# LDC Lately...

Learning Development Center

Volume 3 No. 1 Fall 2001 Brain-Based Learning Issue



### BRAIN-BASED LEARNING

Two years ago, we founded *LDC* Lately... as a vehicle for sharing themes currently impacting teaching. especially at the college level. We begin our third year with BRAIN-BASED LEARNING, an approach to teaching that is informed by the rapidly advancing field of brain research. The premise is simple: learning is more efficient if the process is structured to work with the brain's natural patterns rather than against them. If, for example, we know that the brain loses its power of concentration after twenty minutes, we would be well advised to vary our class activities rather than deliver sixty minute lectures. As we have studied and experimented with Brain-Based Learning strategies, we have been pleased with the results.



We have known for a long time that learning is communal, interactive, and holistic. Brain-based learning explains why these assumptions are true, and it offers new ways to think about how we teach.

In this edition of *LDC Lately...*, we start with the theoretical base for Brain-Based Learning. Then we show you its application as you visit "Julie's Brain."

At the time of this printing, a workshop co-sponsored by the LDC and the Institute Effective Teaching Committee has been presented on brain-based learning. Contact Jane Munt (jamldc@rit.edu) for more information. We have also provided a list of books and web sites that we have found most informative and accessible.

This issue is intended to challenge your way of thinking and your way of doing. We encourage you to try just one new strategy this quarter, and let us know what happens. Join us in a discussion of how to enhance RIT's primary mission – teaching.

### **Brain-Compatible Learning...**

Many people have heard the terms *brain-compatible learning* or *brain-based learning*. What exactly is meant by these terms? Isn't all learning brain-based? It is true that what the brain does best is learn, but over the last decade there has been an explosion of new findings about how the brain functions.

Recent technology in brain imaging devices such as MRIs (Magnetic Resonance Imaging), PET scans (Positron Emission Tomography), EEG scans (electroencephalograms), and MEG scans (magnetoencephalography) have allowed neuroscientists to study the human brain in living subjects. For example, an EEG provides readings of electrical output to determine brain wave patterns; an MRI can measure the sequence of thinking across areas of the brain; an MEG can track the level of brain activity that occurs during problem solving; and spectrometers can measure brain chemicals, or neurotransmitters, as an activity occurs (Jensen, *Teaching with the Brain in Mind*, 1998).

These new technologies, along with research from clinical studies and autopsies, have resulted in a "knowledge explosion." Neuroscience has teamed up with other fields, such as genetics, physics, pharmacology, psychology and education; one result has been brain-compatible learning. Broadly defined, brain-based learning is a comprehensive approach to teaching and learning that is based on current research on how the brain naturally learns best. It is a biologically-driven framework which is constantly evolving as we learn more and more about how the brain functions. As such, there are certain guiding principles, interpreted from neuroscience, which have already begun to change the way some teachers teach. The objective now is to share this information with colleagues and encourage in-context research applications that would provide testing results under real life conditions (Sousa, *How the Brain Learns*, 1995; Jensen, *Teaching with the Brain in Mind*, 1998).

Theorists have taken the findings from neuroscience and identified key principles to help guide a teacher's approach in the classroom. Learning theory is different from brain research in that the former is interpretive and the latter is scientific. Theories vary and research is ongoing, so there is no simple recipe. However, educators should be aware of the paradigm shift brain-based learning suggests about how to organize and structure a successful classroom experience.

