BRAIN RESEARCH

DOES IT SUPPORT ELLEN G. WHITE'S COUNSELS TO EDUCATORS?

Clearly, Ellen White's writings and brain research share one overriding theme: Learning and wholistic development depend on a balanced nurture of the physical, mental, and emotional/social/spiritual powers.

By LINDA BRYANT CAVINESS

The 1990s produced an explosion of information on the brain and how it works. This bombardment of data was especially intriguing to me. In the early 1990s, our teen-aged son, Tad, was in the last stages of Niemann Pick disease, a gradual deterioration of brain tissue that somewhat resembles Lou Gehrig's disease. Both are terminal conditions.

Personal interest compelled me to search deeper into brain studies than most classroom teachers would. Though this quest taught me much about the brain and how it operates, it did not reveal a cure for our son.

After Tad's death in 1993, I began completing requirements for the Ph.D. I had begun before his diagnosis. It seemed natural to write about the topic that had consumed so much of my interest—the brain and education—but how to approach it puzzled me.

One evening, I commented to my husband, Larry: "It amazes me how brain-science findings reflect many of Ellen White's counsels to educators."

"Why don't you make that your dissertation study?" he responded.

With further encouragement from others, I began preliminary research and information-gathering. The value of such a study became increasingly apparent as journal articles began to challenge the relevance of brain-research data to educational practice. The stimulating questions raised by the data convinced me that the study could be valuable. The intrigue intensified as I read Ellen White's references to the *science of religion*[1] and the *science of education*.[2]

Early on, I identified eight individuals recognized for their ability to translate brain science into educational practice—Marian Diamond, Candace Pert, Carla Hannaford, Renate and Geoffrey Caine, Jane Healy, Eric Jensen, and Robert Sylwester.[3] An inductive process identified 15 common themes

in their publications:

1. Body and mind function as one.

2. Sensory reception stimulates mind, body, and neurochemistry.

3. Exercise and movement are vital to cognition.

4. Health habits profoundly affect learning.

5. Emotions and neurochemistry unite brain and body functions and powerfully impact learning.

6. Music and the arts significantly stimulate cognition.

7. Social influences make important contributions to cognition.

8. Plasticity and enrichment contribute to brain growth and change.

9. Certain stages of development provide optimal times for cognitive patterning.

10. Early language experiences profoundly affect future brain function.

11. Making meaning involves body, brain, neurochemistry, and sensory perception.

12. Individualism typifies brain function.

13. Both extrinsic and intrinsic motivation are critical learning factors.

14. Memory is a dynamic process influenced by sensory stimulation, neurochemistry, and previous experience.

15. Attentional states drive learning.

The next challenge was to synthesize Ellen White's voluminous counsels on learning. I consulted four authoritative resources—Drs. George Akers, Herbert E. Douglass, and George R. Knight, and the E. M. Cadwallader doctoral dissertation entitled "Principles of Education."[4] Akers, Douglass, and Knight provided lists of what they considered to be her principles for education. Again, using an inductive process, 12 principles emerged:

1. The Bible is foundational and contextual in education.

2. Knowledge of God and knowing God—the Source of wisdom, love, and life—allows the learner to achieve full educational potential.

3. Redemption and restoration of the image of God in humanity are major goals of education.

4. God sacrificially honors humanity's freedom to choose, and He also expects education to respect the human will.

5. Character development is integral to God's educational plan for humanity.

6. Selfless service to others is a major objective in educating the whole person.

7. True education is the harmonious development of the physical, mental, and spiritual powers (including emotional, social, moral, esthetic, vocational, and religious aspects).

8. Students develop best when amusement is minimized and useful work becomes a source of recreation, relaxation, and healthful exercise.

9. A primary objective of education is to provide training and nurture that is practical as well as cultural and academic.

10. Health is a major factor in student success; therefore, educators, parents, and students should concern themselves with health principles.

11. Parental influence profoundly affects cognitive development and future success.

12. Teacher characteristics and influence can powerfully inhibit or promote learning and future success.

How do the themes and principles of these two bodies of data stack up against each other?

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Comparing Ellen White's Principles and Brain Research Themes

Ellen White's 12 principles are so comprehensive that each of the 15 brain-research themes is addressed by at least one of them.

For example, her definition of true education (No. 7) encompasses many of the brain-research themes.

