

Child and Adolescent Brain Development: Applications from Neuroscience to Practice

*Course Number: V05.0141

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*This course is offered every Fall semester and carries 4 points.

*There are no prerequisites to this class.

Course Description:

This course teaches students the fundamentals of human brain development from birth to young adulthood. The focus of the course is largely on normal brain functioning, but illustrative pathological development and dysfunctional conditions are reviewed as well, such as developmental dyslexia, autistic disorders, and attention-deficit/hyperactivity disorder. Once students have developed a foundational knowledge of neurocognitive functioning, the course addresses three additional sections which reflect methods of examining brain-based activity: Observation, assessment, and intervention. At the end of each section, students demonstrate a greater understanding of the neurocognitive developmental perspective and are able to apply their knowledge of brain-based skill sets to understanding the environmental demands that children and teens confront; including learning in school, handling complex social interactions, remembering autobiographical experiences, and managing emotional reactions. Students read a sampling of research articles, relevant clinical materials, and textbooks chapters.

Course Aims:

Knowledge

Students will learn key aspects of:

1. The anatomy of the human brain;
2. The development of the human brain across the lifespan; and
3. How scientists observe, assess and intervene in the development of neurocognitive processes in childhood and adolescence.

Skills

Students will be able to:

1. Generate ideas about how brain development parallels other developmental changes seen through childhood and adolescence; and
2. Critically evaluate the common, albeit unscientific assumptions that are made about the development of children's brain functioning and provide alternate theoretically and empirically supported explanations about child and adolescent behavior based on neurocognitive models.

Course Syllabus:

Section I Foundations: Knowledge versus the Unknown

In this section, students will be involved in lectures and discussions aimed at expanding their knowledge of functional neuroanatomy, while developing an appreciation of how the human brain grows from gestation through infancy, early childhood and into adolescence. We will focus on the historic models that have been utilized to explain the relationships between neuroanatomy and human behavior, such as phrenology and specific localization of cognitive functioning, and contrast those models with our current knowledge. Students will also develop an appreciation of the limits of our present understanding of brain development and consider frontiers for future exploration.

Class 1: Introduction

The term will begin with a review of the course syllabi, assignments and expectations for course grading. In addition, course dialectics will be introduced, including Knowledge versus the Unknown, Nature versus Nurture, Normalcy versus Disorder, and Complacency versus Action. These dialectics are chosen to help students develop a mindset about important questions in the field and to provide a broader base of knowledge in order to manage the tensions between the two poles of each dialectic. It is recognized that these issues have not been definitively resolved. We will also review Mischel's "Marshmallow Test" to highlight the relationship between cognitive functioning and human behaviors.

Readings:
None

Class 2: Cognitive Models: The History

We will review past models of brain functioning, such as phrenology and specific localization of cognitive functioning. Students will be introduced to computational models of brain functioning. Finally, we will discuss the functional brain areas, units, and brain systems that are considered to be accurate from a contemporary viewpoint.

Readings:
Gardner, H (1985). *The mind's new science: A history of the cognitive revolution*. Massachusetts: Basic Books.

Fennell, E. & Bauer, R. (1989). Models of inference in evaluating brain-behavior relationships in children. In C.R. Reynolds (Ed.) *Handbook of child clinical neuropsychology* (pp. 167-180). New York: Plenum Press.

Class 3: Functional Neuroanatomy: From Autopsy to Neuroimaging

We will review directional terms used to describe neuroanatomy, including dorsal, ventral, caudal, rostral, posterior, anterior, sagittal, coronal and horizontal slices. We will also discuss subcortical structures and functional properties of those areas. We will examine cortical structures and preview the functional properties attributed to those areas, including occipital, parietal, temporal, and frontal lobes, as well as more detailed examination of the prefrontal cortex. We will also discuss the ventricular and vascular systems and the use of autopsy, CT scans, MRI and fMRI technology, as well as more contemporary technologies, such as Diffusion MRI.

Readings:

Diamond, M. & Scheibel, A.B. (1985). *The human brain coloring book*. New York: Coloring Concepts Inc

Fields, R (2007). New brain cells go to work. *Scientific American Mind*. pp. 31-35.

Class 4: The Developing Brain I

We will discuss the identification of gray and white matter. We will examine cell migration, pruning, and arborization in animal and human models. Lastly, we will review the growth and development of the gray and white matter during early childhood and discuss the functional implications of those brain changes.