Below is a list of key principles for brain-based learning:

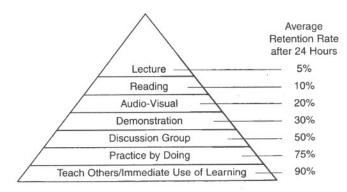
- The brain is a parallel processor. Therefore, learning involves multiple pathways that run simultaneously.
- · Learning engages the entire physiology. Therefore, all learning is mind/body.
- · The brain has cycles and rhythms.
- The brain needs good food and lots of water. Dehydration may account for student lethargy in the classroom.
- The search for meaning is innate. The meaning-driven brain cannot be stopped, only channeled and focused.
- The search for meaning occurs through patterning. The brain is designed to perceive and generate patterns, and it resists having "meaningless" patterns imposed on it. "Meaningless" patterns are isolated pieces of information unrelated to what makes sense to a student.
- Emotions are critical to patterning and memory. What we learn is influenced and organized by emotions and mindsets based on expectancy, personal biases and prejudices, degree of self-esteem, and the need for social interaction. Emotions and cognition cannot be separated.
- The brain processes parts and wholes simultaneously. The left and right hemispheres are inextricably interactive, organizing information simultaneously in parts and wholes.
- Learning involves both focused attention and peripheral perception. Peripheral stimuli include things like the color of the walls, as well as signals that are not consciously noticed, such as slight changes in body posture. Peripheral information can, therefore, be purposely organized to facilitate learning.
- The brain has several memory systems. These include semantic, spatial, emotional, procedural and automatic systems. There is still much more to discover about how memory works.
- Learning is enhanced by challenge and inhibited by threat, anxiety and stress. Good teaching means knowing how to manage the mindstates of students for optimal learning.
- Our brain is a social brain. Therefore, learning activities should include social interaction.
- We understand and remember best when facts and skills are embedded in natural, spatial memory. Specific items are given meaning when embedded in ordinary experiences. An example would be the way language is learned through multiple interactive experiences. It is shaped both by internal processes and by social interaction. All education can be enhanced when this type of embedding is adopted.
- Each person's brain is unique. No two people share the same thoughts, feelings, memories, beliefs, and experiences.
- Most of what is critical to the brain and learning is difficult to assess.

(Adapted from Caine, Caine, and Crowell, MindShifts, 1994; and Jensen, Teaching with the Brain in Mind, 1998).

Many instructors have already learned intuitively how to enhance their students' learning. However, the majority of classrooms still reflect the "factory model" instituted during the Industrial Revolution whereby large groups of students

gather in a single place to hear a teacher's lecture (Jensen, Teaching with the Brain in Mind, 1998). Ironically, 24 hours

after a learning episode we we hear and 10% of what we 75% of what we do and 90% (Sousa, How the Brain Learns,



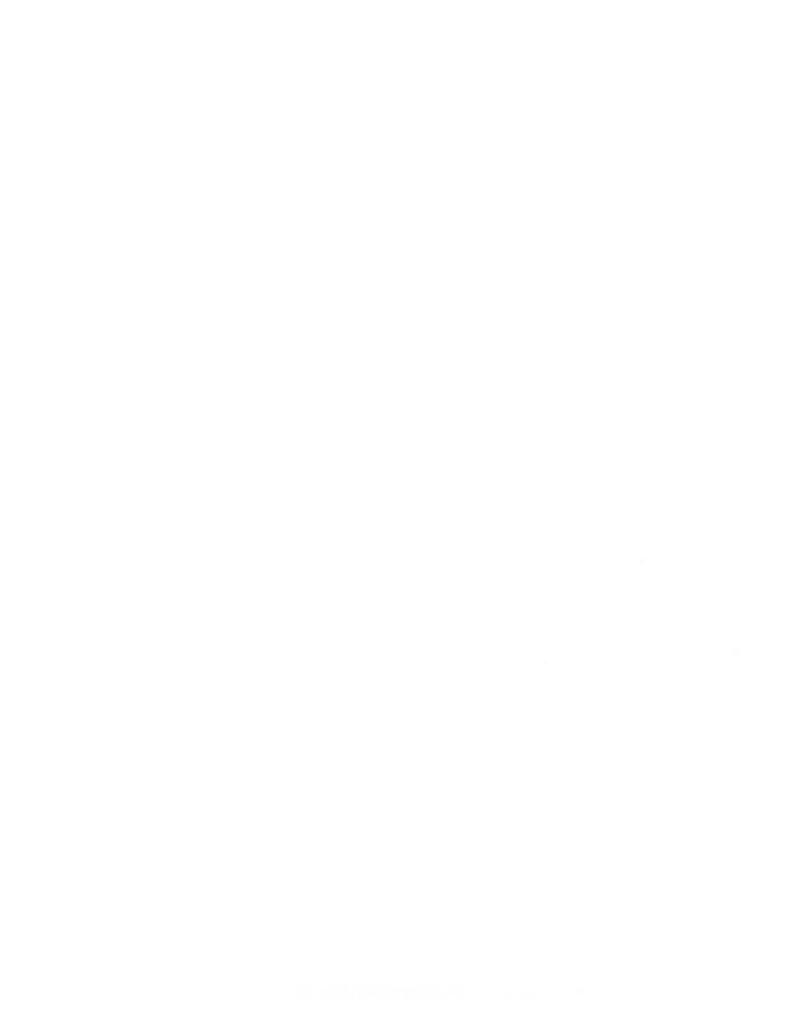
1998). Ironically, 24 hours remember only 5% of what read; whereas, we remember of what we teach to others 1995).

