

# Brain-Based Ways We Think and Learn®

**B**rain-Based Ways We Think and Learn is a lively course tracing thought processes we use on a regular basis: induction, deduction, analysis, and synthesis. Taught in an environment that models brain-compatible teaching and learning, educators analyze how the brain integrates, stores, and communicates information. From their understanding of the four basic thinking patterns, educators apply brain-based teaching strategies to enriched lesson plans and real-life problem-solving situations. They recognize from the work of a sophisticated mix of brain experts the important link between the brain and effective teaching practices.

To the right are the key areas of focus for the 45-hour course. For more information, refer to the syllabus, which provides a detailed outline of the course material as well as a bibliography of research on which the course is based.

## In this course, participants will

- ▶ Discover, model, and participate in brain-based teaching and learning strategies in a brain-compatible learning environment.
- ▶ Recognize four powerful thinking processes and apply them to enriched lessons and classroom applications.
- ▶ Examine the work of a wide variety of experts to identify how the brain receives and makes sense of knowledge and experience.
- ▶ Integrate thinking processes into real-life problem-solving and critical thinking strategies.
- ▶ Incorporate music, color, imaging, Discovery Learning Centers, and other brain-based teaching strategies into the school or classroom environment.

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## Course Description

*Brain-Based Ways We Think and Learn* is a Performance Learning Systems® course that provides experienced and beginner educators with a comprehensive understanding of the ways in which findings from current brain research can be applied to teaching and learning. Participants will engage in brain-based learning experiences that will take place in a brain-compatible learning environment as they examine the work of a wide variety of experts. Concepts include identifying how the brain receives information and creates meaning from it, understanding the characteristics of a brain-compatible learning environment, studying brain-based instructional strategies, and learning how to create an enriched classroom environment. Throughout the course, class members will also hone their understanding of how to apply four key cognitive processes (induction, deduction, analysis, and synthesis) to their lesson planning and instructional practice in a way that enhances the benefits of brain-compatible learning and further increases student comprehension and achievement.

## Course Outcomes

Upon completion of this class, the learner is expected to be able to:

1. Apply the findings in current brain research to teaching and learning strategies in the classroom.
2. Identify basic brain anatomy and explain the implications for the cognitive process of learning and memory.
3. Apply the elements of a brain-compatible, enriched environment to a classroom environment that supports learning.
4. Identify instructional strategies that are compatible with the brain's natural learning process, and incorporate these strategies into the design of curriculum and instruction.
5. Distinguish between deductive and inductive thinking.
6. Incorporate deductive-learning experiences into the design of curriculum and instruction.
7. Incorporate inductive-learning experiences into the design of curriculum and instruction.
8. Identify analysis thinking and incorporate analysis-learning experiences into the design of curriculum and instruction.
9. Identify synthesis thinking and incorporate synthesis-learning experiences into the design of curriculum and instruction.
10. Experience and evaluate the interconnectedness of the inductive-, deductive-, analysis-, and synthesis-thinking processes to real-world problem solving and cognition.
11. Design a lesson plan that enhances comprehension, retention, and achievement by incorporating the inductive-, deductive-, analysis-, and synthesis-thinking processes, as well as brain-compatible instructional strategies and an enriched environment.
12. Reflect on and continuously evaluate personal practice to actively seek out opportunities to grow professionally.

13. Generalize this course content to reflect how the diverse populations within classrooms have their needs met by the application of the skills, strategies, and knowledge gained in this course.
14. Work collaboratively to share knowledge, skills, and experiences, refine understanding of content, give and receive feedback, and improve expertise.

