

# The Heart in Holistic Education

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**Educational programs based on new scientific discoveries about the heart lead to improved emotional stability, cognitive functioning, and academic performance.**

In recent decades, neurophysiological research related to learning and education has focused predominantly on the brain. This emphasis, which is reflected in Western pedagogy, is a logical extension of the ascendancy of rationalism since the seventeenth century. Until that time, however, *logos* and *mythos*, mind and heart, were seen not as conflicting but rather as complementary ways of making meaning of the world. Many of the world's ancient civilizations—including the Egyptians, Greeks, Chinese, Japanese, Hindus, Hebrews, and early Christians—respected the heart for harboring an “intelligence” that operates independently of the brain, yet is in communication with it (Elder 1996; Eliade 1987; Godwin 2001; Young 2003). This perspective, reflected in the language, customs, writings, art, spiritual practices, and even medical systems of these civilizations, survived for centuries. Indeed, the view that the heart is a key center of cognition, emotion, volition, discernment, wisdom, and spirit may be the strongest common thread uniting diverse cultures throughout human history as well as most of the world's major religions and spiritual traditions.

However, with the Enlightenment, the Industrial Revolution, the beginnings of capitalism, and the dawn of modern science, the West at least gave ascendancy of the mind over the heart. Gail Godwin refers to this as “The Great Heart Split” (2001, 111). As James Hillman says in his essay about William Harvey's anatomical explorations of the heart, “At that moment when Harvey conceived the heart to be divided, ... thought lost its heart, heart lost its thought” (as quoted in Godwin 2001, 112). Speaking of Harvey's anatomical study of the heart, Godwin (2001, 113) says:

At the moment the anatomist held up the excised heart, ... a sort of Eucharistic celebration of the literal heart could be said to have oc-

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curred. In the church of the anatomical theater, the heart became demythologized.

With that demythologizing (which resulted in the heart being reduced essentially to either a simple pump or a sentimentalized valentine), Western culture has placed almost total emphasis on the mind/brain. With the brain seen as the sole or essential governing organ of the human body and psyche, it was rather easy to shift from an emphasis on holistic, integrated learning to a focus on cognitive-based learning. This perceptual paradigm has dominated formal education in the West for over two centuries and currently exerts considerable influence in the schooling systems of the modernizing East and of neocolonial countries around the globe.

Recent research in cardiology and neurobiology has uncovered some astonishing insights about the human heart and its place in physiological, psychological, and cognitive functioning. This article focuses on new scientific discoveries about the heart and the importance of a reintegration of the heart-mind dynamic in teaching and learning.

### New Science and the Heart

While many cultures and spiritual traditions throughout history have shared a regard for the heart as a source of wisdom and of positive emotions such as love, care, appreciation, and compassion, recent scientific discoveries suggest that these long-surviving associations may indeed be more than merely metaphorical. In particular, new understandings of the physiology of positive emotions and the key role played by the heart in the generation of emotional experience have exciting implications for holistic education.

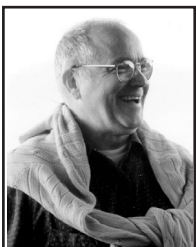
### A New View of Emotion

Research conducted throughout the past decade has challenged several longstanding assumptions about emotions. For example, psychologists once

maintained that emotions were purely mental expressions generated by the brain alone. However, we now know that emotions have as much to do with the body as they do with the brain. Research has shown that neurological and hormonal signals flowing to the brain from many bodily organs and systems not only play a role in regulating physiological functions, but also influence higher brain centers involved in perception and emotional processing (Frysinger and Harper 1990; McCraty, forthcoming; Sandman, Walker, and Berka 1982; van der Molen, Somsen, and Orlebeke 1985). Furthermore, it appears that pertinent information is transmitted not only in the amplitude (strength or amount) of these bodily signals, but also in their *rhythm* and *pattern* (McCraty and Atkinson, forthcoming; Schofl, Prank, and Brabant 1995; Schonher and Kelso 1988; van der Molen, Somsen, and Orlebeke 1985)

### The Role of the Heart

Although input originating from many different bodily organs and systems is involved in determining our emotional experience, recent research provides evidence that input from the heart may play a particularly important role (McCraty and Childre 2002; McCraty and Childre, in press; McCraty, forthcoming). As a primary and consistent generator of rhythmic information patterns in the human body, and possessing a far more extensive communication system with the brain than do other major organs, the heart exerts a unique and far-reaching influence on the brain and the entire body. It is now well-established that the heart is far more than a simple pump. It also functions as a hormonal gland, a sensory organ, and an information-encoding and -processing center, with an extensive intrinsic nervous system sufficiently sophisticated to qualify as a "heart brain." Its neural circuitry effectively enables it to learn, remember, and make functional decisions independent of the cranial brain (Armour and Ardell



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1994; Armour 2003). With every beat, the heart transmits to the brain and throughout the body complex patterns of neurological, hormonal, pressure, and electromagnetic information, which form a major component of the physiological backdrop that ultimately determines our emotional experience.