The Learning pyramid shows the average percentage of retention of material after 24 hours for each of these instructional methods.

The art of brain-based teaching addresses both curriculum and delivery. Organizing content around themes and integrating curriculum from different disciplines makes information much more meaningful and, therefore, more likely to be remembered. The seemingly more efficient lecture and textbook format, which was the format most instructors had when they were students, is teacher-centered rather than learner-centered. Teacher-centered instruction is efficient in delivery, but woefully inefficient in creating learning.

Below is a comparison of traditional teaching and brain-based teaching adapted from Eric Jensen's book *Teaching with the Brain in Mind*, and from Renate Numella Caine and Geoffrey Caine's book *Making Connections: Teaching and the Human Brain.* 

ELEMENTS OF ORCHESTRATION	BRAIN-BASED TEACHING	TRADITIONAL TEACHING
Source of Information	Complex. Social interactions, group discovery, individual search and reflection, role playing, integrated subject matter  Learning is related to what the learner knows and values.	Simple. Two-way from teacher to book, worksheet, or film to student.  Teacher assumes the learner has little base knowledge.
Classroom Organization	Complex. Thematic, integrative, cooperative, workstations, individual projects  The search for patterns and relationships is emphasized.	Linear. Individual work or teacher-directed.  Information is presented discretely and disjointedly.
Classroom Management	Complex. Designated status and responsibilities delegated to students and monitored by teacher.	Hierarchical. Teacher controlled.
Outcomes	Complex. Emphasis on reorganization of information in unique ways, with both predictable and unpredictable outcomes, divergent and convergent, increase in natural knowledge demonstrated through ability to use learned skills in variable contexts.	Specified and convergent. Emphasis on memorized concepts, vocabulary and skills.
	Recognizes and uses the brain's ability to remember moment-to-moment life experience.	Uses primarily the memorization of facts and specific detail.



Creating a classroom atmosphere of relaxed alertness through meaningful challenge, immersing students in rich, complex, interactive experiences, and facilitating students' active processing through intensive analysis should be the goals of college teachers, even if it means adjusting the way content is covered. Faculty need to constantly ask themselves if their students really are learning or if they are merely parroting discrete pieces of information. When students are active learners, new neural pathways are formed in their brains. When students are passive learners or when the learning environment is stressful, information is unlikely to be meaningfully processed and stored in long-term memory. Content and delivery must work together in order for successful learning to take place.

### **Enhancing Teaching and Learning...**

The LDC is proud to collaborate with the Institute Effective Teaching Committee to present a series of workshops and seminars on best practices in college teaching. Each quarter, a brief workshop will present specific teaching strategies, and a Saturday seminar will provide more in-depth discussions of current pedagogical thinking. Workshops are listed on the quarterly flier of LDC offerings. By this printing, the October 3 workshop, "Superior Syllabi," will have been presented. Reviews by two participants are included in this newsletter. Mark your calendars for future workshops.