### **Institutional Outcomes**

(To be listed here)

### **Required Text**

Selected research articles, research summaries, and topical articles drawn from educational literature

### **Topical Outline**

### **List of Concepts**

#### **Overview**

Course overview, IDEAS icons (inductive reasoning, deductive reasoning, enriched environment, analysis, and synthesis), the Enhanced Learning graph, components of the course (research excerpts, energizers, state changes, reflections, celebrations, metacognition)

#### **Compelling Why: The Brain and How It Works**

Teaching in a brain-compatible way, research about brain-based learning environments, the “E” of IDEAS (Enriched Environment), the value of celebrations as a tool for enrichment, brain facts, brain-anatomy diagram, the triune brain, brain-mind learning principles, characteristics of brain-based learning, implications of brain research for teachers

#### **Deduction**

Introduction to the “D” of IDEAS (Deduction), examples of deductive thinking, deductive statements, deductive lesson plans, common generalities, metacognition, brain-based teaching strategies, research about deductive teaching and learning

#### **Giving Directions in a Brain-Based Classroom**

Formats for effective direction-giving; brain-based teaching strategies from the experts: emotions in learning, awareness and meaning, states for learning

#### **Induction**

Introduction to the “I” of IDEAS (Induction), teaching inductively, mental rehearsal (Imagining, Visualization, Mental Imagery, Mental Rehearsal), creating a virtual field trip, examples of inductive learning in the classroom, debriefing inductive activities, research about inductive teaching and learning

#### **Enhanced Learning**

Elements of brain-based learning environments (absence of threat, meaningful content, choices, adequate processing time, enriched environment, collaboration, immediate feedback, and opportunities to achieve mastery), creating an enriched environment, six kinds of input (symbolic, secondhand, hands-on representation, hands-on real thing, immersion, being there)

<b>Discovery Learning Centers</b>	Discovery learning centers as strategies to implement deductive reasoning in the classroom; strategies to improve student memory
<b>Analysis</b>	Introduction to the “A” of IDEAS (Analysis), examples of analytical thinking, analysis skills, analysis activity using two levels of analysis (factual and metacognitive), classroom applications of analysis, reflections on brain-compatible learning environments
<b>Synthesis and Patterns of Thinking</b>	Research findings: patterns and meaning, word mapping, introduction to the “S” of IDEAS (Synthesis), problem-solving scenarios designed to metacognitively apply and analyze all course elements

### Course Assessments and Links to Institutional Outcomes and Course Outcomes

Throughout the course, the learner will be assessed and evaluated on the completion of the following assessments. There are 13 assessments in this course, for a total of 100 points.

		<b>Points</b>	<b>Correlations With Institutional Outcomes</b>	<b>Correlations With Course Outcomes</b>
Assessment No. 1:	Excerpts from the Experts—The Brain	7		1, 2, 4
Assessment No. 2:	Classroom Application of Deduction	7		5, 6, 13
Assessment No. 3:	Excerpts from the Experts: Brain-Compatible Learning Environment	7		1, 3
Assessment No. 4:	Excerpts from the Experts: Brain-Based Teaching Strategies	7		1, 4, 13
Assessment No. 5:	My Brain-Based Teaching Strategies	3		1, 4, 13
Assessment No. 6:	Inductive Learning in the Classroom	7		5, 7, 13, 14
Assessment No. 7:	Reflections on a Brain-Compatible Learning Environment	7		1, 3, 4, 13, 14
Assessment No. 8:	Excerpts from the Experts—Memory	7		1, 5, 7
Assessment No. 9:	Excerpts from the Experts—Patterns and Meaning	7		1, 8
Assessment No. 10:	Classroom Application of Analysis	6		9, 13
Assessment No. 11:	My IDEAS Plan	15		5, 6, 7, 11, 13
Assessment No. 12:	Group Presentation	15		3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14
Assessment No. 13:	Preparedness and Participation Memo	5		12, 14
		<b>Total</b>	<b>100</b>	

Criteria specific to each assessment will be explained in conjunction with the instructional activities.

### **Instructional Materials**

Instructors and learners will use instructor-generated materials, learner-generated materials, print resources, and Web-based resources to facilitate learning.