### Emotions are Reflected in the Heart's Rhythms

One tool that has proven particularly valuable in examining the interactions between the heart and brain is the analysis of heart rate variability. Contrary to many people's beliefs, the rhythmic beat of the heart is not monotonously regular, but rather varies dynamically from moment to moment. The term *heart rate variability* (HRV) is used to refer to these naturally-occurring, beat-to-beat changes in heart rate, which are reflective of heart-brain interactions and autonomic nervous system dynamics. Recent research has revealed that heart rate variability patterns, or *heart rhythms*, are remarkably responsive to changes in emotional states (McCraty et al. 1995; McCraty et al. 1999; McCraty et al. 1998; Tiller, McCraty, and Atkinson 1996). Specifically, during the experience of stress and negative emotions such as anger, frustration, and anxiety, heart rhythms become more erratic and disordered, indicating desynchronization in the reciprocal action between the parasympathetic and sympathetic branches of

the autonomic nervous system (Figure 1). In simple terms, feeling stressed causes our system to get "out of sync"—not only mentally and emotionally, but also physiologically. When the two branches of the autonomic nervous system are out of sync with each other, it is similar to driving a car with one foot on the accelerator (the sympathetic nervous system) and the other on the brake (the parasympathetic nervous system) at the same time. The result is emotional incoherence, increased energy drain, and added wear and tear on the body.

In contrast, sustained positive emotions, such as appreciation, love, and compassion, are associated with highly ordered or *coherent* patterns in the heart rhythms, reflecting greater synchronization between the two branches of the autonomic nervous system and increased physiological efficiency (McCraty et al. 1995; McCraty et al. 1999; McCraty et al. 1998; Tiller, McCraty, and Atkinson 1996). Thus, sincerely experiencing positive feelings helps us get (and stay) "in sync."

Different patterns in the heart's rhythms and nervous system activity also affect the synchronized activity in the brain, which is the very basis of perception and cognition, including higher-order thinking skills. During emotional stress, when the heart transmits a disordered signal to the brain and activity in the nervous system is chaotic or desynchronized, higher cognitive functions are inhibited—limiting our ability to think clearly, focus, remember, learn, and reason. (This can help explain why we often can't think clearly, make careless mistakes, and have trouble retrieving information from memory when under stress.) In contrast, during positive feeling states, when the heart transmits an ordered, coherent signal to the brain and nervous system activity is harmonious and synchronized, our higher cognitive abilities are facilitated—often resulting in enhanced focus, memory recall, comprehension, and creativity.

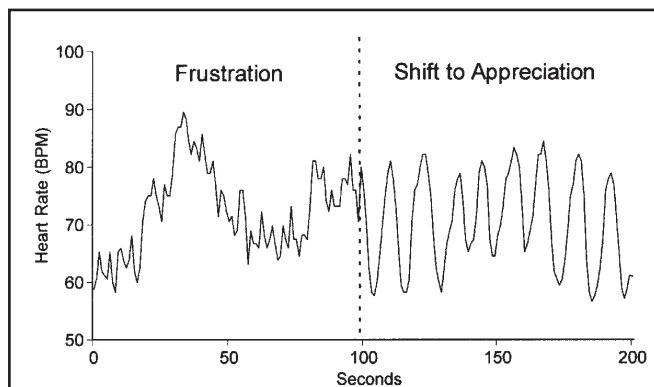


Figure 1. Emotions Are Reflected in Our Heart Rhythm Patterns. Real-time heart rate variability (heart rhythm) pattern of an individual making an intentional shift from a self-induced state of frustration to a genuine feeling of appreciation by using the Freeze-Frame positive emotion-refocusing technique (at the dotted line). Note the immediate shift from an erratic, disordered heart rhythm pattern associated with frustration to a smooth, harmonious, sine wave-like (coherent) pattern as the individual uses the positive emotion-refocusing technique and self-generates a heartfelt feeling of appreciation.