Readings:

Posner, M. & Raichle, M. (1994). *Images of mind*. New York: Scientific American Library.

Ratey, J. (2001). Chapter One: Development, *A user's guide to the brain: Perception, attention and the four theaters of the brain*. New York: Vintage Books. pp. 14-47.

Class 5: The Developing Brain II

We will review cell migration, pruning, and arborization in humans during late childhood, adolescence and adulthood. We will focus on the growth and development of the gray and white matter during later childhood and adolescence and the functional implications of those brain changes. Finally, we will take a developmental perspective and discuss how contemporary research findings can be understood in the context of the behaviors in which children and teens typically engage.

Readings:

Giedd, J., Blumenthal, J., Jeffries, N.O., Castellanos, F.X., Liu, H., Zijdenbos, A., Paus, T., Evans, A., & Rapoport, J. (1999). Brain development during childhood and adolescence: a longitudinal MRI study. *Nature Neuroscience*, 2(10), 861-863.

Thompson, R. A. & Nelson, C. A. (2001). Developmental science and the media: Early brain development. *American Psychologist*, 56, 5-15.

Class 6: Sensitive/Critical Periods and Neuroplasticity

We will discuss the concept of plasticity and how it applies to child, adolescent, and adult brain development. We will examine cases of traumatic brain injury during these different developmental periods to highlight differences in plasticity and subsequent brain functioning. We will also review the concept of sensitive or critical periods in the development of specific neurocognitive functions. Finally, we will examine clinical cases of language development and fine motor functioning as they apply to critical periods.

Readings:

Goldberg, E. (2005). *The Life of Your Brain and the Seasons of Your Brain The wisdom paradox: How your mind can grow strong as your brain grows older*. New York: Gotham Books. pp. 15-50.

Spreen, O., Risser, A.H. & Edgell, D. (1995). Chapter 8: Critical Periods, Plasticity and Recovery of Function Developmental Neuropsychology. New York: Oxford University Press. pp.139-155.

Class 7: Classroom Q & A/Review

ASSIGNMENT DUE

Observation Paper

Students will spend approximately one hour observing children who they do not know in a natural environment, such as a playground, park, or restaurant. Students will then briefly compose a description of those behaviors that were noteworthy during their observations which reflect developmentally appropriate neurocognitive functioning; they will then provide interpretations about what these actions suggest about brain development. The entire paper should be approximately 5 – 7 pages in length.

Section II

Observation: Nature versus Nurture

In this section, students will be involved in lectures and discussions aimed at expanding their knowledge of the essential neurocognitive functions during infancy and early childhood. Students will cultivate an appreciation of observational methods of examining the behavior of very young children and will review empirical studies of children's intellectual, language, and motor development, and perception and orientation toward human faces. These studies will help students to consider the role of genetics and the impact that environmental influences have on the brain development of children.

Class 8: Infancy and Early Childhood
Intellect: Genes and the Role of the Environment

We will discuss the developmental milestones of infants and young children. We will review the history of the intelligence tests for children; highlighting the types of intelligence and models of multiple intelligences. We will also examine how genetics and the environment impact intelligence, and we will obtain a better understanding of the application of the IQ test for best practices within the field of mental health.

Readings:

Kreppner, J. M., Rutter, M., Beckett, C., Castle, J., Colvert, E., & Groothues, C. (2007). Normality and impairment following profound early institutional deprivation: A longitudinal follow-up into early adolescence. *Developmental Psychology, 43*, 931-946.

Neisser, U., Boodoo, G., Bouchard, T.J., Boykin, A.W., Brody, N., Ceci, S.J. Halpern, D.F., Loehlin, J.C. Perloff, R. Sternberg, R.J. & Urbina, S. (1996). Intelligence: Knowns and unknowns. *American Psychologist 51* (2), 77-102.

Class 9: Facial and Object Perception

This class session will begin by revisiting the occipital, parietal and temporal lobes and important subcortical areas. We will then observe the orientation of a baby's visually gaze and how infants examine human faces. We will discuss the empirical studies of facial perception and the implications of these studies to the brain areas that are implicated. The class will break up into small groups to discuss key readings for the week. Finally, as a large group we will discuss our understanding of the relationship between facial perception and attachment between caregivers and children (both typical and autistic).