### **Instructional Methodology**

The instructional methodology of this course focuses on developing, enhancing, and improving the instructional expertise and pedagogical knowledge base of practicing educators. Strategies include instructor presentation of new content through short lecturebursts, active construction of knowledge during hands-on practice and problem solving, collaborative group work, personal reflection, in-class presentations and demonstrations, ad hoc and structured small-group or whole-class discussion, analysis of assigned reading, and application of course content and skills to each participant's individual grade level, subject area, and classroom.

### **Evaluation**

The evaluation of learner work will be based on the defined criteria for learner assessments, which will be processed with learners prior to their instructional activities and engagement with the student learning targets (outcomes). Grading is based solely on the evaluation of student learning targets and defined criteria for learner assessments.

Formative assessment of learning outcomes is conducted throughout the course, using a variety of means that include the following: completion of assessments; constructive contributions to class discussions (whole-class as well as small-group); sharing of valuable, pertinent, and/or applicable ideas and experiences; involvement in the inductive process; interactive journal entries with written instructor feedback; critical or reflective responses to assigned readings; oral discussions in a whole-class or small-group setting; active participation and general attentiveness to the instructor and others. It is expected that each student will contribute to the academic quality of the course.

Summative assessment includes the completion of a culminating assignment that requires the participant to synthesize class content, apply it to his or her specific teaching situation, and complete a reflective action plan for implementing the major components of content and skill acquired during the course.

### **Grading Policy**

(To be listed here)

### **Absence and Tardy Policy**

(To be listed here)

### **Performance Learning Systems' Academic Integrity Policy**

Performance Learning Systems expects absolute academic honesty and integrity from every course participant. The specific Academic Integrity and Honor Code Policies of our partner colleges and universities are embraced and enforced by PLS instructors. The following are considered to be serious violations:

- Plagiarism: the use of another's ideas, data, or words without proper acknowledgement.

- Fabrication: the use of invented information or the falsification of research or other findings with the intent to deceive.
- Collusion: improper collaboration with another in preparing assignments or projects.
- Cheating: an act of deception by which a student misrepresents that he or she has mastered information on an academic exercise that he or she has not mastered.
- Academic Misconduct: tampering with grades, or taking part in obtaining or distributing any part of student work that is not his or her own.

Violation or suspected violation will be investigated and pursued according to specific college/university procedures.

### **Identity Authentication**

The college/university, Performance Learning Systems (PLS), and students share a joint responsibility to ensure that each student's contribution in an online course activity comes from that student alone. For the student, this responsibility has two parts:

1. Students are responsible for positively ensuring that every contribution to an online course created with the students' computer account is made by the student alone. Contributions covered under this policy include: written assignments; quiz and exam submissions; discussion forum postings; live participation in text-based chat sessions, phone conferences, and videoconferences. If a student allows another person to write or make any kind of submission to an online activity in the student's name, then this constitutes cheating and will be treated as a violation of academic honesty.
2. Students are responsible for ensuring the integrity of their computer account security by following the actions required of them by the PLS Acceptable Use Policy. These actions include keeping passcodes private, updating passcodes when required by Performance Learning Systems, and reporting breaches of the security policy to the IT Helpdesk.

### **Participant Professionalism Policy**

As a courtesy to other participants and to your instructor, please refrain from text messaging, checking e-mail, or answering your cell phone during class time. Breaks are provided throughout the course so you can attend to personal matters. Using your personal electronic devices during class time is distracting and disrupts instruction and participant communication and collaboration. If you have an emergency or justifiable reason to leave your cell phone turned on during class time, please make arrangements with the instructor prior to the beginning of class.

