



A Nonverbal Language for Imagining and Learning: Dance Education in K–12 Curriculum

Judith Lynne Hanna

Curriculum theorists have provided a knowledge base concerning aesthetics, agency, creativity, lived experience, transcendence, learning through the body, and the power of the arts to engender visions of alternative possibilities in culture, politics, and the environment. However, these theoretical threads do not reveal the potential of K–12 dance education. Research on nonverbal communication and cognition, coupled with illustrative programs, provides key insights into dance as a distinct performing art discipline and as a liberal applied art that fosters creative problem solving and the acquisition, reinforcement, and assessment of nondance knowledge. Synthesizing and interpreting theory and research from different disciplines that is relevant to dance education, this article addresses cognition, emotion, language, learning styles, assessment, and new research directions in the field of education.

Keywords: cognition, emotion, and body; dance; language; nonverbal communication; teaching and learning

Many people relegate dance to the realms of play, physical exercise, recreation, and theater performance. Some think Martha Graham is a snack (a graham cracker) rather than a renowned pioneer dancer and choreographer.¹ Unlike music, only recently has the discipline of dance developed a notation system (usually associated with intellectual activity) and Ph.D. programs, in addition to being a focus of doctoral dissertations in other disciplines. The verbal realm of the mind takes pride of place in schooling, and nonverbal cognition has been overlooked.

Dismissive views of dance and few resources for developing and scientifically evaluating dance programs generally have kept dance education out of, or marginalized in, the K–12 curriculum. Yet dance has long had a significant role in the education, religion, ethnic identity, gender marking, and social and political organization of many cultures.

The question posed is, What knowledge from nonverbal communication and cognition theory and research provides new insights into ways of knowing and communicating through K–12 dance education? In trying to answer this question, I will eschew

the common, narrow, in-depth focus for articles and instead address a panorama of issues that educators, dancers, and researchers have been raising, at least since my teacher training at the University of California–Los Angeles in the late 1950s.

Underlying the discussion is the theoretical work of John Dewey (1934) and Eliot Eisner (2002), who have looked at the arts broadly. They have established the significance of the expression of agency, creativity, lived experience, transcendence, learning through the body, and the power of the arts to engender visions of alternative possibilities in culture, politics, and the environment. Dewey's prolific writing and teaching at Teachers College of Columbia University prepared schools to offer dance for all children. He believed that children learn by doing—action being the test of comprehension, and imagination the result of the mind blending the old and familiar to make it new in experience. Eisner has argued that concept formation begins with sensory experience and interactions among different sensory modalities. The purpose of an individual's representation of knowledge through any of multiple forms is to further his or her own understanding and to communicate this understanding to others.

However, the theories of Dewey and Eisner are insufficient to explain the potential of K–12 dance education. Synthesizing and interpreting theory and research from different disciplines relevant to K–12 students learning in, about, and through dance speaks to the education field's broader interests in cognition, emotion, language, teaching, learning, and assessment, and to new directions for research. Triangulating knowledge from the arts and humanities, social and behavioral sciences, and cognitive and neurological science, within a curriculum ideology of cognitive pluralism (Eisner, 2002, pp. 79–83), elucidates the intertwined “mentality and matter” of dance and challenges long-held assumptions.

In Sections 1–4, respectively, this article discusses (1) the entry of dance to academe and subsequently K–12 education, key concepts of dance, and its potential for packing and unpacking meaning; (2) evidence of the power of nonverbal communication (of which dance is a subcategory) and similarities and differences between verbal language and the body language and knowledge of dance; (3) the mentality and matter of dance: the salience of the intertwining of cognition, emotion, and kinesthetic intelligence, and the attraction of dance education for academically disinterested students, from at-risk to gifted; and (4) practices in K–12 dance education as a performing and liberal art (distinctions between preprofessional programs and dance education for everyone in ways of

embodying and animating the conceptual building blocks of dance) and dance as an applied art, followed by illustrative research that demonstrates the acquisition of learning skills and knowledge in dance education that reverberate to other domains, as well as learning as a perceived necessity and enhanced learning. Such research implicitly tests a theory of dance as nonverbal multisensory communication situated in the K–12 curriculum. Finally, Section 5 offers suggestions for new research. Sections 2 and 3 also explore what might be the case where a dearth of dance research precludes illustrative examples, and in a sense can be viewed as prolegomena for future study.

I. An Academic Discipline

How did dance enter the scholarly world and subsequently K–12 education with its various practices? In the early 1900s, the development of modern dance (eschewing the rules of ballet) spurred an ongoing philosophical debate about dance: its nature, purpose, notation, place in history, and relationship to psyche, gender, politics, and change. The debate generated knowledge that led Margaret Newall H'Doubler (1925) to establish the first dance major, in the physical education department of the University of Wisconsin, the year following her book publication. Her background as a biology major helped her couch dance in a scientific framework of the times and relate movement to the skeletal–muscular system from which it springs. Believing that each student had potential creativity and ability that could be nurtured, she helped the students discover the intellectual, physical, and emotional dimensions of dance (E. Moore, 1975–1976).