### Physiological Coherence: Increasing Nervous System Harmony and Emotional Stability

Research conducted by the Institute of HeartMath on the heart's rhythms and emotions has identified a distinct mode of physiological functioning that is associated with the experience of heartfelt positive emotions. The term *physiological coherence* has been

introduced to describe this mode (McCraty and Atkinson, forthcoming; McCraty and Childre, in press). Correlates of physiological coherence include a smooth, sine wave-like pattern in the heart rhythms; decreased sympathetic nervous system activation and increased parasympathetic activity; increased heart-brain synchronization (the brain's alpha rhythms become more synchronized to the heartbeat); increased vascular resonance; and entrainment between diverse physiological oscillatory systems (McCraty and Atkinson, forthcoming; Tiller, McCraty, and Atkinson 1996). These physiological changes result in a highly efficient state in which the body, brain, and nervous system function with increased synchronization and harmony—in other words, we're highly "in sync."

Increased physiological coherence has been found to directly correlate with improvements in cognitive performance in tasks requiring abilities such as focus, attention, and discrimination (McCraty 2002b; McCraty and Atkinson, forthcoming). Physiological coherence is also associated with greater emotional stability, a reduction in the perception of stress and negative emotions, and an increase in the experience of sustained positive emotions (McCraty, Atkinson, and Tomasino 2001; McCraty et al. 1999; McCraty et al. 1998; McCraty and Childre, in press). Further, the practice of techniques that increase physiological coherence has been associated with favorable health-related outcomes in both healthy and various clinical populations (Luskin et al. 2002; McCraty, Atkinson, and Tomasino 2001; McCraty Atkinson, and Tomasino 2001; McCraty et al. 1998; Rozman et al. 1996).

### **Heart-Based Tools and Technologies For Teaching and Learning**

#### **Coherence-Building Tools**

Based on the research described above, new, positive emotion-focused tools and technologies have been developed that enable students to systematically increase physiological coherence and emotional stability, thereby improving both academic and social-emotional outcomes (Childre 2001; Childre and Martin 1999; Institute of HeartMath 2002). Collectively known as the HeartMath System, these tools utilize the heart as a point of entry into the psychophysiological networks that underlie emo-

tional experience (Childre and Martin 1999; Childre and Rozman 2002; McCraty and Childre 2002). As discussed, because the heart is a primary generator of rhythmic patterns in the body—influencing brain processes that control the autonomic nervous system, cognitive function and emotion—it provides an access point from which system-wide dynamics can be quickly and profoundly affected (McCraty and Childre 2002; McCraty and Childre, in press; McCraty and Atkinson, forthcoming).

In brief, HeartMath tools combine a shift in the focus of attention to the area of the heart (where many people subjectively feel positive emotions) with the intentional self-induction of a sincere positive emotional state, such as appreciation. Such a shift in focus and feeling serves to increase heart rhythm coherence and nervous system harmony, which results in a change in the pattern of neurological signals sent to the cognitive and emotional centers in the brain. This, in turn, facilitates higher cognitive faculties and emotion regulation abilities that are normally compromised during stress or negative emotional states, thus sharpening one's discernment abilities, increasing resourcefulness, and often enabling problematic issues, interactions, or decisions to be assessed and dealt with from a broader, more emotionally balanced perspective.

Positive emotion-focused, coherence-building tools are effective in helping to stabilize nervous system dynamics in real time—for example, when used in the midst of a potentially stressful situation that otherwise might have drained both physical and mental resources. However, the use of such tools is also associated with benefits that extend well beyond the present moment. Research studies have shown that people of all ages who regularly use HeartMath tools experience enduring improvements in health, emotional well-being, attitudes, behaviors, and relationships, affecting many aspects of their lives (Luskin et al. 2002; McCraty, Atkinson, and Tomasino 2001; McCraty et al. 1999; McCraty et al. 1998; McCraty and Childre, in press). Research suggests that these enduring benefits stem from the fact that as people learn to generate physiological coherence with increasing consistency, *a system-wide repatterning process occurs*, whereby the associated synchronized, harmonious patterns of activity be-

come ever more familiar to the brain and nervous system. These patterns thus become established in the neural architecture as a new, stable baseline or norm, which the system then strives to maintain. The result is that unhealthy or maladaptive patterns are progressively replaced with ones that foster increased physiological efficiency, mental acuity, and emotional stability. Moreover, even at times when stress, challenge, or emotional instability are experienced, the familiar, coherent, stable state is more quickly and easily accessible.