## Course Outcome Correlations With INTASC Standards for Teachers

	Course Outcomes
<b>Standard 1: Subject Matter</b> The teacher understands the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches and can create learning experiences that make these aspects of subject matter meaningful for students.	1, 3, 4, 5, 6, 7, 8, 9, 10, 11
<b>Standard 2: Student Learning</b> The teacher understands how children and youth learn and develop, and can provide learning opportunities that support their intellectual, social and personal development.	1, 2, 3, 4, 6, 7, 8, 9, 11, 13
<b>Standard 3: Diverse Learners</b> The teacher understands how students differ in their approaches to learning and creates instructional opportunities that are adapted to diverse learners.	1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 13
<b>Standard 4: Instructional Strategies</b> The teacher understands and uses a variety of instructional strategies to encourage students' development of critical thinking, problem solving, and performance skills.	1, 3, 4, 5, 6, 7, 8, 9, 10, 11
<b>Standard 5: Learning Environment</b> The teacher uses an understanding of individual and group motivation and behavior to create a learning environment that encourages positive social interaction, active engagement in learning, and self-motivation.	1, 2, 3, 4, 6, 7, 8, 9, 10, 11
<b>Standard 6: Communication</b> The teacher uses knowledge of effective verbal, nonverbal, and media communication techniques to foster active inquiry, collaboration, and supportive interaction in the classroom.	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 14
<b>Standard 7: Planning Instruction</b> The teacher plans and manages instruction based upon knowledge of subject matter, students, the community, and curriculum goals.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11
<b>Standard 8: Assessment</b> The teacher understands and uses formal and informal assessment strategies to evaluate and ensure the continuous intellectual, social and physical development of the learner.	1, 3, 4, 5, 6, 7, 8, 9, 10, 11
<b>Standard 9: Reflection and Professional Development</b> The teacher is a reflective practitioner who continually evaluates the effects of her/his choices and actions on others (students, parents, and other professionals in the learning community) and who actively seeks out opportunities to grow professionally.	1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14
<b>Standard 10: Collaboration, Ethics, and Relationships</b> The teacher fosters relationships with school colleagues, parents, and agencies in the larger community to support students' learning and well-being.	3, 4, 6, 7, 8, 9, 10, 11, 14

The Interstate New Teacher Assessment and the Support for Consortium (INTASC) standards were developed by the Council of the Chief State School Officers and member states. Copies may be downloaded from the Council's website at <http://www.ccsso.org>.

© Council of Chief State School Officers. (1992) Model standards for beginning teacher licensing, assessment, and development: A resource for state dialogue. Washington, DC: Author. <http://www.ccsso.org/content/pdfs/corestrd.pdf>.

## Course Outcome Correlations With National Board of Professional Teaching (NBPTS) Five Core Propositions

<b>Proposition 1: Teachers are Committed to Students and Their Learning.</b>	<b>Course Outcomes</b>
NBCTs are dedicated to making knowledge accessible to all students. They believe all students can learn.	1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14
They treat students equitably. They recognize the individual differences that distinguish their students from one another and they take account for these differences in their practice.	1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14
NBCTs understand how students develop and learn.	1, 2, 3, 4, 6, 7, 8, 9, 11, 13
They respect the cultural and family differences students bring to their classroom.	1, 3, 4, 6, 7, 8, 9, 10, 11, 13
They are concerned with their students' self-concept, their motivation and the effects of learning on peer relationships.	1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 13
NBCTs are also concerned with the development of character and civic responsibility.	1, 10, 11, 12, 13
<b>Proposition 2: Teachers Know the Subjects They Teach and How to Teach Those Subjects to Students.</b>	
NBCTs have mastery over the subject(s) they teach. They have a deep understanding of the history, structure and real-world applications of the subject.	1, 3, 4, 6, 7, 8, 9, 10, 11, 13, 14
They have skill and experience in teaching it, and they are very familiar with the skills gaps and preconceptions students may bring to the subject.	1, 3, 4, 6, 7, 8, 9, 13, 14
They are able to use diverse instructional strategies to teach for understanding.	1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14
<b>Proposition 3: Teachers are Responsible for Managing and Monitoring Student Learning.</b>	
NBCTs deliver effective instruction. They move fluently through a range of instructional techniques, keeping students motivated, engaged and focused.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14
They know how to engage students to ensure a disciplined learning environment, and how to organize instruction to meet instructional goals.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14
NBCTs know how to assess the progress of individual students as well as the class as a whole.	1, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14
They use multiple methods for measuring student growth and understanding, and they can clearly explain student performance to parents.	1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14
<b>Proposition 4: Teachers Think Systematically about Their Practice and Learn from Experience.</b>	
NBCTs model what it means to be an educated person – they read, they question, they create and they are willing to try new things.	1, 3, 10, 11, 12, 14
They are familiar with learning theories and instructional strategies and stay abreast of current issues in American education.	1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13
They critically examine their practice on a regular basis to deepen knowledge, expand their repertoire of skills, and incorporate new findings into their practice.	1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 13, 14