In the late 1970s, dance scholarship in the arts and humanities and in the social and behavioral science disciplines burgeoned. When the 1980s witnessed university dance education partially splintering off from physical education to an additional home in departments of dance in schools of fine arts or education, dance earned credibility as a serious independent academic discipline and even offered doctorates. The 1990s government-funded artists-in-the-schools programs and collaboration between departments of dance and medicine, computer and information science (for dance notation and dance-making), kinesiology, and physics (using dance to illustrate and test principles) have led to more recognition of dance in academe. Physical education at the university and K–12 levels still exposes students to folk and square dance toward the goal of physical fitness. However, some physical education teachers teach artistic dance-making and learning through dance.

As an academic discipline, dance has a coherent body of knowledge. I will discuss key parts of this knowledge: a conceptualization of dance and its elements, cultural and multisensory dimensions, devices and spheres of conveying meaning, building blocks, and progressive learning in embodying and animating the concepts. Note that the dance category of nonverbal communication, as an academic discipline at the university level, also situates dance in the K–12 curriculum for all students. This curriculum usually differs from academy training to be in a professional dance company, although key concepts of dance pertain to both.

Key Concepts of Dance

Dance can be conceptualized as human behavior composed of purposeful, intentionally rhythmical, and culturally influenced

sequences of nonverbal body movements and stillness in time and space and with effort. The movements are mostly not those performed in ordinary motor activities but may refer to them. For example, there are movements used to actually wash clothes and movements imaginatively used in dance to symbolize washing. Both motor activities may be culturally specific. Dance has inherent and aesthetic value (standards of appropriateness and competency). Dance is usually accompanied by music, with its range of sounds and rhythm, and sometimes by costume and props.

A dancer's purpose may be to provide an emotional experience, to conceptualize through movement, or to play with movement itself. Playing with form and creating nonrepresentational dance parallels 20th-century abstraction in the arts in general. In telling stories through dance, troublesome themes, like fear, can be held up to scrutiny, played with, distanced, made less threatening, and even move people to social action (Greene, 1995; Hanna, 2006), as advocated by critical pedagogy. Dance may be a vehicle, or an open channel, for purposeful communication. Effective communication, of course, depends on the shared knowledge between dancer and audience.

Emotion, a significant source of human motivation, constrains or inspires people as they create dances and relate to one another. Dance is multisensory, and so it heightens the perceptual awareness that expands access to the meaning of different kinds of emotional expression.² There is the sight of dancers moving in time and space; the sound of physical movement, breathing, accompanying music and talk; the smell of dancers' physical exertion; the tactile sensation of body parts touching the ground, other body parts, people or props, and the air around the dancers; the proxemic sense of distance among dancers and between dancers and audience; and the kinesthetic experience and sense of empathy with a performer's bodily movement and energy. The eyes indicate degrees of attentiveness and arousal, influence attitude change, and regulate interaction. In addition, the eyes define power and status relationships (Leathers, 1986, p. 42).

An individual's creativity and culture influence her or his dance-making, performing, and viewing. Culture, another key concept in the discipline of dance, refers to the values, beliefs, norms, and rules shared by a group and learned through communication. The relationship between dance and culture is reciprocal. Culture gives meaning to who dances what, why, how, when, where, and with and for whom, in addition to the role of the dance audience. Such variables may bespeak sexual orientation and gender roles, as well as ethnic, national, and other group identities. These may promote self-esteem, separatism, or nationalism. Dancers may reflect and/or influence culture, engendering visions of alternative possibilities. History attests to dance as a means of sending messages of grievance and remedy.

Symbolization, another key concept as integral to dance as to verbal language, is a fundamental cognitive activity that people use on an ongoing basis. People may be prewired to recognize or create metaphoric associations across disparate sensory, perceptual, enactive, and affective domains of experience (Seitz, 2005). Lakoff (1993, p. 244) points out that metaphor, a cross-domain mapping, is fundamentally conceptual, not linguistic (see Ortony, 1993, on various functions of metaphor; Lakoff & Johnson, 1999). There may be external or outer representation,

that is, some actual object or an internal or inner representation that is imagined (Dilworth, 2004). Research on different forms of dance has revealed complex ways of conveying meaning in dance (through devices and spheres)³ that students can use according to their intellectual development and teacher instruction (Hanna, 1979, 1987). These ways of embodying cognition and the imagination are briefly noted to suggest the sophisticated semantic potential of dance.

Packing and Unpacking Meaning

Dancers may use one or more of at least six symbolic devices to encode meaning. *Concretization* is movement that produces the outward aspect of something, such as a warrior dance displaying advance and retreat battle tactics. An *icon* represents most characteristics of something and is responded to as if it actually were what it represents. For example, a Haitian dancer manifesting through a specific dance the presence of Ghede, the god of love and death, is treated by fellow Haitians with genuine awe and gender-appropriate behavior—as if the dancer were actually the god himself. A *stylization* encompasses arbitrary and conventional gestures or movements, such as a ballet dancer pointing to his heart as a sign of love for his lady. A *metonym* is a motional conceptualization of one thing representing another of which it is a part, such as a romantic duet representing an affair. The most common way of encoding meaning in dance is through *metaphor*, the expression of one thought, experience, or phenomenon in place of another that it resembles. Illustrative of joining different domains are contrastive movement patterns for men and women referring to their distinct biological and social roles. *Actualization* is a portrayal of one or several of a dancer's usual roles, such as a woman who performs in a dance for mothers, to convey her maternal role.

