take to learn the material (8-15 min. is acceptable).
- Under no condition, should there be more than 15 consecutive minutes of content input.
- Students should always allow time for processing the material.

Citations: Gobet F, Clarkson G. (2004) Chunks in expert memory: evidence for the magical number four... or is it two? *Memory*. 2004 Nov;12(6):732-47.
Cowan, N. (2001, Feb). The magical number 4 in short-term memory: A reconsideration of mental storage capacity. *The Behavioral and Brain Sciences*, 24(1):87-114.

Brain Principle Seven

Five neuroscience departments at five universities (University of Oregon, Harvard, Univ. of Michigan, Dartmouth, and Stanford) have recently completed projects studying the impact of arts on the brain. They show that art and music boost attention, working memory, and visual spatial skills. Other arts such as dance, theater and drama boost social skills, empathy, timing, patience, verbal memory and other transferable life skills.

Practical college application: Research suggests that individuals get the most value from 30 to 60 minutes a day three to five days a week from some type of art experience. Arts support the development of the brain's academic operating systems in ways that provide many transferable life skills.

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Citations: Posner, M., Rothbart, MK, Sheese, BK, and Kieras, J. (2008) "How Arts Training Influences Cognition" Pgs. 1-10. in "Learning, Arts, and the Brain: The Dana Consortium Report on Arts and Cognition" Organized by: Gazzaniga, M., Edited by Asbury, C. and Rich, B. Published by Dana Press. New York/Washington, D.C. web access: www.dana.org.

Jonides, J. (2008) "Musical Skill and Cognition" Pgs. 11-16. In "How Arts Training Influences Cognition" in "Learning, Arts, and the Brain: The Dana Consortium Report on Arts and Cognition" Organized by: Gazzaniga, M., Edited by Asbury, C. and Rich, B. Published by Dana Press. New York/Washington, D.C. web access: www.dana.org.

Spelke, E. (2008) Effects of Music Instruction on Developing Cognitive Systems. at the Foundations of Mathematics and Science. " Pgs. 17-50 In "How Arts Training Influences Cognition" in "Learning, Arts, and the Brain: The Dana Consortium Report on Arts and Cognition" Organized by: Gazzaniga, M., Edited by Asbury, C. and Rich, B. Published by Dana Press. New York/Washington, D.C. web access: www.dana.org.

Brain Principle Eight

Humans have the remarkable capacity to display many emotions, but only six of them (anger, disgust, fear, joy, sadness, & surprise) are "hard wired" or built in at birth. This is important because the remaining emotional states must be taught.

- Emotions influence cognition and behavior;
- Students who have not been taught the remaining emotional states may not be ready academically;
- Unawareness of emotional states leads to discipline problems and weakened cognitive skills in school.
- This means that there are students in school who do not understand appropriate emotional responses (e.g. cooperation, trust, shame and humility) unless they are taught.
- Students should find mentors to help them practice skill-building emotional states.
- Students will act inappropriately in class, not understand directions, fail to be respectful to teachers and show no empathy when others are in pain if emotional states have not been taught.

Out of the possible hundreds of emotional states, only a few are good for learning (e.g. anticipate on, curiosity, suspicion, confusion). Most emotional states are, in fact, bad for learning.

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Practical college application:

Students must strive to read and manage emotional states in the classroom. In positive states, students learn well and behave better. Social skills must be practiced. Cooperative learning groups in College Success help students to practice reading and managing emotional states.

The better the social skills student have, the better the academics. Many good programs for practice in reading and managing emotional states are found in books, workshops and online. Why put effort into this area? Students who learn patience, attention, empathy and cooperation will be better students.

Citations: Duckworth, Angela L.1; Seligman, Martin E.P.1(2005) Self-Discipline Outdoes IQ in Predicting Academic Performance of Adolescents *Psychological Science*, Volume 16, Number 12, December, pp. 939-944(6).

Ekman, P. (2003). *Emotions Revealed*. New York: Henry Holt and Co.

Ostberg V. (2003) Children in classrooms: peer status, status distribution and mental well-being. *Soc Sci Med*. 2003 Jan;56(1):17-29.

Marjoribanks K. (2003) Family and ability correlates of academic achievement: social status group differences. *Psychol Rep*. 2003 Oct;93(2):419-22.

Summers CH, Forster GL, Korzan WJ, Watt MJ, Larson ET, Overli O, Hoglund E, Ronan PJ, Summers TR, Renner KJ, Greenberg N. (2004) Dynamics and mechanics of social rank reversal. *J Comp Physiol A Neuroethol Sens Neural Behav Physiol*. Sep 11.

Brain Principle Nine

There have been stunning strides in rehabilitation of brain-based disorders, including Asperger's, learning delays, dyslexia, and autism. The discovery that aggressive behavioral therapies, new drugs and revolutionary stem cell implantation can be used to influence, regulate and repair brain-based disorders has been amazing.

Practical college application:

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Learning disabled students can learn better with consistent skill building strategies based on their learning styles. It may take time and practice, but with persistent practice, students can make amazing strides in their college classes. It takes consistent one hour-a-day skill building or the student's behavior won't change. Students should learn the right skills based on their learning styles and brain research that work and practice those skills 3-5 days a week.

Citations: Ball K, Edwards JD, Ross LA. (2007) The impact of speed of processing training on cognitive and everyday functions. *J Gerontology B Psychol Sci Soc Sci Jun*;62 Spec No 1:19-31.

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Gaab, N. (2007) Correlates of rapid auditory processing are disrupted in children with developmental dyslexia and ameliorated with training: an fMRI study. *Neurological Neuroscience*. 25(3-4), 295-310.

Brain Principle Ten

The recent brain/mind discovery that memories are not fixed but, instead, are quite malleable is powerful. Every time an individual retrieves a memory, it goes into a volatile, flex state in which it is temporarily reorganized. Every time students review, they might change their memory (and often do). Yet, without review, they are less likely to recall their learning.

Research suggests that students use several strategies to continually strengthen memory over time instead of assuming that once learned, the memory is preserved. Students should continually review previously learned material, so that the material is not forgotten and can be connected to new material more quickly and relevantly.

Practical college application: Students should review the content midway between the original learning and the test. If content is taught Monday and tested on Friday, then review should be on Wednesday. Secondly, students should mediate the review process through structured reviews such as group work

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that ensures quality control. Otherwise the material could become confused and test scores could drop.

Citations: Pashler H, Rohrer D, Cepeda NJ, Carpenter SK. (2007) Enhancing learning and retarding forgetting: choices and consequences. *Psychon Bull Rev.* Apr;14(2):187-93.

Pashler H, et al. (2005) When does feedback facilitate learning of words? *J Exp Psychol Learn Mem Cogn.* Jan;31(1):3-8.

Jensen, E. (2007). *Introduction to brain-compatible learning.* 2nd ed. Thousand Oaks, CA: Corwin Press