# **Using Brain-compatible Strategies at the College Level** Saturday, October 20, 2001 9:00 to 12:00 Room 76-1275

Hear about the latest research related to brain-compatible learning and the implications for your classroom. Learn about how emotions impact learning, expand your techniques for engaging students in active processing, and explore aids to the storage and retention of course content.

### Practical Tips and Strategies for the Professor Wednesday, January 16, 2002 Time and location TBA.

Learn practical strategies for establishing rapport with students, delivering effective lectures, building group dynamics, using appropriate assessments and evaluations, and generating intrinsic motivation in your classroom. An opportunity will also be provided to share your most effective techniques.

# Understanding Prevalent Models of Learning Style Theories Saturday, January 26, 2002 Time and location TBA.

Get an overview of a variety of models of learning styles. Theories presented will include multiple intelligences, modalities, information processing models, and personality approaches. With this understanding, improve your chance of reaching every student in your classroom and learn more about how your learning style impacts your teaching style.

# Using Graphic Organizers in a Variety of Academic Disciplines Wednesday, March 20, 2002 Time and location TBA.

Explore the use of this visual tool for effective presentation, active processing, and meaningful review of course information. Approach content in a variety of ways using comparison, contrast, sequence, stage, decision, problem-solving, and classification diagrams. College-level examples will be discussed and an opportunity to apply this strategy to your own content will be offered.

## Authentic Assessment in the College Classroom Saturday, April 13, 2002 Time and location TBA.

Are you testing what you are teaching? Evaluate your current testing methods and reframe your perceptions of what "assessment" really means. Explore alternative models such as performance-based evaluation, portfolios, and multi-modal testing practices. Bring samples of your current evaluation tools.

### Profiles...



Lisa Fraser is the interim staff chair of LDC's Learning Support Services. She has worked for RIT's LDC for eight years. She began as a learning support specialist for the Structured Monitoring program. Students in this program meet with a learning support specialist on a regular basis throughout the ten-week quarter. In addition to mentoring, Lisa has developed workshops in the areas of Learning Styles and Brain-based Learning. She also provides workshops and training to various local school districts. Her most recent project was providing a certification to BOCES students for Paraprofessional Training. During the summer, Lisa teaches Study Skills for the new HEOP students and is involved with the Academic Success in College Conference. In addition to her new administrative duties, Lisa continues to teach Time Management and Transition Seminar for the College Restoration Program. Last year, Lisa was nominated for an Eisenhart Award for Excellence in Teaching.

Lisa completed her degrees at Nazareth College in Rochester. She has a B.A. in Sociology with a concentration in Social Work and a MS Ed. with certification in Elementary Education. Before coming to RIT, Lisa taught locally in both elementary and special education classrooms. While attending graduate school, she worked at the University of Rochester in the academic advising office and also provided support to students studying abroad. Before entering the field of education, Lisa was involved in the banking industry as a trainer and support specialist.

### Workshop Reviews...

As we sit down to write our course syllabi we think about which topics we will cover, when assignments are due, how grades are assigned, what course agendas will contain, and other pertinent details. While all of this logistical information and content is certainly central to designing course syllabi, Jane Munt and Lisa Fraser from the LDC suggest we think about course syllabi in a different light.

Their workshop, "Superior Syllabi to Get Students Off to a Good Start," suggests we focus on creating syllabi from a student-centered perspective. Course syllabi are more than tools for disseminating content; they are communication devices that create first impressions and set the tone and climate in the class. Syllabi should shift from being solely an overview of the course toward a document that focuses on tools and strategies students need to succeed. Writing effective syllabi requires instructors to engage in a form of self-analysis, answering questions such as, " What is my teaching philosophy?", "How does my course relate to the larger discipline?", "What teaching and learning strategies am I comfortable with?", "What do I want my students to learn?" and, "How do I want them to process information?" All of these questions help us understand how we teach: how we want our students to learn: and allow us to express course expectations beyond the mere nuts and bolts.