The devices for encapsulating meaning in dance seem to operate in one or more of eight spheres of communication. An example of the meaning of dance being in the *dance event* itself is when people attend a social dance to be seen, perhaps as participants in a fundraising charity ball. The meaning of dance may be in the sphere of the *total human body in action*, such as in a person's self-presentation. The *whole pattern of performance*, emphasizing structure, style, feeling, or drama, may be the locus of meaning. Meaning may be centered in the *sequence of unfolding movement*, including who does what to whom and how, in dramatic episodes. *Specific movements* and how they are performed may be significant, as when a male dancer parodies a woman by dancing *en pointe*. The *intermesh of movements with other communication modes*, such as song (speech) or costume, may be where meaning lies. Meaning may be in the sphere of *dance as a vehicle for another medium*. An example is dance as a backdrop for a performer's song or rap recitation. The sphere of meaning may be centered in *presence*, the emotional impact of projected sensuality, raw animality, charisma, or the magic of dance.

2. The Power of Nonverbal Communication

Movement as an Evolutionary Tool

Having set the stage for further discussion by noting the journey of dance into K–12, key concepts in the coherent body of dance

knowledge, including ways of conveying meaning through dance, I will now address the power of dance as a form of nonverbal communication. History points to dance as captivating nonverbal communication. Evolutionary biologists note that human beings need to attend to motion as a tool for survival—to distinguish prey and predator and to select a mate. Human beings have to anticipate others' actions and respond accordingly. Perceptual and motor systems play major roles in survival. The body gives clues. It “talks” and people “listen.” Human beings first learn through movement, and movement facilitates learning. Sensory–motor activities form new neural pathways and synaptic connections throughout life, and the merger of body, emotion, and cognition leads to effective communication (see Damasio, 1994; dePaulo, 1992; S. C. Moore & Oaksford, 2002), the medium of education and dance. Moreover, human beings alone among species have art experiences without obvious evolutionary payoff because fictional thinking engages innate “play” brain modules that allow us to consider hypothetical situations so that we can form plans in advance of difficulties (Gazzaniga, 2008, pp. 203–245).

Nonverbal communication constitutes a central feature of human development, knowing, and learning (Corballis, 2002; dePaulo, 1992; Hewes, 1973; Roth, 2001). The body communicates through gesture and locomotion (moving from place to place) using proximity, touch, gaze, facial expression, posture, physical appearance, smell, and emotion.⁴

Verbal Language and the Body Language of Dance Compared

Dance is a form of stylized movement that bears some similarities to verbal language (including sign language; Armstrong, Stokoe, & Wilcox, 1995; Barko, 1977; Goellner & Murphy, 1995; Hanna, 2001b). Both dance and verbal language have vocabulary (locomotion and gestures in dance) and grammar (rules in different languages and dance traditions for putting the vocabulary together and, in dance traditions, justifying how one movement can follow another). And both dance and verbal language have semantics (meaning).⁵ Verbal language strings together sequences of words, and dance strings together sequences of movement. However, dance more often resembles poetry, with its multiple, symbolic, and elusive meanings, than it resembles prose. Dance can be mimetic or abstract. It is more difficult to communicate complex logical structures with dance than it is with verbal language. Although spoken language can simply be meaningless sounds, and movements can be mere motion, listeners and viewers tend to read meaning into what they hear and see.

Both verbal language and dance contain ambiguity and engender cultural transmission; arbitrariness (many of their characteristics have no predictability), discreteness (separateness), displacement (reference can be made to something not immediately present), productivity (messages never created before can be sent and understood within a set of structural principles), duality of patterning (a system of physical action and a system of meaning), affectivity (expression of an internal state with the potential for changing moods and situations), and a wide range in the number of potential participants in the communication processes (Hockett & Ascher, 1964).

Verbal language is unique among languages because it represents things in parts of speech: The syntax “hinges on whether words are nouns, verbs, and so on—not on their specific meanings” (Galaburda, Kosslyn, & Christen, 2002, p. 10). Channels of communication differ between dance and verbal language. Whereas the motor, moving visual, and kinesthetic channels predominate in dance, the vocal, auditory, and somewhat static visual channels predominate in verbal language. Verbal language exists solely in a temporal dimension, whereas dance involves the temporal plus three dimensions in space.

The Brain in Verbal Language and Dance

Areas in the brain that control the hands and gesture overlap and develop together with the areas that control the mouth and speech.⁶ The Broca and Wernicke areas, located in the left hemisphere, have been associated with verbal language expression and comprehension, abstract symbolic and analytic functions, sequential information processing, and complex patterns of movement. The process of making a dance engages some of the same components in the brain for conceptualization, creativity, and memory as do verbal poetry or prose, but not the same procedural knowledge (Cross, de C. Hamilton, & Grafton, 2006). A study of the neural basis of dance (using MRI and position emission tomography) found an interacting network of brain areas active during the performance of specific movements in the tango. The right front operculum near Broca’s area was involved in motor sequencing, and the right medial superior parietal cortex was involved in movement intention (Brown, Martinez, & Parsons, 2006). Dance is also linked to the right hemisphere, which seems to involve elementary perceptual tasks, nonverbal processing of spatial information, music, and emotional reactivity. However, rigid lateralization of brain function is precluded by the transfer of inputs to each side of the brain over the corpus callosum, the main body of nerve fibers connecting the two hemispheres. For example, there are left-hemisphere processes for words spoken or spelled out and right-hemisphere patterns for representations of numbers (visual Arabic codes) that have interconnectivity by direct transcallosal pathways (Dehaene, 2002).