**Proposition 5: Teachers are Members of Learning Communities.**

NBCTs collaborate with others to improve student learning.	<b>1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 13, 14</b>
They are leaders and actively know how to seek and build partnerships with community groups and businesses.	<b>4, 10, 11, 12, 13, 14</b>
They work with other professionals on instructional policy, curriculum development and staff development.	<b>1, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14</b>
They can evaluate school progress and the allocation of resources in order to meet state and local education objectives.	<b>1, 10, 13, 14</b>
They know how to work collaboratively with parents to engage them productively in the work of the school.	<b>1, 3, 4, 10, 11, 13, 14</b>

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## Bibliography

- Beland, K. (2007). Social and emotional learning hikes interest and resiliency. *Education Digest: Essential Readings Condensed for Quick Review*, 72(9), 24–29.
- Bowkett, S. (2007). *100+ ideas for teaching creativity*. New York: Continuum.
- Bruce, W. R. (2007). *Higher order thinking skills: Challenging all students to achieve*. Thousand Oaks, CA: Corwin Press.
- Coch, D., Fischer, K. W., & Dawson, G. (Eds.). (2007). *Human Behavior, Learning, and the Developing Brain: Typical Development*. New York: Guilford Press.
- Corbin, B. (2008). *Unleashing the potential of the teenage brain: 10 powerful ideas*. Thousand Oaks, CA: Corwin Press.
- De Bono, E. (2008). *How to have creative ideas: 62 games to develop the mind*. London: Vermilion.
- Derrington, C., & Goddard, H. (2008). *Whole-brain behaviour management in the classroom: Every piece of the puzzle*. New York: Routledge.
- De Simone, C. (2007). Applications of concept mapping. *College Teaching*, 55(1), 33–36.
- Dettmer, H. W. (2007). *The logical thinking process: A systems approach to complex problem solving*. Milwaukee, WI: ASQ Quality Press.
- Feinstein, S. (2007a). *Learning and the brain: A comprehensive guide for educators, parents, and teachers*. Lanham, MD: Rowman & Littlefield Education.
- Feinstein, S. (2007b). *Teaching the at-risk teenage brain*. Lanham, MD: Rowman & Littlefield Education.
- Fletcher-Janzen, E., & Reynolds, C. R. (Eds.). (2008). *Neuropsychological perspectives on learning disabilities in the era of RTI: Recommendations for diagnosis and intervention*. Hoboken, NJ: John Wiley.
- Frith, U. (2005). Teaching in 2020: The impact of neuroscience. *Journal of Education for Teaching*, 31, 289–291.
- Galaburda, A. M. (2005). Neurology of learning disabilities: What will the future bring? The answer comes from the successes of the recent past. *Learning Disability Quarterly*, 28(2), 107.
- Gregory, G. H., & Parry, H. T. (2006). *Designing brain-compatible learning* (3rd ed.). Thousand Oaks, CA: Corwin Press.
- Gunn, A. M., Richburg, R. W., & Smilkstein, R. (2007). *Igniting student potential: Teaching with the brain's natural learning process*. Thousand Oaks, CA: Corwin Press.
- Haskell, R. E. (2001). *Transfer of learning: Cognition, instruction, and reasoning*. San Diego, CA: Academic Press.
- Hudley, C., & Novac, A. (2007). Environmental influences, the developing brain, and aggressive behavior. *Theory Into Practice*, 46(2), 121–129.
- Hudson, R. F., High, L., & Al Otaiba, S. (2007). Dyslexia and the brain: What does