At the physiological level, the occurrence of such a repatterning process is supported by data showing that individuals well-practiced in coherence-building techniques often enter and sustain this mode spontaneously during their day-to-day activities, without conscious application of the techniques (McCraty and Atkinson, unpublished results). We propose that the progressive establishment of new, healthier patterns in the neural architecture is what permits the practice of coherence-building techniques to produce the long-term improvements in emotion regulation abilities, behaviors, and health that have been documented by research studies in diverse populations.

HeartMath tools include positive emotion-refocusing techniques, which enable individuals to intercept and modify their response to stress as it occurs, and emotional restructuring techniques, which build the capacity to sustain positive emotions and physiological coherence for longer periods. One example of a positive emotion-refocusing technique is the Freeze-Frame tool (Childre 1998). This technique consists of five simple steps in which the individual identifies a stressful or disturbing feeling, puts a temporary pause on it—like freezing the frame of a movie or video, shifts her focus to the area of the heart, breathes as if the breath were coming in through the heart area and out through the solar plexus, and self-generates a genuine positive feeling, such as appreciation or care. The combination of focus in the heart area and truly experiencing a positive emotion leads to increased synchronization and harmony in nervous system dynamics (as reflected by a coherent heart rhythm), thus interrupting or preventing the body's normal stress response. This shift has a salutary effect on both physiological and cogni-

tive functioning, and typically enables the individual to address the original stressor from a more balanced and objective vantage point.

Examples of emotional restructuring techniques include the Attitude Breathing and Heart Lock-In tools (Childre 2001; Childre and Rozman 2002). Attitude Breathing is used to shift a mood, feeling, or attitude that one desires to change. After acknowledging an undesirable feeling or attitude, the individual shifts his attention to the area of the heart, asks himself what would be a better attitude to maintain, and then focuses on sincerely breathing the feeling of the new attitude as if it were coming in through the heart and out through the solar plexus area. This process facilitates a shift towards increased coherence and helps to stabilize the new feeling or attitude. The Heart Lock-In technique, designed to promote sustained states of physiological coherence, involves focusing attention in the heart area while sincerely experiencing a positive feeling such as appreciation or care, generally for a period of 5 to 15 minutes. With practice, emotional restructuring techniques reinforce the coherent psychophysiological patterns associated with heartfelt positive emotions, thus helping establish increased physiological efficiency, mental acuity, and emotional stability as a new, familiar baseline or norm.

HeartMath tools are designed as simple, easy-to-use, low-cost interventions that can be adapted to virtually any culture or subculture, age group, or educational context. In addition, a number of these tools have recently been incorporated into an educational curriculum known as TestEdge (Institute of HeartMath 2002), which focuses specifically on reducing test anxiety and improving test performance in order to empower students to survive and even thrive in the stress-ridden environments of standards-based education and violent communities.

### **Heart Rhythm Coherence Feedback Training**

Heart rhythm feedback training is a powerful tool to assist students in using positive emotion-focused techniques effectively and learning to self-generate increased physiological coherence (McCraty 2002a). Physiological coherence can be noninvasively monitored, quantified, and facilitated using practical technologies adaptable for classroom and counsel-

ing settings. One such device is the Freeze-Framer<sup>®</sup> heart rhythm-monitoring and coherence-building system (Quantum Intech, Boulder Creek, CA). This interactive hardware/software system monitors and displays individuals' heart rate variability patterns in real time as they practice the positive emotion-focused techniques taught in an online tutorial. Using a fingertip sensor to record the pulse wave, the Freeze-Framer plots changes in heart rate on a beat-to-beat basis. As students practice the coherence-building techniques, they can readily see and experience the changes in their heart rhythm patterns, which generally become more ordered, smoother, and more sine wave-like as students feel appreciation and other positive emotions (See Figure 1). This process reinforces the natural association between the physiological coherence mode and positive feelings. The real-time physiological feedback also essentially takes the guesswork and randomness out of the process of self-inducing a positive emotional state, resulting in greater consistency, focus, and effectiveness in practicing emotional shifts.

The software also analyzes the heart rhythm patterns for coherence level, which is fed back to the user as an accumulated score or success in playing one of three enjoyable on-screen games designed to reinforce the emotion-refocusing skills. Finally, the software includes a multi-user database to store results and track users' progress.