Multilingualism and Multiple Dance Genres

Findings about learning a second or third verbal language seem applicable to learning a nonverbal language such as dance (which has the vocabulary of gesture and locomotion and a way of putting the movement together with meaning, technique, style, music, and costume) and even to learning more than one kind of dance. Clegg (2004) points out that “speech refers to the oral/auditory medium that we use to convey the sounds associated with human languages. Language, on the other hand, is the method of conveying complex concepts and ideas with or without recourse to sound” (p. 8). In *The Languages of the Brain* (Galaburda et al., 2002), researchers argue that there are multiple possible “languages of thought” that play different roles in the life of the mind but nonetheless work together (pp. 1, 200). “Representations of information, representations of relations, and a set of rules for how the relations can be used to combine and manipulate representations” constitute a language.

Researchers have found that youngsters who grow up multilingual have more brain plasticity and multitask more easily. Moreover, learning and knowing a second or third language may use parts of the brain that knowing only one’s mother tongue may not. Adults have more difficulty learning a foreign language because their lifelong immersion experience in their native language teaches the brain to act within a certain framework; age of onset of acquisition is also a contributing factor (Jean-Marc Dewaele, personal communication, May, 8, 2008; Dewaele, Housen, & Wei, 2003). Similarly, dancers who have only classical ballet training often have difficulty picking up contemporary movements.

The advantages of bilingualism include creativity, mental flexibility, expanded worldview, and most notably, “the possibility that an essential cognitive process that underlies much of our intellectual life, namely the control over attention and inhibition, may develop differently and more advantageously in bilingual children” (Bialystok, 2001, p. 248). Selective attention is the ability to attend selectively to information when there is competing or misleading information present (pp. 141, 185, 191, 226). It appears that bilingual speakers need to focus on form in order to differentiate their two language codes (p. 151; see Asbury & Rich, 2008, on sustained attentiveness learned in arts education). Moreover, children’s knowledge and skills likely transfer across languages, both languages nurturing each other (Cummins, 2003, p. 63). Knowledge of two or more languages allows the comparison of how each language organizes reality and fantasy.

A dance language may help teach a verbal language. Teachers at the Lincoln Center Institute for the Arts in Education explored how the principles of a flamenco dance (shifts in rhythm, speed, and phrasing, in addition to the interplay of rules and inventions in some ways similar to the intonation, transition, gestures, and facial expressions of verbal language) could help build the confidence of students learning to speak English as a second language (Toumani, 2005).

Language and Thinking

Knowledge of verbal language is a determinant of thought (Vygotsky, 1962), although thought may also determine verbal and nonverbal languages (see J. R. Anderson, 1990, on this controversy). “Words can . . . determine our ideas, because they focus our attention on certain concepts at the expense of others and invoke assumptions that may never be made explicit” (Bialystok, 2001, p. 121). “Language becomes part of thought as well as a tool to thought” (p. 191).

We may also learn and think through dance, which can convey complex notions. As Lakoff and Johnson (1999) explain,

Concepts arise from, and are understood through, the body, the brain, and experience in the world. Concepts get their meaning through embodiment, especially via perceptual and motor capacities. Directly embodied concepts include basic-level concepts, spatial-relations concepts, bodily action concepts (e.g., hand movement), aspect (that is, the general structure of actions and events), color, and others. (p. 497)

Dewey (1934) recognized that an art form may be able to convey some information better than other languages can (p. 106). Dance theorists agree (e.g., Blumenfeld-Jones, 1995). In program

notes for the Paul Taylor Dance Company at the New York City Center, in 2008, Taylor said,

I make dances in an effort to communicate to people. A visual medium can be more effective than words. I make dances because I don't always trust my own words or, for that matter, those of quite a few others I've known.

Evidence of the Power of Nonverbal Communication From the Hand Alone

Evidence of the potency of nonverbal communication comes from the research of psychologist Susan Goldin-Meadow and her colleagues, who focus on gestures of the hand, which is only one of the dancer's communicative body parts: When produced beside speech, gesture becomes image and analog. However, when called on to carry the full burden of communication, gesture takes a verbal language-like form using word- and sentence-level structure.

Among congenitally deaf children who have hearing parents and who are not exposed to a conventional sign language, gestures carry the primary burden of communication (Alibali, Flevaris, & Goldin-Meadow, 1997; Goldin-Meadow, 1997, 1999; Goldin-Meadow & Mylander, 1998; Phillips, Goldin-Meadow, & Miller, 2001; Singleton, Morford, & Goldin-Meadow, 1993). Youngsters refer to information that is spatially and temporally displaced from the location of the speaker and the listener. Gestures that deaf-and-speaking children produce convey information that is often different from that found in their talk (Goldin-Meadow, 2002).

Congenitally blind speakers gesture despite their lack of a visual model, even when speaking to a blind listener. Blind children gesturally convey to seeing adults substantive information that is not found anywhere in the children's speech. Moreover, when speech and gesture convey different information, gesture carries the dominant message (Goldin-Meadow & Sandhofer, 1999; Iverson 1998).

A study of children not visually or aurally challenged found that a child's gestures convey information to ordinary listeners that is different from speech. Gestures thus offer insight into a child's thoughts, mental processes, and representations by reflecting knowledge that the child possesses but does not verbalize. This knowledge may not be fully explicit because it may not be found in a child's speech and thus appears to be inaccessible to verbal report (Garber, Alibali, & Goldin-Meadow, 1998).