Readings:

Brooks, R. & Meltzoff, A. (2002). The importance of eyes: How infants interpret adult looking behavior. *Developmental Psychology, 38*, 958-966.

Klin, A., Jones, W., Schultz, R., Volkmar, F. & Cohen, D. (2002). Defining and quantifying the social phenotype. *American Journal of Psychiatry*, 159(6), 895-908.

Klin, A., Jones, W., Schultz, R., Volkmar, F. & Cohen, D. (2002). Visual fixation patterns during viewing of naturalistic social situations as predictors of social competence in individuals with autism. *Archives of General Psychiatry*, 59(9), 809-816.

Nelson, C.A. (2001). The development and neural bases of face recognition. *Infant and Child Development*, 10 (1-2), 3-18.

Stern, D. (1985). Chapter 3: The Sense of an Emergent Self, *The interpersonal world of the infant: A view from psychoanalysis and developmental psychology*. New York: Basic Books. pp. 37-68.

Class 10: Language Development: The Role of the Environment

We will begin by revisiting the temporal, parietal and frontal-cortical areas of the brain. We will discuss a system for understanding different language based skills and functions. The class will conclude with a small group discussion of the reading by Hart & Risley.

Readings:

Galaburda, A. & Sanides, F. (1980). Cytoarchitectonic organization of the human brain. *The Journal of Comparative Neurology*, 190, 597-610.

Hart, B. & Risley, T. (1995). Meaningful differences in the everyday experience of young American children. Maryland: Paul H. Brookes Publishing Co.

Class 11: Motor Development

We will revisit the following brain areas: The frontal lobe, the subcortical areas, and the cerebellum. A neurocognitive model for understanding different motor based skills and functions will be proposed. The class will subsequently break up into small group discussion of a video documenting motor development in children.

Readings:

Pick, J.P. (2002) The role of variability in early motor development. *Infant Behavior and Development*, 25(4), 452.

Ratey, J. (2001). Chapter Four: Movement. *A user's guide to the brain: Perception, attention and the four theaters of the brain*. New York: Vintage Books. pp. 147-181.

Section III Assessment: Normalcy versus Disorder

In this section, students will be involved in lectures and discussions aimed at increasing their knowledge of the neurocognitive functions that are essential during middle and late childhood. Students will be introduced to the methods of assessment used by neuropsychologists and will cultivate an appreciation of how standardized instruments can be employed to compare a child to his peer group. We will also review how neuropsychological testing can be used to differentiate normal or typical development from disorders in cognitive functioning, such as dyslexia, ADHD, anxiety, and errors children make in remembering factual and autobiographical information.

Class 12: Middle and Late Childhood

We will examine the developmental milestones of middle and late childhood. We will review methods for thinking about the assessment of cognitive functions during these developmental periods and discuss guidelines for cognitive development according to a child's age. Finally, an introduction to psycho-educational assessment and the neuropsychological evaluation will be provided.

Readings:

Wood, C. (1997). *Yardsticks: Children in the classroom ages 4-14*, a resource for parents and teachers. Massachusetts: Northeast Foundation for Children.

ASSIGNMENT DUE Critique of a Contemporary Article

Students must find an article from the popular press, including the daily newspaper, magazines, or internet websites, that provides commentary or advice about the neuropsychological/brain functioning of infants, children or adolescents. After reading the article, students must provide a critique about the conclusions that were drawn and use an empirical study from a current peer-reviewed journal to support or refute the claims. The paper should be no more than 5-6 pages.

Class 13: The Neuropsychological Evaluation

We will discuss the neuropsychological method and how to apply such an evaluation to children. We will examine areas of cognitive functioning, including intelligence, language, memory, attention and executive functioning. We will also focus on understanding areas of gross and fine motor functioning, sensorimotor abilities, and visual perception. Lastly, we will review academic achievement and social-emotional functioning. Further, case examples of differential diagnosis will be provided to help illustrate the benefits of neuropsychological evaluation.

Readings:

Baron, I. (2004). Chapter 1. *Neuropsychological Evaluation of the Child*. (pp. 3-34). Oxford University Press. pp. 3-34.

Class 14: The Reading System

We will review how the brain learns to read. We will discuss the concepts of phonological awareness and reading fluency. We will also examine automaticity and problems with retrieval.

Finally, we will review the functional relationship between reading and the temporal and frontal lobes of the human brain.

