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INTEGRATING NEUROSCIENCE KNOWLEDGE INTO SOCIAL WORK EDUCATION: A CASE-BASED APPROACH

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New knowledge from the rapidly growing field of neuroscience has important implications for our understanding of human behavior in the social environment, yet little of this knowledge has made its way into social work education. This article presents a model for integrating neuroscience into instruction on human development, the biopsychosocial model, psychopathology, and social work theory. Key concepts such as critical periods of brain development, neural plasticity, memory, cognition, and the impact of stress and trauma are discussed. Case studies and discussion questions are used to demonstrate the integration of neuroscience knowledge into social work education. We argue that teaching neuroscience will enhance students' critical thinking skills and better prepare them for direct and policy practice.

THE EXPLOSION OF KNOWLEDGE about the brain and its functions that occurred during the last two decades is informing psychosocial knowledge relevant to graduate and undergraduate social work education and to practice in several areas (Farmer, 2009; Garrett, 2003). These areas include, for instance, human development and behavior across the lifespan, cognition, memory, emotions, stress and trauma, and addictions (e.g., Balbernie, 2002; Claes, 2004; Heim & Nemeroff, 1999; Heim et al., 2000; Negash & Petersen, 2006; Pennington,

2009). Unfortunately, it appears that other professions have responded to the revolution in brain science more vigorously to date than has social work. As an illustration, Canadian nursing professionals now publish a nursing neuroscience journal and sponsor professional conferences specific to neuroscience in nursing (Poochikian-Sarkissian, 2009). Integration of the burgeoning knowledge from neuroscience into social work is proceeding, but in comparison doing so slowly. For instance, nearly a decade ago, the National Association of Social

Workers endorsed neuroscience as elemental in human behavior curricula (O'Neill, 2000). A few social work textbooks cover this topic (e.g., Farmer, 2009; Hutchison, 2008), yet a framework for integrating this content into social work education is lacking. Of note to this discussion is that the new Council on Social Work Education (CSWE) educational policy standards (EPS) specifically include biological development in the required content on the human behavior curriculum of master's programs (CSWE, 2008, EPS 2.1.7). The purpose of this article is to address this gap in the literature and further the integration of neuroscience in social work education.

Why is neuroscience important for social work education? Knowledge from the rapidly expanding world of neuroscience has several important implications for social work education and practice. First, neuroscience has the potential of enhancing our understanding of the role of the brain in human development and behavior, from the formation of the brain before birth to its functioning in older adults to the development of psychopathology (DiPietro, 2000; Negash & Petersen, 2006; Weatherston, 2001). Second, neuroscience provides new insights into biology's contributions to our multilayered biopsychosocial model (Farmer, 2009; Strohmman, 2003). Exploring neuroscience adds to our understanding of the transactional and ecological nature of human development. That is, from early life to old age, brain development is influenced by both genes and environment (Shonkoff & Phillips, 2000). Johnson (2001) suggests that neuroscience knowledge can inform interventions with clients and client systems, although we note that as of now this is mostly unrealized potential. Shapiro and

Applegate (2000) posit the relevance of the developments in neuroscience to the "often unaddressed biological component of social work's biopsychosocial perspective" (p. 9). Third, developments in neuroscience support social work's increasing focus on evidence-based practice and the development of new interventions. As one instance, explanations of brain structure and function in psychopathology can help debunk the moral failure model of mental illness (Olkin, 1999) and offer new evidence for why some of our already established treatment methods (e.g., psychotherapy) are successful (Farmer, 2009).

Lastly, knowledge from neuroscience facilitates social workers' common language and knowledge for interdisciplinary practice with psychologists, physicians, nurses, psychiatrists, and gerontologists around key topics such as developmental delay (Balbernie, 2002; Pennington, 2009), psychopathology (Garrett, 2003; Taylor & Bentley, 2004), substance abuse (Azmitia, 2001), and cognitive aspects of aging (Negash & Petersen, 2006). Armed with an understanding of the interactions of the brain and central nervous system and the relevant psychosocial elements, and of the terms and language used by multidisciplinary colleagues, social workers will be more effective communicators with team members in the increasingly transdisciplinary environment of professional practice.