Goldin-Meadow (2000) says that gesture

may be involved in the process of cognitive change itself . . . through two mechanisms which are not mutually exclusive: (1) indirectly, by communicating unspoken aspects of the learner's cognitive state to potential agents of change (parents, teachers, siblings, friends); and (2) directly by offering the learner a simpler way to express and explore ideas that may be difficult to think through in a verbal format, thus easing the learner's cognitive burden. (p. 231)

Dance Uses the Hand and the Entire Body to Communicate

Although much research comes from a tradition that frames the communication of manual gesture in relation to verbal language, it is not unreasonable to extrapolate this work to dance

communication that is autonomous. Dance has been recognized as powerful nonverbal communication in India for about 2,000 years (Ghosh, 1950) and in the West since the 1970s (Hanna, 1987). The importance of the hand gesture in teaching and learning (Goldin-Meadow, Kim, & Singer, 1999; Goldin-Meadow & Singer, 2003) suggests the exponential impact of dance as it utilizes a multichanneled gestural system to communicate: gestures of various body parts, and locomotion in time, space, and with effort, music, and costume. Drawing from movements in everyday life, dance stylizes movement with a degree of conventionality or distinctiveness. A multichanneled system, dance is embodied cognition that can convey declarative, procedural, and emotional knowledge, apart from co-occurring with speech or being an element of a sign language.

3. The Mentality of the Matter of Dance

Multiple Ways of Learning Through Dance

I have discussed the power of dance as a form of nonverbal communication, in some ways comparable to verbal language, and I now turn to the cognitive-emotional power of dance in teaching and learning. Recent interdisciplinary research reaches beyond the insularity of the dance and arts worlds to reveal complex cognitive skills in dance-making and perceiving (Grove, Stevens, & McKechnie, 2005; see Geake, 2008, on myths in using neuroscience to inform teaching practice). Positing that there are eight intelligences that appear in some type of symbolic system, Gardner (1983) calls attention to different ways of learning through dance: Of these, *bodily-kinesthetic intelligence* is a form of thinking, an ability to solve problems through "control of one's bodily motions" (p. 207; see also Shearer, 2004). Surgeons, too, exhibit highly developed bodily-kinesthetic intelligence. Some youngsters may be engaged to learn through bodily-kinesthetic approaches; yet all youngsters may benefit from the creative processes of dance-making and dance-viewing and learn to "write" and read the nonverbal, which is critical to human survival.

Gardner recognized that intelligences are integrated in the real world; dancers necessarily exhibit more than kinesthetic intelligence. Examples are *linguistic intelligence* in listening to teacher or choreographer instruction, reading about dance or ideas for making a dance, and commenting orally and in writing about dance work; *musical intelligence* in moving to and interpreting music; *logical-mathematical intelligence* in working with rhythmic units, adding, subtracting, multiplying, or dividing dance components and performance resources; *spatial intelligence* in creating kinetic images in various directions, levels, and body spaces, and in performer-audience space; *intrapersonal intelligence* in self-discipline, self-reflection, and expression of one's feelings; *interpersonal intelligence* in collaborating with others (performers, choreographers, musicians, and production people) to create a dance performance; and *naturalist intelligence* in recognizing distinct objects through movement representations.

Dance Impact on the Brain

Dance influences the mind, causing positive plastic changes in the brain for young and old alike. Catterall (2005) suggests that

arts learning and experiences, to varying degrees, reorganize neural pathways, or the way the brain functions. Physical activity sparks biological changes that encourage brain cells to bind to one another, which reflects the brain's fundamental ability to adapt to challenges. Physical exercise that requires complex motor movement also exercises "the areas of the brain involved in the full suite of cognitive functions . . . causing the brain to fire signals along the same network of cells, which solidifies their connections" (Ratey, 2008, p. 41). Extended and/or deep learning in dance thus affects how well the brain processes other tasks. In a neurological study of which activities "stretched" minds and lowered the risk of seniors developing Alzheimer's disease, Verghese et al. (2003) found that seniors who did crossword puzzles cut the risk by 38%; those who played instruments, 69%; and those who played board games, 74%. Surprisingly, dancing lowered the risk by 76% (see also Coyle, 2003). Dancing requires the cognitive tasks of remembering dance steps and executing them in response to music and coordinating with a partner or group in space.

Thinking Through Moving Images

The eye is a critical sense in the cognition of dance-making and dance-viewing. Dr. Elias Zerhouni, director of the National Institutes of Health (NIH), said that he believes the eye has understanding, so the NIH now uses computer animation to present complex dimensions of science (National Public Radio, 2002). Indeed, physicist Albert Einstein thought in pictures and embodied the development of his theory of relativity through muscular feeling and body sensation (Rothenberg, 1979; Simonton, 1994, 2004). Dance is moving pictures. The imaginative in art making, viewing, and perceiving fosters youngsters' capacity to acquire cognitive flexibility to interpret, adapt, and apply knowledge; to find significant connections, draw inferences, and solve problems; and to fantasize. These cognitive functions are all essential in coping with information in a rapidly changing visually animated world filled with ambiguity (Efland, 2002; Eisner, 2002). Dance helps students develop observational skills, which are critical to successful medicine (McMahon, MEng, Kritek, & Katz, 2006).