Readings:

Wolf, M. (2008). *Proust and the squid: The story and science of the reading brain*. New York: Harper Books. (Paperback or Audiobook)

Class 15: Developmental Dyslexia and Learning Disorders

We will discuss developmental dyslexia and debunk common myths. We will examine findings of gender and cultural differences in those identified as having reading disorders. A model of dyslexia as a brain-based learning disorder will be proposed and will lead to discussion about other language-based learning disorders typically seen in childhood. We will also discuss the remediation of dyslexia and conclude with a review clinically based on a neuropsychological perspective.

Readings:

Eden, G, & Zeffiro, T. (1998). Neural systems affected in developmental dyslexia revealed by functional neuroimaging. *Neuron*, 21, 279-282.

Grigorenko, E. (2001). Developmental dyslexia: An update on genes, brains, and environments. *Journal of Child Psychology and Psychiatry*, 42 (1), 91-125.

Shaywitz, S (1996). Dyslexia. *Scientific American*, 98-104.

Class 16: Attentional Disorders

We will examine attentional and executive functions important in childhood. We will focus on the frontal lobe and its role in attention. We will also discuss several models of Attention-Deficit/Hyperactivity Disorder (ADHD): The Barkley Model, the Sonuga-Barke Model, the PASS model, and the Halperin Model. Lastly, we will review the ways in which ADHD changes in presentation (i.e., the behavioral phenotype) across the lifespan.

Readings:

Barkley, R. (2006). . Chapter Three: Associated Cognitive, Developmental and Health Problems. *Attention deficit hyperactivity disorder – A handbook for diagnosis and treatment- Third edition*. New York: Guilford Press. pp. 122-183.

Kelly, A.M., Scheres, A., Sonuga-Barke, E. & Castellanos, F. X. (2007). Functional neuroimaging of reward and motivational pathways in ADHD. In M. Fitzgerald, M. Bellgrove, & M. Gill (Eds.), *The handbook of attention deficit hyperactivity disorder*. New York, John Wiley and Sons, Ltd. pp. 209-235.

Class 17: Problems with Memory

We will review the different types of memory, including declarative and episodic memory. We will discuss the memory functions important in childhood and consider how memories are made and stored in the human brain. We will assess the role of the hippocampus and examine unusual experiences in memory function, including retrieval problems, problems with source memory, false memories, trauma, and suggestibility.

Readings:

Loftus, E.F. (1997). Creating false memories. *Scientific American*, 277 (3), 70-75.

Loftus, E.F. & Pickrell, J. (1995). The formation of false memories. *Psychiatric Annals* (25), 720-724.

Schacter, D.L. (1999). The seven sins of memory: Insights from psychology and cognitive neuroscience. *American Psychologist*, 54 (3), 182-203.

Class 18: Emotions: Fear and Anxiety Disorders

We will review the brain's mechanisms for the processing of emotional experiences. We will discuss specific models of emotional experience, such as the Somatic Marker Hypothesis. We will examine how emotional experiences occur and how they are understood, highlighting the role of the amygdala. Lastly, we will apply these models to cases of childhood anxiety and fearfulness.

Readings:

LeDoux, J. (1996). Chapter 6-9. *The emotional brain: The mysterious underpinnings of emotional life*. New York, Simon & Schuster. pp. 138-303.

ASSIGNMENT DUE

Confirm Final Paper Topic

Students must choose a topic for their final paper. The topic must address neuropsychological brain development from birth to young adulthood. It will be presented briefly in writing to the instructor for approval.

Section IV

Prevention and Intervention: Complacency versus Action

In this section, students will be involved in lectures and discussions aimed at expanding their knowledge of the neurocognitive functions that are essential during adolescence. We will also strive to appreciate the remarkable changes occurring in the human brain during the teen years.

Students will be asked to consider areas of complex psychological development, including decision making, morality, brain hygiene, and emotional control or inhibition. We will review the implications of our understanding on public policy and practices. We will discuss when professionals and lay people should advocate for changes in public policy and detail what actions should be taken through programs of prevention and intervention.

Class 19: Adolescence

We will review the psychological and developmental theories central to understanding adolescence. We will also discuss the neurodevelopmental changes during adolescence and the both the vulnerabilities and the opportunities that are present during this developmental period.

Readings:

Dahl, R. (2004). Adolescent brain development. A period of vulnerabilities and opportunities. *Annals of the New York Academy of Science, 1021*, 1-22.