The purpose of this article is to present a model for integrating neuroscience content into the social work curriculum with special emphasis on foundation content on human behavior in the social environment (HBSE). The approach integrates neuroscience into knowledge of human development, psycho-

pathology, the biopsychosocial perspective, and treatment methods. In turn, these four areas of social work knowledge underlie preparation for direct social work and policy practice. We use a case method, a traditional teaching modality in social work education, to demonstrate integration of neuroscience into the HBSE curriculum with the ultimate aim of better preparation for practice. To that end, the following discussion examines the relevant themes and concepts from neuroscience followed by three client scenarios. These scenarios integrate neuroscience knowledge on the following: brain development in an infant under the age of 1 year, brain injury and post-traumatic stress disorder (PTSD) in a young adult veteran of the Iraq war, and cognition and memory in an older adult.

Each case study includes questions for classroom discussions or short critical thinking written exercises. In this discussion, critical thinking is conceptualized as the intentional, purposive process using a sequence of steps to answer specific questions as delineated by the Critical Thinking Institute (<http://www.criticalthinking.org/starting/index.cfm>).

Concepts and Literature Review

Neuroscience, which is sometimes referred to as “brain science,” involves multiple disciplines in the study of the brain and central nervous system and their functions (Bear, Connors, & Paradiso, 2007). In terms of social work practice, because our work involves persons and families challenged by psychosocial issues (Shapiro & Applegate, 2000; Weatherston, 2001), the link between neuroscience and social behaviors and processes is referred to by Farmer (2009) as “social neuroscience.”

Certain themes of brain development and function are pivotal to understanding the role of brain activities and structures and their development in the context of social neuroscience and biopsychosocial development across the lifespan. For purposes of this article, the following themes are discussed and then incorporated in client scenarios: critical and sensitive periods, neural plasticity, cognition and memory, and stress and trauma.

Critical and Sensitive Periods

One theme is that certain aspects of brain development and function are ready to develop during specific periods, called *sensitive periods* (Shonkoff & Phillips, 2000). This term is invoked to refer to stages of development during which a structure or area of the brain is uniquely receptive to input from environmental stimuli (Pennington, 2009; Shonkoff & Phillips, 2000) and develops rapidly, making multitudinous interactive connections between neurons and neuronal systems, each of which can then interact with other systems (i.e., synaptogenesis; Azmitia, 2001).

For example, the orbital prefrontal cortex (located just behind the eyes) enters a sensitive period of development early in life continuing until about 2 years of age. This system processes facial expressions and responses to touch, taste, and smell and interacts with the limbic system, which monitors and adjusts emotional responses to balance emotion and reasoning. Schore (2000) links these two brain structures and this sensitive period of rapid development with the attachment formation process between an infant and its nurturing caregiver. In sum, what this means for social work students’ understanding is that parts of

the brain develop or reorganize connections (synapses) among brain cells (neurons) extensively during sensitive periods (Pennington, 2009). This understanding provides opportunities for discussions of the import of social policy and programs, for instance, on healthy child development, prevention of brain injuries, and conditions related to brain changes at later ages.

Although sensitive periods are important, they are not, however, necessarily determinative once and for all. Newer knowledge stands in stark contrast to previous beliefs that the brain developed early in life, and then ceased development, and that development was immutable to environmental or experiential contexts. That earlier tenet, in sum, was that the brain was “hardwired” and unchangeable (Cicchetti & Cannon, 1999). More recent research shows that brain development and reorganization occur throughout the lifespan.

Neural Plasticity

Development of the brain and its functions throughout the lifespan results from the brain’s ability to reorganize connections (synapses) among multiple neurons and create new neurons (neurogenesis) in response to new experiences. The term for this ability to change and to respond to environment and experiences is *neural plasticity*—a characteristic that endures across the lifespan (Cicchetti & Cannon, 1999; Shonkoff & Phillips, 2000). Brain plasticity is the brain’s capacity to adapt and to develop new neurons (neurogenesis) and new connections or synapses (synaptogenesis) between neurons in response to experiences.

Neural plasticity not only means that neurons and neural connections can grow and change throughout life, but also implies the import of several psychosocial aspects, such as life-long learning, the influence of environmental conditions on the way people process emotions, and the influence of stress or trauma on the brain. The central relevance of neural plasticity to understanding the brain’s role in affect or emotion regulation and in infant–caregiver relationships should be obvious given the significance of each on psychosocial development and on relationships across the lifespan (Schoore, 2000; Shapiro & Applegate, 2000). The ability of the brain to adapt to experiences is not, however, absolute. Some aspects of brain development and psychosocial sequelae, such as early attachment between an infant and its caregiver, may change less easily than other aspects. However, some recent research suggests that deprivation of this imprinting relationship may resolve through ensuing positive nurturing relationships (Zigler, Finn-Stevenson, & Hall, 2002). Other neuroscience research demonstrates the role of neural plasticity in older adults’ cognition and memory (Hedden, & Gabrieli, 2005; Smith et al., 2009).