Declarative and Procedural Knowledge

In dance education, students acquire various kinds of knowledge. They acquire declarative knowledge about dance, including concepts, history, movement vocabulary, and rules of building dances (grammar). Students can learn to express declarative knowledge in their choreography, visualizing movement ideas. Students gain procedural knowledge, also called "knowing-is-in-the-doing" (J. R. Anderson, 1990); and bodily knowledge, called "knowing-in-the-body," or embodied knowledge (Bresler, 2004; Parviainen, 1998, 2002), which is attained through multiple aspects of sensory perception, especially kinesthesia—a revelation of the given essence of something by the moving sensual body. This knowledge involves motor skills and "muscle memory" (proprioception felt in the body), cognitive skills, and cognitive strategies that enable the application of patterns (a rule of grammar) in communicating ideas and feelings in dance. "Nuance, intention to communicate, and expression distinguish dance (and music) performance from other movement-based behaviours that

rely on procedural knowledge" (Stevens & McKechnine, 2005b, p. 251). Tacit knowledge is knowledge that cannot be articulated verbally but may be expressed kinesthetically and emotionally through dance.

A difference between declarative knowledge and procedural knowledge in dance is that a student can know the grammatical rules for a dance form and appreciate its denotations and connotations with ideas about appropriateness and yet not have the skills for performance. Declarative and procedural knowledge likely activate or use different parts of the brain (Galaburda et al., 2002, p. 20). After a cognitive stage in which a description of a procedure is learned, skill learning has an associative stage in which a method for performing the skill is worked out and, finally, an autonomous stage in which the skill becomes automatic (J. R. Anderson, 1990, p. 256). Stevens and McKechnine (2005b, p. 249) note that through rehearsals and experiences in the studio, dancers also have declarative (semantic and episodic) knowledge of the movement phrases and vocabulary that constitute a specific dance work.

The choreographer and the dancer use knowledge differently. The creativity of making set dances and improvising within a style requires declarative and procedural knowledge (usually tacit) of relational rules for matching movements with appropriate meanings. These rules emphasize digital, analytical, and sequential information processing (as in verbal language or mathematics). Stevens, Malloch, McKechnie, and Steven (2003; Stevens & McKechnie, 2005a, 2005b) point out that choreographic cognition is a complex and problematic phenomenon because the underlying processes are hidden, rapid, multimodal, nonlinear, and nonverbal, and the dance evolves from experimentation and exploration in the medium itself.

In contrast to dance-making, dance imitation (or dancing someone else's choreography) depends on learning a set pattern that involves analogical and spatial abilities. Imitation requires observation—inferring the mental representations that underlie their behaviors and storing the representations in memory. Imitation is not strict copying but a constructed version of what is imitated. In the performing terrain, a dancer creatively interprets a choreographed dance through emotional expression. Copying, or imitating, entails "a complex and ongoing alignment of observation of the model with action in the world. In this alignment lies the work of improvisation" (Hallam & Ingold, 2007, p. 5). Improvisation refers to extemporaneously creating dance out of what is known. Furthermore, "the continuity of tradition is due not to its passive inertia but to its active regeneration—in the tasks of *carrying on*" (p. 6).

Related to declarative and procedural knowledge is the coupling of perception and action (Calvo-Merino, Glaser, Grèzes, Passingham, & Haggard, 2005, 2006; Stevens, 2005). It is likely that mirror neurons are active in the person carrying out a particular dance movement and in the person who watches that movement. The same code is active in both phenomena. The brain has a kind of social representation that could allow this simulation process to underpin the sophisticated mental functions of empathy, sympathetic kinesthesia, and understanding in student–teacher and dancer–spectator interactions. However, an individual's personal motor repertoire is relevant; there are greater

bilateral activations when expert dancers view movements that they have been trained to perform compared to movements they have not. Learning to dance by observation is cognitively related to practice: There is neural resonance between observed and embodied action (Cross et al., 2006; Grafton & Cross, 2008). Yet observational learning may occur without the benefits of physical practice (Cross, Kraemer, de C. Hamilton, Kelley, & Grafton, 2008).

Certainly, motivation is critical to the successful acquisition of knowledge. Experimental studies reported by Asbury and Rich (2008) show that interest in the arts leads to motivation that creates the sustained attentiveness required to improve performance as well as the focused attention that leads to improvement in other domains of cognition. Dancers develop the skill to inhibit and select appropriate sensory cues. Findings related to the other arts are likely to apply to dance because dance may occur in combination with music, written text, poetry, and the visual arts of set design and costume.

Emotion

Feelings, integral to cognition, are inherent to successful dance and to education in general. Emotion may prime some goals and processes while inhibiting others. What a dancer feels varies according to the person and the stage of learning dance. As might a student in any classroom, a dancer may feel stressed by “not getting it” or by receiving negative feedback from teachers and students. Performance anxiety affects novice and pro alike. Mastery of dance makes one feel satisfied, confident, and proud. Performance can give a feeling of the “runner’s high.” Individuals usually find strength in the self-mastery required in learning to dance and feel supported by others in cohesive group dancing. Performers feel accomplishment as they express the sense of doing something and being in control; as they achieve what others want to do, try to do, but cannot do well; and as they experience the exhilaration of performance. Dancers may perform for others and in place of others. Of course, dance is art and entertainment that diverts performers and audiences alike from stressors (Hanna, 2006).