But what about Ellen White's educational principles? How many are addressed by brain research? Only nine of her 12 principles are dealt with by the brain researchers cited above. The other three (biblical foundation, knowledge of God, and redemption and restoration of the image of God in humanity) relate specifically to a relationship with the Godhead. Brain science is relatively silent in this area, probably because of the overwhelmingly naturalistic orientation of the neuroscientific community. According to this philosophy, there is no supernatural power and humanity's evolution occurs mindlessly and without purpose.[5] These assumptions are antithetically opposed to the theistic creationism of Ellen White's writings.

Clearly, Ellen White's writings and brain research share one overriding theme: Learning and wholistic development depend on a balanced nurture of the physical, mental, and emotional/social/spiritual powers.

Ellen White places this emphasis up front in her writings. In the first paragraphs of her 1903 treatise on pedagogy—the book *Education*[6]—she defines true education as the harmonious development of the physical, mental, and spiritual powers. To this dynamic triad, she adds the goal of service to others.

Brain educators referred to in this article also draw attention to harmonious development. However, for the *spiritual* component, they use the term(s) *emotional/social.*

Carla Hannaford, best known for her emphasis on the importance of physical activity in promoting learning, states:

"Body, thought and emotion are intimately bound together through intricate nerve networks, and function as a whole unit to enrich our knowing. And research in the neurosciences is helping to explain how and why rich emotional development is essential for understanding relationships, rational thought, imagination, creativity and even the health of the body." She adds: "This ties to Damasio's findings that emotion, body and reason are physiologically inseparable."[8]

Jane Healy, a psychologist and professional educator for more than 35 years, says that "Children are 'disadvantaged' to the degree they do not receive adequate physical, social-emotional, or intellectual nurturing. . . . The physical, emotional, and cognitive events that transpire during the early years of a brain's development have a lifelong impact, not only on the brain itself but also on the society in which it will inevitably make its mark—for better or for worse."[9]

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The brain and the body are united by a flow of information that permeates them both.

According to Robert Sylwester, a professor at the University of Oregon: "Our profession pays lip service to educating the whole student, but school activities tend to focus on the development of measurable, rational qualities."[10]

Though Ellen White clearly defines as a vital triad the physical, mental, and *spiritual* powers, brain researchers often refer to the latter as *emotion* or the *emotional/social* factor, and rarely use the term *spiritual.*

Candace Pert, famous for her discovery of the opiate receptor, says that "for decades, most people thought of the brain and its extension, the central nervous system, primarily as an electrical communication system."[11] The standard model of information transfer, from neuron to neuron across the synaptic gap, represents only a small percentage of the activity that occurs throughout the body and brain. Pert and others have discovered evidence that cells throughout the body and brain—not just neuron cells—are equipped to participate in an information network.

Body fluids carry protein ligands that bind with receptor sites on individual cells and stimulate cell activity. This activity produces emotions and drives that are felt throughout the body and brain. Pert describes these ligands as molecules of emotion that act as fingers to press the buttons (receptor sites) on cell bodies (minute engines that facilitate life processes and body/brain functions).

While this is a greatly simplified overview, it does show that the brain and the body are united by a flow of information that permeates them both. Due to their integral relationship, the mind and body depend on each other for wholistic function.

Some naturalistic scientists equate this neurochemical flow of information—which emotionally binds body and brain—with spirit. Some even assert that human concepts of God can be explained as a function of the prefrontal lobes of the cortex. However, Scripture and Ellen White do *not* confine God in this way. He is the vital power that created the universe and on which all life processes depend. Theistic creationists are not likely to dispute the accuracy of the neuron-to-neuron model of information transfer or the evidence

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Both researchers and Ellen White agree on the intimate connection between the health of the body and the health of the brain.

that neurochemistry plays a vital role in emotional and social function, but they oppose any reduction of God to an interaction of chemicals.

Ellen White does refer to God's ability to flash light into the mind and to profoundly impact the brain and the body with His love. But she portrays this love as being on a higher order than humanity's impulsive, constantly changing emotions.[12] Interestingly, Daniel Goleman[13] and Candace Pert[14] in her discussions with Paul MacLean, similarly refer to a higher order of emotion that is controlled more by the prefrontal cortex, where judgment and willpower seem to be centered. They speak of the importance of self-restraint, compassion, and willpower—attributes Ellen White seems to identify with love.