Cognition and Memory

Cognition is the ability to sort out and store information and to develop solutions to problems (i.e., learning). The cerebral cortex (the front and top of the outer layer of the brain) is the seat of cognition in the brain (Garrett, 2003). Cognition develops progressively from less complex to more complex processes beginning in infancy, continuing in childhood

and, as research in neuroscience demonstrates, throughout the lifespan. Ongoing cognitive development rests on brain plasticity and its role in continuously facilitating accommodation to changing environmental stimuli (Hertzog, Kramer, Wilson, & Lindenberger, 2009).

Remembering what is learned involves several parts of the brain and changes in connections between neurons in those areas of the brain (Garrett, 2003). It is generally agreed that the hippocampus, located in the limbic system, acts as a sort of entry point for information received from sensory organs (Schacter & Wagner, 1999). Although different authors use different terms, it is useful to think of *working memory* or *working attention* as a theoretical concept indicating the capacity to temporarily hold several pieces of information in mind while problem-solving. Working memory involves many parts of the brain functioning together (Wickelgren, 1997). The term *short-term memory* is often used to refer to the storage of information for a few seconds or minutes, whereas *long-term memory* may be retained perhaps indefinitely, even with severe brain injury or Alzheimer's disease (Bear et al., 2007). Biologically, *working* or *short-term memory* may be thought of as temporary potentiation of neural connections, whereas *long-term memory* involves a change in brain architecture through the construction of new structures (Garrett, 2003; Schacter & Wagner, 1999).

Though variable in its occurrence, the loss of cognitive and memory abilities in older adults is believed to be due to interferences in neural connections, many of which occur in the temporal lobes and prefrontal cortex (Gar-

rett, 2003; Hedden & Gabrieli, 2005). Specifically, collections of specific proteins within the synapse (the space between neurons) and/or collections of neural fibers within neurons themselves may interfere in memory processes (Garrett, 2003). In Alzheimer's disease these "tangles and plaques" may block the hippocampus from its normal function of sorting input information from output information, thus interfering with sorting and processing information pivotal for memory (Hedden & Gabrieli, 2005). The implications for social work students of understanding these processes are critical for both policy and direct practice in light of the increasing population of older adults.

Stress and Trauma

The importance of stress and trauma for the ecological perspective has a long tradition in social work. However, the new knowledge gained through research in neuroscience sheds needed light on the impact of stress and trauma on the brain, and the role of brain functions in adaptive or maladaptive responses to stress and trauma for future positive development.

Shonkoff and Phillips (2000) describe stress as the set of changes occurring in one's body and brain triggered by a stimulus or threat that is perceived as traumatic. The immediate result of such a stressor is a rapid redirection in the priorities of the brain and body to the immediate challenge rather than the normative processes of development and growth (e.g., digestion, learning). The shift produces changes in multiple neurochemicals of the brain and body (e.g., corticosteroids). This stress reaction and biochemical shift may

be of short duration or prolonged, depending on the stressor event. Perry (2002) explains that the chronic stress of childhood neglect increases specific neurotransmitters that turn off the frontal cortex's ability to control the amygdala, a component of the limbic system located in the center of the brain that is central to regulating emotions.

The amygdala is also believed to play a key role in emotional memory (Adolphs, Tranel, & Buchanan, 2005). The long-term sequelae of disruptions in the regulation of emotions early in life on future brain development and psychosocial well-being can be dramatic (Heim et al., 2000; Hobfoll, 2002). For example, Cicchetti and Cannon (1999) and Claes (2004) suggest that the stressors associated with child mistreatment and the resultant changes in neurochemicals in the brain modify brain development and may create vulnerability to later psychopathology. Traumatic events that occur anytime in life may result in differences in the way that memories are processed in the brain. Lanius et al. (2004) found that people who experience PTSD as a result of trauma differ in their neural connectivity from those who experienced trauma but did not develop PTSD.