### Studies in School Settings

Programs incorporating HeartMath tools and the Freeze-Framer coherence-building technology have been introduced at the elementary, middle school, high school, and college levels across the U.S. and have been demonstrated to improve emotional well-being, classroom behaviors, learning, and academic performance (McCraty, Atkinson, and Tomasino 2001). One collaborative research study by the Institute of HeartMath and the Miami Heart Research Institute was conducted in a predominantly Latino middle school with sixth, seventh, and eighth grade students. In this study, a HeartMath program was incorporated into the curriculum, first as a 16-hour in-class program conducted over a period of two weeks, and subsequently as a full-year elective course. The program was designed to reinforce resiliency skills

and positive citizenship among students, while counteracting the negative effects of mental and emotional stress on learning. Application of the HeartMath tools was reinforced through a variety of fun, experiential games and activities, including participation in a cross-age mentoring program with elementary school students. The course also included an emotional physiology education component, using HeartMath's interactive Freeze-Framer system, in which students were given the opportunity to see changes in their heart rhythm patterns in real time as they practiced the Freeze-Frame and Heart Lock-In techniques. The Achievement Inventory Measure (AIM) was used to assess changes in psychosocial functioning, including measures of achievement aptitude, mental attitudes, and interpersonal skills, in 32 seventh grade students enrolled in the two-week in-class program.

While many of the students initially demonstrated anxiety, lack of motivation, and risky behavior problems or were at risk for school dropout, after learning and practicing the HeartMath tools the group exhibited significant improvements in 17 of the 19 areas of psychosocial functioning assessed. These included stress and anger management, risky behavior, self-reliance, motivation, work management and focus, and relationships with teachers, family, and peers. Further, a follow-up analysis indicated that many of these improvements were sustained over the following six months (McCraty et al. 1999).

A second phase of the study, involving 60 students in the sixth through eighth grades, examined the impact of the HeartMath tools on children's physiological responses to stress. A randomly selected group of 30 students enrolled in the full-year elective HeartMath course participated in this phase of the study, while an additional 30 students, randomly selected from classmates not enrolled in the course, formed a control group. As a measure of cardiovascular and nervous system dynamics, students' heart rate variability was assessed immediately prior to, during, and following a structured interview designed to elicit emotional responses to real-life stressful issues. Results showed that children who used the Freeze-Frame technique to recover from acute emotional stress were able to favorably modulate their physiological stress responses in real time,

thus demonstrating increased stress resiliency in comparison to the control group that did not learn the technique (McCraty et al. 1999).

Another study conducted by clinical psychologist Dr. Pam Aasen and reading curriculum specialist Stephanie Thurik, in collaboration with the Minneapolis Public School District, examined the impact of HeartMath tools and technology on reducing test-taking anxiety and improving test scores in high school students. Twenty high school seniors who had previously failed their state-required exit exams and who needed to re-take the tests in order to graduate participated in a three-week intensive program. The course included approximately eight hours of instruction in HeartMath tools, with an emphasis on reducing test-related anxiety and instilling greater emotional stability and self-confidence. Students received heart rhythm feedback training with the Freeze-Framer to help them learn how to self-generate physiological coherence and increase nervous system harmony.

After the program, the students showed improvements in test-taking performance that greatly exceeded those achieved through standard academic preparation alone. The HeartMath group demonstrated a mean increase of 35% in math scores and a 14% increase in reading scores on the Minnesota Basic Standards Tests—gains that represented one to two years' growth in academic skills. Students' passing rates on the exams also improved substantially after the three-week program. Of the trained students re-taking the math test, 64% passed, as compared to the district average of 42% for all seniors re-taking the test at that time. For reading, the trained group's passing rate was 55%, as compared to the district average of 31%. As compared to a control group of 20 untrained students, the HeartMath-trained students also demonstrated significant improvements in emotional well-being following the program, as measured by the Brief Symptom Inventory. These included reductions in hostility, depression, interpersonal sensitivity (feelings of personal inadequacy, inferiority, and self-doubt), paranoid ideation (fearfulness, suspiciousness, and mistrust), somatization (physical symptoms due to stress), and global indices of distress (McCraty et al. 2000).

The success of the Minneapolis pilot program led to a small subsequent study with 32 at-risk students in Houston, which substantiated the positive impact of the HeartMath system on test-taking. As part of their preparation for the Exit Level Texas Assessment of Academic Skills (TAAS) test, a group of 15 high school juniors and seniors, all of whom lacked mastery of one or more portions of the test, practiced the HeartMath coherence-building skills while studying the TAAS preparation materials to help raise their test scores. Before beginning the test, the students used the Heart Lock-In technique to promote a state of physiological coherence. They were also encouraged to use the Freeze-Frame technique while answering test questions to facilitate the easy retrieval of information. Test results were compared to those of a control group of 17 of their peers (matched according to demographics, socioeconomic standing, and ethnic balance) who received standard test preparation alone. All seven of the seniors in the HeartMath program passed the TAAS Test compared with five of the seven seniors in the control group. Of the junior program participants, five of eight passed the test, compared to five of ten of those in the control group.