Framing hypothetical research questions and providing quotes which ask students to contemplate the course material are two simple methods to change syllabi from mere information dissemination tools into documents that engage students from the moment they first enter the classroom.

Jane Munt and Lisa Fraser offered these and many other suggestions in an entertaining and informative one-hour workshop.

They are happy to be contacted as we continue to embark on syllabus creation and revision.

Dr. David Neumann, Professor,
 Department of Communication

. . .

After ten years in the English Language Center, my syllabi were starting to look old and stale. They were also rather directive, dry and dull. My syllabi are often the first syllabi our new international students see as an introduction to American academics, and they just weren't as good as I knew they could be. They desperately needed help and to the rescue came the IETC/LDC workshop on Superior Syllabi.

The very first comments from the presenters, Jane Munt and Lisa Fraser, changed my attitude about what my syllabi could do. My syllabi could be meaningful communication tools for my students and a learning-centered approach could revitalize them with fresh new ideas on how to better communicate my class expectations, student responsibilities, intended goals, and student outcomes as well as the basics such as evaluation procedures and tentative schedules.

I appreciated the step-by-step examination of the steps involved, and the examples of other syllabi were very helpful. This was the answer I was searching for to make my course syllabi more meaningful and helpful to my students. From now on, I will be writing superior syllabi.

- Kris Mook, Professor, English Language Center

### Julie's Brain Goes to College...

Julie is a freshman in college and seems like a bright young woman. At least that's what her admission scores said. You can count her absences on one hand, and, as far as her professors know, she comes from a fairly typical home. So why does she - and countless others at her college - have to go over material twice and even three times for the information to sink in?

From recent developments in brain research, we know that Julie's professors don't always teach in ways that match how Julie's brain learns best.

Julie's brain is not a "blank slate" on which her instructors can write information or a vessel that they can fill with facts. Julie's neural history contains more than grades and exam scores. Julie's brain has been impacted by many things, including genes she was given by her parents, developmental stages she has gone through, experiences she has had, and even the bump on her head when she was 12.

At birth, Julie's brain had a trillion neural connections already "wired in." By now, countless experiences have shaped the 3-pound operating system that is her brain. These experiences, along with her natural biological structure, have formed intricate neural networks that represent complex patterns, mental models, and belief systems. She brings her personal neurological history to college with her every day. Her teachers have the challenge of customizing information and tasks to fit how she learns best.

Julie's professors influence her learning every day by designing the physical and emotional environment in which she tries to learn. For example, although Julie rarely arrives late to class, she has a tendency to cut it close. A close call could be a result of trying to solve a financial aid issue, an argument with her boyfriend, or an unexpected phone call. Without knowing the details of Julie's life, instructors can assume that she may arrive to class distressed or distracted. Julie's brain

may not be quite ready for learning when the class begins. Good teachers who know that the emotional state of their students is important will invest the first few minutes of every class in activities that help students transition into a positive learning state.

As important as the emotional context for learning is, the physical and physiological environments are just as important. Julie begins to get sleepy if the temperature in the room is higher than 70 degrees. Also, she finds that she gets thirsty after her Tai Chi class and remains so for an hour or more. Since Julie's brain is primarily made up of water, hydration is important for remaining alert and focused. In addition, Julie's attentional systems are affected by the time of day. Since Julie usually sleeps from 1am to 8 am, by midafternoon the chemicals controlling her attention (amines) are at their lowest and she is ready for a nap. This problem is confounded by Julie's high fat and high carbohydrate lunch (a burger and french fries)...she would have been better off with the tuna salad.