Client Scenarios

Client scenarios can assist students to integrate neuroscience into their understanding of the human lifespan, the biopsychosocial framework, psychopathology, and treatment theories. The following scenarios depict clients in specific lifespan stages and incorporate as appropriate the concepts from neuroscience. In reading and analyzing case scenarios, students can more easily understand the

relevance of neuroscience concepts to social work practice.

Scenario 1: Brain Development in a Young Infant

Juan, a 10-month-old Mexican American boy, has come in to an early childhood assessment program with his mother, Maria, who is an undocumented immigrant. When she found out she was pregnant, Maria did not seek prenatal care for fear that she would be deported. Thus, she did not receive care until she went into labor. Juan was born at 2 pounds 9 ounces and spent 20 days in the neonatal intensive care unit. He qualifies for early intervention services from birth because of his low birth weight and because he is a U.S. citizen. A few weeks after Juan was born, Maria went through a period of feeling down and having crying spells nearly every day. She had started to feel better, but these spells recently returned after her husband decided he needed to return to Mexico to find work there. Now, Maria is alone in the United States with Juan. She has a few friends and no family nearby.

The case of Juan and Maria provides an excellent example for teaching students to integrate neuroscience into practice. First, we can use this case scenario to underscore the importance of the biopsychosocial perspective and to emphasize the importance of neuroscience in this model. For example, we might ask students to discuss the following ques-

tion: How has Juan's family, the local community, national policies, his culture, and globalization influenced his brain development? How will these factors continue to influence his brain development in the future?

Such a discussion would help students integrate knowledge of brain development into the social context (e.g., the concept of social neuroscience). Macro-level decisions and processes such as national policies on immigration and health care access have an influence on the resources available to developing children (Dawson, Ashman, & Carver, 2000). In Juan's case, key resources are scarce and/or lacking. The experience of both poverty and prematurity put children like Juan in double jeopardy for risk factors related to brain development (DiPietro, 2000). For example, infants living in poverty are likely to live in stressful, chaotic, unstimulating, and unsafe physical environments and to experience poor parenting (Combs-Orme & Cain, 2006), and prematurity conveys the risk of brain hemorrhages (Kelly, 2006).

Through the case study, students can link macro and micro issues and put neuroscience in the context of social work practice. Dawson et al. (2000) provide an excellent discussion of the policy implications of neuroscience. We might also ask students: How are Juan's low birth weight and possible prematurity related to his brain development? Suppose Maria tells you that he is not yet crawling and wonders if he is delayed. Using your knowledge of neuroscience, what could you say to her?

Students who study neurodevelopment as part of their HBSE curriculum will understand that a sensitive period of brain development starts before birth and continues through the

first few years of life. During this sensitive period, neurons are created (proliferation), migrate, differentiate into their specialized functions, and connections between the neurons are formed (DiPietro, 2000). Because Juan was premature, some of this critical development that would normally occur before birth must now occur after, in an environment quite unlike that in the womb. Premature babies reach developmental milestones a little later than do full-term babies, because preemies' development is related to their due date, not their birth date (Kelly, 2006). Thus, our students can reassure Maria that his development is still within normal limits and that this alone should not be a cause for concern.

The case of Maria and Juan also provides an excellent example for talking about the link between attachment and brain development. To this end, we might ask our students: How is neurodevelopment related to attachment? What supports might Maria need to ensure that Juan develops a healthy attachment? Students who study neurodevelopment will understand that the sensitive period for attachment—from birth to age 3—occurs at the same time as the formation of the connections between the limbic system and the prefrontal cortex that regulate emotion (Siegel, 2001). Juan's ability to form an attachment to his mother will support his developing brain and influence his ability to form other relationships and regulate his emotions later in life (Schorre, 2000). Using knowledge of both brain development and attachment theory, students critically assess whether Juan has an adequate available caretaker. Attachment research would tell us that Maria's crying spells and feeling down could be a cause for

concern if they are indicators that Maria is experiencing mild to moderate depression (Lovejoy, Graczyk, O'Hare, & Neuman, 2000). Students will further understand that taking care of Maria's mental health is critical to Juan's brain development (Schoe, 2000). The discussion of attachment could also be linked back to policy through a discussion around the importance of funding programs to support mental health care of mothers including immigrant mothers.