Luna, B. Garver, K, Urban, T. Lazar, N, & Sweeney, J. (2004). Maturation of cognitive processes from later childhood to adulthood. *Child Development, 75(5)*, 1357-1372.

Class 20: Emotional Control

We will examine the development of brain areas essential to response inhibition, delay of gratification, and self-regulation. We will also discuss the research literature on adolescence and emotion regulation. We will consider how these changes may influence teenagers.

Readings:

Shoda, Y., Mischel, W., & Peake, P. K. (1990). Predicting adolescent cognitive and self-regulatory competencies from preschool delay of gratification: Identifying diagnostic conditions. *Developmental Psychology, 26(6)*, 978–986.

Weinberger, D, Elvevag, B. & Giedd, J. (2005). The adolescent brain: A work in progress. Paper from the National Campaign to Prevent Teen Pregnancy. Retrieved from <http://www.thenationalcampaign.org/resources/pdf/BRAIN.pdf>.

Chapter 21: You Are What You Eat, Sleep And Drink!

We will review the changes in sleep patterns and habits during adolescence. We will also discuss the influence of nutrition on cognitive functioning. Lastly, we will have small group discussions about the most favorable school schedule and the most favorable diet for teenagers, given these cognitive changes.

Readings:

Carpenter, S. (2001) Sleep deprivation may be undermining teen health. *Monitor on Psychology* 32(9).

Ratey, J. (2001). Chapter Ten: Care and Feeding. *A user's guide to the brain: Perception, attention and the four theaters of the brain*. New York: Vintage Books. pp. 356-378

Kiefer, I (2007). Brain Food. *Scientific American Mind*. 58-63.

Article from Frontline News on Adolescents and Sleep.

ASSIGNMENT DUE Final Paper First Draft/Outline

Students must provide a first draft of their paper or an extensive outline with references attached. The topic must address neuropsychological brain development from birth to young adulthood and have been cleared with the instructor. Students will compose a brief literature review, using at least three current peer-reviewed articles. This paper will be returned to students to provide them with an opportunity to edit their work before the final draft is due.

Class 22: Complex Decision Making

We will review neuro-economics, highlighting its relationship to complex decision making. We will examine the use of rewards and consequences with adolescents and discuss whether how they are most effective for teenagers. Lastly, we will have small group discussion about the impact of alcohol on the teenage brain.

Readings:

Brown, A.S. Tapert, S.F., Granholm, E. & Delis, D.C. (2000). Neurocognitive functioning of adolescents: effects of protracted alcohol use. *Alcoholism: Clinical and Experimental Research*, 24, 164-171.

Steinberg, L (2004). Risk taking in adolescence: What changes and why? Recent brain development. A period of vulnerabilities and opportunities. *Annals of the New York Academy of Science*, 1021, 51-57.

White, A.M. & Swartzwelder, H.S. (2004) Hippocampal function during adolescence: A unique target of ethanol effects, *Annals of the New York Academy of Sciences*, 1021, 206–20.

Class 23: Social Cognition

We will review the concept of social cognition and discuss automaticity in social perception and processing. We will also discuss how cognition impacts social functioning and social decision making in adolescence. We will have small group discussions about how these models can be applied to understanding adolescent peer relationships as opposed to adult models of peer interaction.

Readings:

Bargh, J (1997). The automaticity of everyday life. In R. S. Wyer, Jr., & T. K. Srull, (Eds.), *Handbook of Social Cognition* (3), (pp. 1-43). Hillsdale, NJ: Erlbaum.

Fiske, S. (1995). Social Cognition. In A. Tesser. (Ed). *Advanced Social Psychology*. (pp.149-194). New York: MacGraw Hill.

Class 24: Morality, Law and Execution

This class will focus on understanding moral development in adolescence. We will review adolescent brain development in relation to legal culpability. Students will be asked to engage in a classroom debate focused on whether or not adolescents should be criminally sentenced as adults. We will also discuss what actions professionals and lay people should take in order to influence the legal system for teenage offenders.

Readings:

American Bar Association. (2004). "Cruel and unusual punishment: The juvenile death penalty. Adolescence, brain development and legal culpability. Juvenile Justice Center, Washington: District of Columbia.

Lewis, D, Pincus, J., Bard, B., Richardson, E., Prichep, L.S., Feldman, M. & Yeager, C. (1988). Neuropsychiatric, psychoeducational, and family characteristics of 14 juveniles condemned to death in the United States. *American Journal of Psychiatry*, 145(5), 584-589.