While dancers and their audiences can sense the feel and command of the human body in dance, the mind stirs the imagination, directs movement, and makes sense of feeling. While feeling a particular emotion, a performer may immediately manifest it through dance, and dancing may induce emotion through energetic physical activity or through the interaction between dancers or between dancers and spectators. During a performance, a dancer may recall an emotion from earlier personal experience and use the memory as a stimulus to express the emotion in dance. A dancer thus expresses the emotion symbolically, creating an illusion of the emotion rather than feeling its actual presence (Hanna, 1983).

Critical Thinking

The main focus of dance in academe is the process of dance-making, learning that solutions to problems can take many forms. In the constructivist sense, youngsters participate in the creation of their own knowledge. The acquisition of critical thinking and learning skills, essential to education in any subject,

is involved in learning a dance technique and performing creatively and, most productively, in making and analyzing dances that convey thoughts, feelings, or a perspective on movement itself (e.g., Baum, Owen, & Oreck, 1997; Heath, 1998; Seham, 1997). For example, mental alertness, attention to sequence and detail, and memorization skills are necessary, as are observing, listening to directions, following complicated instructions, and executing specific movements. Creating dances and making sense of dances require reasoning, understanding symbols, analyzing images, and knowing how to organize knowledge. Dance-making involves composing movement phrases and, subsequently, long sequences, evaluating, changing, reevaluating, deleting, and adding.

I have traced the path of dance into the university and, consequently, K–12; the key concepts of dance; dance’s power as nonverbal communication; and the mind–body connection in dance as cognitive and emotional communication and critical thinking in dance-making and dance-viewing. So how is dance delivered in K–12? I now turn to illustrative ways of providing dance education and examples of the impact of such practices.

4. Practices in K–12 Dance Education

An interdisciplinary constellation of theoretical perspectives and research support the idea that the nonverbal communication of dance is a powerful way of thinking, doing, and experiencing. Dance is offered as an academic discipline in its own right and taught as a separate curriculum. But dance is also taught across curricula as a means to acquire, reinforce, or assess learning in other disciplines.

A Performing Art

As an art—imaginative, skillful, and communicative—dance has intrinsic value and is meritorious in itself as a sequential performing art curriculum. Dance is intellectually, emotionally, and physically challenging and needs no outside excuse or pretext. This type of curriculum is typically offered in dance academies and arts magnet schools that accept students on the basis of audition for preprofessional training. Study in classical ballet focuses on a codified technique and skill taught through teacher direction and visual models (Johnston, 2006), repetitive drill, and teacher assessment of the student’s mastery of skills and expression. Dance-making is usually not part of the classical ballet curriculum. Yelena Vinogradova of the Kirov Academy of Ballet in Washington, D.C., said, “Choreographers have an inborn talent that involves vision and imagination, a God-given gift. Putting combinations together is not the same.” She continued, “If a student were to appear who had the time and interest to choreograph, we’d support it” (personal communication, 1997). Some academies or magnet arts schools focus on modern dance and have a curriculum that is akin to dance education for everyone.

Preprofessional study in modern dance usually explores the approaches of the early choreographers who distinguished themselves by developing distinct styles and techniques, for example, Martha Graham, José Limón, Merce Cunningham, and Katherine Dunham. Other forms of dance also may be studied.

Although a high degree of innovation and individual expression might appear to be limited through the acquisition

of repetitive, prefigured dance movement, dancer responsiveness and interpretation are creative. Moreover, changes in music, setting, and constellation of performers allow for the imaginative. “Innovation is not always apparent, and technical expertise can dissimulate newness behind the appearance of similarity” (Hughes-Freeland, 2007, p. 218).

Academies or magnet arts schools may have separate traditional academic programs or intertwine all subject matter. Dance student assessment tools have been developed for specific dance forms and for dance more generally (e.g., by the Royal Academy of Dance, Cecchetti Council, and Dance Masters; Bonbright & McGreevy-Nichols, 1999; Hämäläinen, 2002; McCutchen, 2006; Minton, 2003; Schmid, 2003; Smith-Autard, 2002; U.S. Department of Education, National Center for Educational Statistics, 1998; Warburton, 2002; see also http://www.ccsso.org/projects/scass/projects/arts_education_assessment_consortium, and the English National Curriculum Specifications for ages 5–16 at www.standards.dfes.gov.uk/schemes2/phe).

A Liberal Art

When dance education is provided for all K–12 students, it tends to have an interdisciplinary reach. Dance has context, or ecology, which makes it a liberal art, part of the humanities and social and behavioral sciences, as opposed to professional training. In the history, anthropology, and sociology of dance, individuals explore the culturally specific nature of dance, as well as the commonality of all of dance. Dance is located in the domains of psychology and philosophy when individuals learn to critically perceive, respond to, and judge the elements of dance and their connections, and to realize the qualities of dance that contribute to the aesthetic response. The business of dance places dance in the spheres of economics, arts administration, and law. Being corporeal, dance is a physical art in the science domains of anatomy, biomechanics, kinesiology, health, physiology, computer science, and physics.