Julie's professors are experienced teachers. They follow the prescribed models of good teaching, including the traditional "stand and deliver" or lecture format. Unfortunately, much of what Julie learns during the day is not what her teachers are emphasizing. Much of what she learns is coming to her almost indirectly, through the comments her classmates make, the subtle cues of her teacher's voice, and the things she picks up "accidentally" through trial and error. Julie's brain can focus her attention for only about 20 minutes at a time. Julie's professors might consider using that prime time for introductions, key points, directions, focused lectures, reviews, and stories. The rest of the class time could be devoted to giving students an opportunity for discussion. processing activities, feedback, design, research, and partner and group work.

As mentioned earlier, Julie doesn't arrive in the classroom as a white board to be written upon. She brings with her a variety of prior

knowledge and a keen sense of what is of interest or importance to her. When her teachers use her preexisting knowledge as a basis for new learning, she makes better and more complex neural connections. Learning is the strengthening or expansion of neural pathways!

Sometimes Julie has trouble remembering what she's learned. Often when Julie's professors ask questions, they get a roomful of blank stares. The instructors are puzzled as to why this happens, and they shouldn't be. Julie's synaptic connections are often temporary. Her neural space is expensive real estate, and her brain builds only what's needed. If teachers want Julie to hang onto the information, they need to use elaborative techniques (such as discussion, reflection, sorting, and analyzing) to help her extend and retain that information.

Many of Julie's professors still live in the paradigm for feedback that dictates that they must have the final "say" as to whether or not Julie has learned. It's appropriate for instructors to be one source of feedback, but peer editing, discussion, student-generated rubrics, answer sheets, paired sharing, videotaping and creative assessments would probably give their students a clearer picture of just how well information has been learned and retained.

Imagine Julie during finals week. You'd think Julie's brain would have permanently encoded the learning she did this quarter. God knows she reviewed the facts enough! But did she do the things that will facilitate her recall? Julie remembers clearly the quotes from The Tree of Red Stars -- after all it is one of her favorite books. However, Julie is having trouble remembering her Modern European History. This class is right before lunch, and that has never been a very productive time for her. In contrast, Principles of Economics I seems relatively easy. After choosing and following her own stock in the newspaper, she really "gets" those concepts. And after having lived in France for a summer in high school, the cultural part of the French exams should be a "piece of cake," but forget the conjugations! Her final grades will likely be a result of circumstance and selective memory...as usual.

Julie's brain will continue to work over the

breaks...focusing most likely on those things that naturally draw her attention at her age...relationships, trends, music, and making enough money to buy her books. She'll be back for next quarter...but will her brain be going back to college with her? Maybe it just needs to be invited!

Eight Things to Tell Your Students About Their Brains:

- 1. Your brain is unique. Capitalize on its strengths and compensate for its weaknesses with tutoring, help labs, and additional focus on areas that give you difficulty. Don't compare yourself to other students.
- 2. Access the previous knowledge, experience, and mental models that already exist in your brain when learning new material. Associating new learning with old learning is one of the most efficient ways to encode information.
- 3. Solve personal problems when they arise so that you can focus your mental energy when needed. Personal distractions and negative emotions seriously impair your brain's ability to take in, process, and retain information.
- **4.** Keep your body and your brain hydrated. Avoid alcohol, caffeine, and sugary sodas. Pure water is your best "brain fuel."
- 5. Eat protein in the morning and complex carbohydrates for lunch. High amounts of fat and sugar in your diet make your brain sluggish.
- 6. Get an adequate amount of rest each night before class. Your brain needs sleep to process information effectively and store it in long-term memory.
- 7. Pay attention to subtle cues from your teachers and your classmates when learning and discussing information. Your brain picks up information peripherally as well as directly.
- 8. Use elaboration techniques for study and review. Sort, analyze, consolidate, and discuss information to learn and retain it better. Colorcoding will help your brain use its natural attentional biases to store and retrieve information more efficiently.

Adapted from:

How Julie's Brain Learns, Educational Leadership:

### Resources...

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Websites:

http://www.cainelearning.com

http://www.learningbrain.com

http://www.newhorizons.org/blab.html

Lately...

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