Although the results of the above study are merely suggestive, they conform to an overall pattern of success when the HeartMath System has been implemented in school classrooms across the nation.

One independent study conducted at an inner-city Phoenix elementary school examined the impact of HeartMath tools on a small class of seven fifth and sixth grade students with learning disabilities. Most of the students suffered from a high level of emotional stress and had significant behavior and academic problems. In their regular classes, the students had already practiced a variety of learning methodologies for years, with very minimal improvement, and their self-esteem was extremely low. The students took part in a three-week summer course designed to improve reading skills and thereby allow many of the children to be promoted to the next grade. The class met for 1¼ hours each day for a total of 14 days within a three-week period. Given the short time period available and the instructor's perception of the children's needs, the course focused primarily on teaching the students the HeartMath

tools and provided very little traditional reading instruction. Pre- and post-intervention evaluations of students' reading proficiency were conducted using the Wide Range Achievement Test (WRAT). Additionally, changes in classroom behaviors were assessed by observational methods.

By the end of the three weeks, tremendous improvements in the classroom environment, reflected in children's attitudes and behavior, were readily apparent. Moreover, every student's reading scores improved dramatically, ranging from a two-month jump in reading proficiency for a bilingual student to over three years' growth (average growth of 1.5 years in grade level) (McCraty, Atkinson, and Tomasino 2001). The teacher's conclusion:

When techniques are presented that children are able to internalize and use to reduce stress, reduce the emotional pain of perceived failure, develop more sensitive communication, and relax, they are able to access what they have already learned.

Teachers who were trained in the HeartMath system at Claremont Graduate University and have begun to introduce its tools and technologies into public schools have found its secular, semi-populist, and developing nature both helpful and compelling. Illustrative of their comments are the words of a seasoned teacher trainee:

The science behind the HeartMath system helped me avoid the threat of being accused in my school of trying to violate the separation of church and state by teaching meditative practices derived from religious traditions. HeartMath's easy-to-use developmental and complementary character makes me feel that I am not buying into an exclusivist, elitist, and static pedagogy. It has complemented beautifully my brain-based holistic teaching practice and probably will continue to do so in years to come. (Arguelles, McCraty, and Rees 2003)

### Summary and Conclusions

In sum, research suggests that by learning to increase physiological coherence, students can increase nervous system harmony and thereby improve emotional stability, cognitive functioning, and

academic performance. Physiological coherence can be noninvasively measured and facilitated in school settings using heart-based, positive emotion-focused tools in combination with heart rhythm feedback technologies. Such approaches have been associated with improvements in test scores, classroom behaviors, and social-emotional outcomes within a relatively brief time frame in studies conducted among diverse student populations. Collectively, results suggest that the integration of heart-based tools and technologies in educational curricula may be an efficient and effective means to facilitate the academic and emotional development of both students and teachers.

Since, as was pointed out in the beginning of this paper, the heart was central to the belief systems and therefore the teaching-learning traditions of ancient societies, and since new research has established a dynamic relationship between the heart and the brain that significantly affects learning, it may be that a new heart-focused pedagogy could dramatically impact holistic education. A new consciousness about the heart may have profound implications not only for the transference of information and knowledge in our learning systems but for the cultivation of those aspects of human experience that are associated with wholeness: caring, giving, appreciation, nurturing, and love. As Jung says, "The utterances of the heart—unlike those of the discriminating intellect—always relate to the whole" (*The Symbolic Life*, as quoted in Godwin 2001, 13).

It is our hope that the discussion of scientific discoveries and humanistic rediscoveries about the heart presented in this paper will lead to a national dialogue about the ways in which the heart can affect learning, performance, and behavior.

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ANDREA ELLEN MEADE, whose family provided the artwork for the cover of this issue, has been afflicted from birth with severe neurological damage. She was born in 1964 and although she is non-verbal, she seems to overcome this handicap, at least in part, through her drawings, which reflect her exuberance for life, the out-of-doors, her friends, and her enjoyment of color and design. Her parents invite readers to communicate with them about her work or her condition by e-mail to <sivoices@aol.com>.