Finally, we could use the case study of Juan and Maria to educate students about language development and culture for contemporary migrants. We could imagine that Maria asks the social worker: Should I be teaching Juan to speak English or Spanish? Knowing that Juan is in a critical period of language development and that all language spoken to him will support his brain stimulation and development, the students would understand that it is best to encourage Maria to help Juan learn both languages (Bear et al., 2001). Understanding that the Spanish language is an important part of Juan's culture and that as migrants Maria and Juan could face a loss of their culture (Barranti, 2005), we could reassure Maria that Juan will only benefit from exposure to both languages. The scenario has implications regarding discussions of immigration and education policies, as well as access to prenatal care for immigrants.

Scenario 2: PTSD and Brain Injury in an Iraqi War Veteran

Cory, a 21-year-old Caucasian male, is a veteran who returned from Iraq 2 years ago. Cory was on patrol on the

Iraq/Iran border when he saw three members of his platoon killed by an improvised explosive device (IED). Cory attempted to provide first aid, but all three died as they waited for a helicopter. He served the remaining 3 months of his tour in Iraq before returning home. It has been 4 months since he returned to the United States. He has been experiencing headaches, sensitivity to light, intrusive nightmares, difficulty remembering, difficulty concentrating, high anxiety, and recurrent and intrusive thoughts about the explosion.

Again, with the case of Cory, we see how a client scenario can help students link neuroscience to social work practice. We might ask our students to discuss: How does acute trauma affect brain functioning? Using their knowledge of how trauma affects the brain, students will understand that Cory may have experienced shifts in the neurochemicals in his brain, changes in his neural connectivity, stretching or compressing of brain tissue, and/or cell death (Zillmer, Spiers, & Culbertson, 2008). Knowledge of how trauma affects the brain can help our students communicate and collaborate with professionals from other disciplines. We ask students to elaborate on how this knowledge can facilitate interdisciplinary discussions of the psychosocial issues for Cory with an interdisciplinary team. A client such as Cory might also be seeing a psychiatrist, a neurologist, a neuropsychologist, a rehabilitation specialist, and/or a physician in general practice. Our students will work more effectively with multidisciplinary colleagues

if they have the knowledge necessary to communicate with these other professions. Knowledge of the effects of trauma on the brain can also help our students communicate with Cory and his family and educate them about Cory's symptoms and the types of treatments that could help him.

Neuroscience knowledge informs students learning about psychopathology later in our curriculum. We might ask students: Do you recognize the symptoms of any particular diagnosis in Cory? Because our students in the human behavior course may not have completed a psychopathology course, we would not necessarily expect them to have complete answers. Some students might recognize that nightmares, recurrent and intrusive thoughts, and high anxiety are symptoms of PTSD. A background in neuroscience can facilitate students' learning in later psychopathology courses and prepare them to critically analyze the physiological basis of the effects of stress and trauma (Bremner, 2005). Another question we might ask our students to discuss is: Can Cory's brain recover, and what treatment methods will assist Cory with his recovery? Here, students can apply their knowledge of neuroplasticity and of the brain's role in emotional regulation. Using this knowledge, students will understand that since the event, Cory's brain has been and will continue to attempt to restore functioning of his current neural pathways. Finally, students will understand that the traumatic event likely caused damage to the brain's emotional regulation center and led to emotionally charged memories of the event (Brewin, 2001). The latter enlightens learning about exposure therapies in the advanced curriculum to help

Cory process emotionally charged memories and restore emotional regulation. These types of therapies take advantage of the neural plasticity of the brain after exposure to a trauma (Young, 2009).

We might also adapt this case study to ask students to imagine that Cory is also having a problem with alcohol abuse. Further, asking students what they know about the brain that would explain why people with PTSD frequently also have substance abuse problems can assist their understanding that the neurochemical balance in Cory's brain could have very well been disrupted in the IED event, contributing to the high anxiety and other trauma-related symptoms that he is experiencing. Knowing that alcohol binds to the same sites as antianxiety medications (Bear et al., 2007) facilitates students' understanding of why Cory might use alcohol to self-medicate for his PTSD-related symptoms. Government policies and services for the treatment of veterans with PTSD and related disorders (Rosenheck & Fontana, 2007) certainly should be informed about the neuroscience of these disorders.