- current research tell us? *Reading Teacher*, 60, 506–515.
- Jeffrey, T. (2007). Creating a culture of thinking and dialogue at home. *Gifted Child Today*, 30(4), 21–25.
- Jensen, E. (2006). *Enriching the brain: How to maximize every learner's potential*. San Francisco: Jossey-Bass.
- Jensen, E. (2007). *Introduction to brain-compatible learning*. Thousand Oaks, CA: Corwin Press.
- Johnson, S., & Taylor, K. (2006). *The neuroscience of adult learning*. San Francisco: Jossey-Bass.
- King, K., & Gurian, M. (2006). The brain: His and hers. *Educational Leadership*, 64(1), 56–61.
- Madrazo, G. M., & Motz, L. L. (2005). Brain research: Implications to diverse learners. *Science Educator*, 14(1), 56–60.
- Mangan, M. A. (2007). *Brain-compatible science*. Thousand Oaks, CA: Corwin Press.
- Marcus, S. (2007). *The hungry brain: The nutrition/cognition connection*. Thousand Oaks, CA: Corwin Press.
- Miri, B., Ben-Chaim, D., & Zoller, U. (2007). Purposely teaching for the promotion of higher-order thinking skills: A case of critical thinking. *Research in Science Education*, 37(4), 353–369.
- Myers, D. G. (2004). *Intuition: Its powers and perils*. New Haven, CT: Yale University Press.
- Nummela-Caine, R. & Caine, G. (2006). The way we learn. *Educational Leadership*, 64(1), 50–54.
- Rock, D., & Schwartz, J. (2007). The neuroscience of leadership. *Reclaiming Children and Youth: The Journal of Strength-based Interventions*, 16(3), 10–17.
- Ronis, D. (2007). *Brain-compatible mathematics* (2nd ed.). Thousand Oaks, CA: Corwin Press.
- Schwed, A & Melichar-Utter, J. (2008). *Brain-friendly study strategies, grades 2-8: How teachers can help students learn*. Thousand Oaks, CA: Corwin Press.
- Sousa, D. A. (2006). *How the brain learns* (3rd ed.). Thousand Oaks, CA: Corwin Press.
- Sousa, D. A. (2008). *How the brain learns mathematics*. Thousand Oaks, CA: Corwin Press.
- Tate, M. L. (2008a). *Shouting won't grow dendrites: 20 techniques for managing a brain-compatible classroom*. Thousand Oaks, CA: Corwin Press.
- Tate, M. L. (2008b). *Graphic organizers and other visual strategies, grade K: Engage the brain*. Thousand Oaks, CA: Corwin Press.
- Twardosz, S. (2007). Exploring neuroscience: A guide for getting started. *Early Education and Development*, 18(2), 171–182.
- Utter, B. (2007). *Pick and plan: 100 brain-compatible strategies for lesson design*. Thousand Oaks, CA: Corwin Press.

- Williams, R. B. (2008). *Brain-compatible learning for the block* (2nd ed.). Thousand Oaks, CA: Corwin/Sage.
- Willis, J. (2007a). *Brain-friendly strategies for the inclusion classroom: Insights from a neurologist and classroom teacher*. Alexandria, VA: Association for Supervision and Curriculum Development.
- Willis, J. (2007b). Cooperative learning is a brain turn-on. *Middle School Journal*, 38(4), 4–5.
- Zambo, R., & Zambo, D. (2007). Mathematics and the learning cycle: How the brain works as it learns mathematics. *Teaching Children Mathematics*, 14(5), 265–270.
- Zimmerman, C. (2007). The development of scientific thinking skills in elementary and middle school. *Developmental Review*, 27, 172–223.
- Zull, J. E. (2006). Key aspects of how the brain learns. *New Directions for Adult and Continuing Education*, 110, 3–9.