The Triune Brain and Harmonious Development

The term *triune brain* was popularized by National Institute of Mental Health re-

The age-old nature-versus-nurture dispute becomes moot in light of current research on brain plasticity—the brain's ability to change and grow.

searcher Paul MacLean.[15] He explains the organization of the brain on three different levels: the brainstem (or hindbrain), the limbic area, and the cerebral cortex. (See Figure 2.)

These areas seem to align with the three components of harmonious development—the physical, mental, and emotional/social/spiritual. The cerebral cortex aligns with the *mental*, since this is where critical thinking occurs. The limbic area aligns with the *emotional/social/spiritual*, since *emotion* and *memory* are a major function of this area. And the brain stem receives information from the *physical* body. Each of the three depends on the others in a symbiotic relationship that underscores Ellen White's counsel about *harmonious development*. As a result of my study,[16] I believe that this physical-mental-spiritual relationship functions as a fractal-like pattern[17] that is repeated over and again in brain function and in life processes in general.

Plasticity and Enrichment

The age-old nature-versus-nurture dispute becomes moot in light of current research on brain plasticity—the brain's ability to change and grow. At the time Ellen White wrote to educators, scientists thought that the brain changed little between birth and death, other than to increase in size as the body grew. Intelligence was assumed to be based on heredity and resistant to change.

Marian Diamond,[18] a neuroanatomist, conducted seminal studies on the effect of environmental stimulation on brain development. She discovered that both nurture and enrichment promote brain growth.

For 30 years, Diamond and others studied the effects of various environments on

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The nerve cell, or neuron, resembles a miniature tree with its cell body, its axon bearing a few long thin extensions, its luxuriantly branching dendrites, and its thornlike spines that grow, change shape, or shrink as a person experiences the world.

dendritic growth in the cortex—the outer layer of the brain. Figure 3 shows a neuron with its information-receiving dendrites, the cell body, and the axon, from which information is distributed to dendrites on other neurons.

Diamond and others have found that enriched environments stimulate dendritic growth in rats. The dendrites branch and grow like little trees. The greater the environmental enrichment, the more levels of dendritic growth. Scientists believe that thicker forests of dendrites enhance neural connections and inter-neural communication. Diamond discovered that, after four days in an enriched environment, rat brains show increased growth. Conversely, after four days of boredom, dendritic growth atrophied.

Diamond defined an impoverished environment as one in which a rat was confined alone in a cage with food and water, but no toys. The enriched environment included multiple rats for social stimulation and challenging objects with which to interact. Interestingly, Diamond also included a third group of rats that were kept in a natural environment. These rats showed the greatest levels of cortical thickness or dendritic growth.

One hundred years ago, when scientists thought the brain was unchangeable, Ellen White[19] wrote about the "plastic" nature of the mind. She advised teachers[20] to exercise caution because the impressionable minds of children can be permanently scarred by the classroom environment and the teacher's influence.[21]

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that children be allowed to develop wholistically—physically, mentally, and spiritually. Such an education, she wrote, "prepares the student for the joy of service in this world and for the higher joy of wider service in the world to come."[22]

Stages of Development

Current research suggests that there are critical periods of brain development. Brain-research themes that parallel Ellen White include prenatal influence, early development of emotion, effects of stress and threat on the young child, influence of parents and caregivers, and the importance of physical activity or motor function during the early years. Brain research also deals with more technical areas, such as critical periods for visual and auditory perception, and language development.

Both brain-research educators and Ellen White concur on the importance of the early years of a child's life in patterning the brain and the child's future. White sees as central the physical, mental, and spiritual development that occur during these time periods, while brain research focuses on neural development, though it appears to substantiate White's wholistic emphasis.

Jane Healy[23] is especially vocal about the negative influences of technology, which tend to make children passive rather than active, during critical times for neural patterning. Ellen White called on teachers and parents to foster children's physical development, advice that brain research strongly endorses.[24]

Though Ellen White[25] saw the first three years of the child's life as the most critical, she indicated that moral training could still occur in later childhood, though it would be more difficult. "If you have waited until your children were three years old to begin to teach them self-control and obedience, seek to do it now, even though it will be much harder."[25]

Ellen White and brain research both indicate that a caregiver's attitudes can powerfully affect the learner.

Marian Diamond indicates that although the brain remains plastic throughout life, it does have critical periods of development.[26] She and the other researchers studied discuss critical periods of visual, hearing, and language development; however, they make little reference to character development.