Scenario 3: Memory and Cognition in an Older Adult

Lucille Warren is a 70-year-old African American widow, her husband having died 2½ years ago, who lives alone. Mrs. Warren retired 3 years ago from her secretarial position in the public school system. She receives spousal Social Security benefits and full Medicare, as well as a small pension from the public schools. She has three

adult children, aged 50 (Sam), 47 (Trinity), and 43 (Corinda), and five grandchildren, aged 18, 15, 13, 11, and 10 years. Over the past few months Corinda has noticed that her mother seems to have difficulty at times balancing her checkbook, and she forgot to meet Corinda for lunch this week. Mrs. Warren has moderate high blood pressure that is controlled by medication alone. Corinda and Trinity are concerned, worrying that their mother's "mind" is going. The sisters spoke with Mrs. Warren's primary care physician who asked you, the social worker in the primary care center, to consult with Mrs. Warren and the sisters.

This scenario prompts students to incorporate behavioral and psychosocial aspects of aging and possible brain changes in older adults. Initially we may ask students the following: What behaviors of Mrs. Warren are typical of older adults, and what behaviors may indicate problems? What does brain science contribute to understanding Mrs. Warren's difficulties in memory and cognition? These questions ask students to critically think through Mrs. Warren's story and the challenges of her transition into retirement and widowhood, as well as the typical and atypical cognitive and memory changes in later adulthood. From a psychosocial perspective only, students might posit that the behaviors of concern indicate Mrs. Warren is grieving over her husband's passing (Kovacs, 2008; Sheldon, 2006). Then again, knowing that the amygdala is central to emotion regulation and emotion-

related memory, students could critically analyze recent findings on the brain and bereavement. For example, O'Connor (2005) reports on recent research that used functional magnetic brain imaging of bereaved individuals and found that prolonged or complicated bereavement is associated with changes in the cortex of the brain and to increased activity in the amygdala, with resolution of grieving correlated with return of amygdalic activity to normal levels. Notably, these findings are an opportunity to caution students about the import of critically analyzing neuroscience findings before adopting them. Neuroscience may enhance our understanding of the possibilities underlying older adults' problems in memory and cognition. We remind students that brain plasticity is lifelong, and, therefore, ask: What interventions are based on neuroscience research findings on older adults' cognition and memory difficulties? Students' integration of neuroscience and aging can lead them to understand the efficacy of interventions using memory strategies and cognitive stimulation for Mrs. Warren (Smith et al., 2009) in addition to increased social support and interactions (Ybarra et al., 2008). We ask students: What macro practice and policy issues for comprehensive services for older adults does this case highlight?

The questions posed in the three scenarios above are appropriate for classroom discussions and/or as written assignments that require incorporation of neuroscience, relevant research studies, and critical analysis of findings to the scenario at hand. When used in either venue, the case study method facilitates acquisition of neuroscience knowledge within

the context of the biopsychosocial perspective of lifespan development and application of that content to client scenarios.

Implications and Conclusions

The integration of neuroscience in social work education discussed above has implication for students, faculty, and practitioners' development, and research.

In the above discussion we argued that when social work educators infuse neuroscience content into their human behavior lifespan curriculum, students are better prepared for practice. Integration of neuroscience into the biopsychosocial perspective of human behavior prepares students for the increasingly transdisciplinary environment of practice and can result in better continuity of care for clients. This integrated knowledge prepares social workers to better educate clients and their families regarding conditions and illnesses related to the brain and to be effective critical links between clients, families, and the transdisciplinary team. This integration also equips students for policy practice and advocating for funding, particularly to support early intervention programs, early childhood screening for developmental disorders, brain injury prevention programs, substance abuse prevention and treatment programs, and cognitive stimulation programs for older adults.

Faculty development may be addressed when they build on their areas of lifespan expertise in collaboration with faculty from other disciplines such as nursing and neuropsychiatry and by participating in interdisciplinary workshops and seminars. Faculty working together within social work pro-

grams can develop and imbed neuroscience across foundation practice and advanced curricula. Continuing education for practitioners is facilitated when workshops focus on workers' client population(s) and/or client issues within specific phases of the lifespan (e.g., infants and families, young adults, older adults, cognitive delays, midlife depression).

Lastly, beyond the mandate of CSWE accreditation standards, research examining what is and what is not taught on aspects of neuroscience in social work programs is needed and would be informative in further developing the integration of brain science in social work education. We, as social work educators, need to rethink our current models for teaching human behavior in the social environment. The approach explicated above can move us to the integration of neuroscience in social work's lifespan curriculum.

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