Sowell, E., Thompson P., Holmes C., Jernigan, T., & Toga, A. (1999). In vivo evidence for post-adolescent brain maturation in frontal and striatal regions. *Nature Neuroscience*, 2(10), 859-861.

Class 25: The College Experience: The Fruition of Personality

We will discuss the concept of personality and review how character develops and personality evolves. We will also discuss contemporary models of how personality stems from neurocognitive functions and review how this model applies to personality development during adolescence.

Readings:

Grigsby, J. & Stevens, D. (2000). Chapters 14-15: Regulation of Behavior and Development, Stability and Change of Character *Neurodynamics of personality*. New York, Guilford Press. pp. 279-326.

Class 26: The Transition to Adulthood

We will discuss the transition to adulthood and the development of independence. We will also focus on the process of maturation and review expectations about brain changes during adulthood. Lastly, we will examine strategies employed to help enhance the brain as it ages and discuss the literature which supports these methods.

Readings:

Goldberg, E. (2005). Use your brain and get more of it & Pattern boosters *The wisdom paradox: How your mind can grow strong as your brain grows older*. New York: Gotham Books. pp. 245-286.

Class 27: The Future: Neuroimaging and Experimental Evidence

We will review neuroimaging technologies and discuss how they have evolved over time. We will also discuss research studies that have used neuroimaging and examine the use of control groups. Finally, we will discuss the experimental limitations of this methodology.

Readings:

Dolan, R.J. (2008). Neuroimaging of cognition: Past, present, and future. *Neuron*, 60(3), 496-502.

ASSIGNMENT DUE

Final Literature Review Paper

Students will submit the final literature review paper with the instructor's comments from the first draft incorporated. This paper should be 8-15 pages double-spaced, written in APA style.

Class 28: Classroom Q & A/ Review

Assignments and Grading:

- a. **Observational Study:** This assignment will count for **15%** of total grade. Students will spend approximately one hour observing children who they do not know in a natural environment, such as a playground, park, or restaurant. Students will then briefly compose a description of those behaviors that were noteworthy during their observations which reflect developmentally appropriate neurocognitive functioning; they will then provide interpretations about what these actions suggest about brain development. The entire paper should be approximately 5 – 7 pages in length.
- b. **Critique:** The critique will count for **15%** of total grade. Students will find an article from the popular press including the daily newspaper, magazines, or internet websites that provides commentary or advice about the neuropsychological/brain functioning of infants, children or adolescents. After reading the article, students will provide a critique about the conclusions that were drawn and use an empirical study from a current peer-reviewed journal to support or refute the claims. The paper should be no more than 5-6 pages.
- c. **Class Participation:** Course participation will count for **20%** of the overall grade. Class participation is encouraged. Students will be given a grade for participation based upon

attendance, attention during class, responsiveness and thoughts about comments made by other students, and a demonstration that they have read the material.

d. **Final Paper First Draft/Outline:** This initial draft will be worth **20%** of total grade. Students will choose a topic of interest in the area of neurocognitive brain development from birth to young adulthood and will complete a brief literature review about this area. Students will clear their topic with the instructor before starting and will provide an initial draft or an extensive outline of their paper with references attached. At least three current peer-reviewed journals must be referenced in their brief literature review. The assignment will provide students an opportunity to receive feedback about the direction of their paper and their conclusions.

e. **Final Literature Review Paper:** This assignment up will count for **30%** of total grade. Students will complete the literature review based on the comments received on the outline/initial draft. This paper will be 8-15 pages double-spaced, APA style.

Readings:

1. Diamond, M. & Scheibel, A.B. (1985). *The human brain coloring book*. New York: Coloring Concepts Inc.
2. Hart, B. & Risley, T. (1995). *Meaningful differences in the everyday experience of young American children*. Maryland: Paul H. Brookes Publishing Co.
3. Ratey, J. (2001). *A user's guide to the brain: Perception, attention and the four theaters of the brain*. New York: Vintage Books.
4. Wolf, M. (2008). *Proust and the squid: The story and science of the reading brain*. New York: Harper Books.
5. Wood, C. (1997). *Yardsticks: Children in the classroom ages 4-14- A resource for parents and teachers*. Massachusetts: Northeast Foundation for Children.