Heart and Brain Connection

A new field of study—neurocardiology—suggests that the heart may have more influence on the brain than previously thought. States of *incoherence*—stress, frustration, anger, etc.—affect heart rate and depress the cardiac, respiratory, digestive, and immune systems, according to Karl Pribram and Deborah Rozman.[27] When the heart is in a state of *coherence*—love, compassion, peace, etc.—this produces a beneficial effect throughout the brain and body.

These emotional states affect "others in close proximity via the heart's electrical field."[28] The influence is more powerful when it involves touch, although electroencephalograph readings show that it can be transmitted to others as far as four feet away.

Could these new neurocardiology findings be echoing Ellen White's counsel?

"Every soul is surrounded by an atmosphere of its own—an atmosphere, it may be, charged with the life-giving power of faith, courage, and hope, and sweet with the fragrance of love. Or it may be heavy and chill with the gloom of discontent and selfishness, or poisonous with the deadly taint of cherished sin. By the atmosphere surrounding us, every person with whom we come in contact is consciously or unconsciously affected."[29]

Ellen White and brain research both indicate that a caregiver's attitudes can powerfully affect the learner. This seems to underscore the importance of her counsel that the "parents, especially [the mother], should be the only teachers" of the child during the first six or seven years, because children are especially "susceptible to demoralizing influences" at this time in life.[30] Placing a child in an environment controlled by those who do not practice God's ideal for child rearing is morally wrong, she wrote.[31]

Other children can also endanger the child's mental and moral development during this impressionable time, White cautioned.[32] "Every soul is surrounded by an atmosphere of its own—an atmosphere, it may be, charged" with evil or good.[33] When children are not "perseveringly and patiently trained in the right way" their influence can easily influence children of more noble training.[34]

Current research suggests that there are critical periods of brain development.

These heart-brain connections make clear the importance of eliminating stress and threat from the classroom, an important theme in brain research. Ellen White counsels teachers to maintain a loving regard for each one of God's children—seeing each student as a candidate for immortal honors.[35] This will help students achieve their full potential.

Summary

Clearly, current brain research provides scientific evidence that supports Ellen White's counsel from a century ago—except for her references to spirituality. With remarkable accuracy, and the correct use of concepts that only recently have been discovered in neuroscience, Ellen White provided guidance that now has been resoundingly confirmed.

Though scientists typically work in a naturalistic context that does not recognize the existence of a loving Creator, there are evidences that a new paradigm may be emerging.[36] And though brain science does not embrace Ellen White's emphasis on the spiritual component, recent research on emotion, will power and self-restraint, and the heart-brain connection seem to be opening doors for an even closer alignment between these two bodies of information.

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3. Renate Nummela Caine is Associate Professor of Education at California State University, San Bernardino (CSUSB).

Geoffrey Caine is a consultant specializing in adult learning. He is Adjunct Member of the Faculty at the University of Redlands, California, and teaches management and law at the Whitehead Center for Lifelong Learning. The Caines have authored several books.

Marian Diamond is Professor of Neuroanatomy at University of California-Berkeley. She is married to Arnold Scheibel of University of California-Los Angeles brain-research renown, with whom she often teams to do symposia on the brain. She has authored several related books.

Carla Hannaford is a neurophysiologist and educator who has received awards from the University of Hawaii and the American Association for the Advancement of Science for outstanding teaching in science. She is known worldwide for her expertise in brain science and the importance of physical activity. She has authored two related books.

Jane M. Healy is a learning specialist, consultant, and educational psychologist who holds high honors internationally for her publications on brain function and child behavior. She has authored several books to assist parents and teachers.

Eric Jensen co-founded SuperCamp—an endeavor established to promote brain-based learning—which has now produced 20,000 graduates. He conducts teacher-training workshops across the nation and has authored numerous books to aid parents and teachers.

Robert Sylwester is Professor of Education at the University of Oregon. A popular speaker at conferences and in-service meetings, he has written dozens of journal articles and a book, *A Celebration of Neurons: An Educator's Guide to the Human Brain.* Sylwester's special interest is brain/stress theory and research.

Candace Pert is Research Professor in the Department of Physiology and Biophysics at Georgetown University Medical Center in Washington, D.C. She discovered the opiate receptor and documents this discovery in her book *Molecules of Emotion.*

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George R. Knight is Professor of Church History at the Seventh-day Adventist Theological Seminary, Berrien Springs, Michigan, and the author of a number of books and articles on Adventist education.

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