The K–12 dance curriculum for everyone emphasizes the process of students *creating* dances—the path a student takes to find and solve problems in choreography and its realization—rather than the product and performance. There is more focus on the concepts behind dance: self-expression and evaluation, curiosity, exploration, skepticism, and reflection on dance-making. Movement taught in K–12 is multifaceted and includes various modern dance and folk dance techniques. Visual models, oral commentary, and student kinesthetic imagination aid learning. Student dance-making incorporates a range of other K–12 subjects that feed into a reservoir of ideas for embodied communication. Metaphor is explored in dance and bestows insights that have the potential to explore power relationships in society, a concern of critical pedagogy (McLaren & Kincheloe, 2007).

As children learn to read and do other complex tasks on their own, some children also learn how to embody or animate the conceptual building blocks of dance and symbolize their concerns through the medium on their own and from peer interaction and television. For example, African American children’s spontaneous cultural dance in an integrated magnet elementary school was a creative commentary about race relations, patterns of authority, and personal identity (Hanna, 1986, 1988a, 1988b, 1989, 1992, 2006). However, most children warrant instruction.

In K–12 dance education, students usually follow an approach that was introduced in England by dancer and theorist Rudolf Laban and later elaborated in America’s National Standards for Dance Education (Consortium of National Arts Education Associations, 1994).⁷ Students learn how the human body—the instrument of dance essentially unmediated by other material, such as the artist’s brush, paint, and canvas—moves through space, in time, and with effort. Students learn that space has direction, level, amplitude, focus, grouping, and shape. Rhythm has tempo, duration, accent, and meter. Effort, or dynamics, is force or energy, tension, relaxation, and flow. Shape is the changing relationship of the mover to another person, object, or space. Locomotion includes a walk, run, leap, hop, jump, skip, slide, and gallop. Gesture, movement that does not carry weight, may be rotation, flexion, extension, and vibration. A phrase is a group of movement sequences that coheres and makes a distinctive statement. A motif is a movement portion of a dance that can be presented in different ways, such as fast or slow or with more or less force.

Students learn how the body itself works when constrained by cognition, anatomy, physiology, and physics. They explore kinesiology and nutrition. In addition to gaining an understanding of mind–body processes that can be expressed in words, procedures, diagrams, and computer animation, students acquire bodily knowledge.

An illustrative progression for students is first mastering a specific dance vocabulary and locomotor and gestural movements, and then putting these together by following a grammar to make phrases and then combinations of phrases that become a dance. Students go on to dissect the process of choreography, describing its physical characteristics and interpreting meaning of the kinetic images. They note the emotional responses of dancer, choreographer, and viewer. A sequential curriculum that becomes increasingly complex also involves knowing the music, history, and culture of different dances; writing about these dances; and, if producing a show, understanding the mathematics to work within budgets and the English to write program notes. Again, it is useful to recall the similarities of the nonverbal communication of dance to verbal communication and its critical role in teaching and learning.

Students may learn Laban Motif Writing, a form of symbolic kinetic literacy derived from the more complex Labanotation of dance. Motif writing is a memory aid to dance-making and yet another intellectual challenge in sense making.

The substance of K–12 dance encompasses a palette of building blocks that students think about and experientially and symbolically embody. In addition to gaining intermodal declarative and procedural dance knowledge, students acquire various skills as they exercise multiple intelligences that are applicable in non-dance realms.

An Applied Art

Some arts devotees advocate dance education as valuable in and of itself and argue that dance integration with other subjects makes it “open to exploitation and dilution” (Davis, 2008). However, this integration does not devalue dance as a distinct domain but acknowledges its power and scope, a concern of other

arts devotees, educators, and policy makers. Integrating dance with other subjects often entices students to pursue in-depth study of dance at an arts magnet school or an outside dance studio. Moreover, dance as solely an aesthetic phenomenon, “art,” is a narrow Western concept. Throughout history and across the world, dance is far more, whether it is a means to educate, praise the gods, or celebrate a wedding (Hanna, 1987).

Dance integrated with other subjects. Dance often facilitates learning by engaging students, giving concrete movement articulation and immediacy to abstract concepts, and promoting creativity. As a California state-certified social studies and English high school teacher and a dance educator, I offered a dance-centered course at Gill/St. Bernard’s High School, in Bernardsville, New Jersey, in 1972, and witnessed students learning the language of dance as an entry point into academic subjects. Students studied different dances and researched their cultures and histories. In addition to the benefits of aesthetic immersion, students developed English skills when they wrote critiques of the dance concerts they saw at the Lincoln Center and then compared their critiques with what was written in the *New York Times* the next day. (See Minton, 2008, and Overby, Post, & Newman, 2005, for numerous examples of dance integrated with other subjects.)

Many youngsters, ranging from the gifted and talented to the slow learners, and especially boys and those at risk of dropping out of school, are alienated from “boring” schooling that cuts knowledge into subjects, pedagogically leaving the “pieces” unrelated to each other and to real life. One reason posited for the male–female imbalance in earning bachelor’s degrees (women now earn more than half) is that boys struggle with “17 years of sustained sitting”—passive learning styles, rote teaching, and rigid authority (Hacker, 2003). However, dance education can hook and sustain many such youngsters’ attention and focus, which are essential for acquiring academic knowledge, through bodily “learning on their feet” (see Ball & Heath, 1993; Rabkin & Redmond, 2006; Stevenson & Deasy, 2005; Stinson, 1997). Youngsters learn in different ways, and dance requires multiple intelligences. Students may joyously discover modern dance in which grown-ups not only go barefoot and wear unusual clothes but also seem to run, twirl, and leap with abandon. Creatively expressing themselves, students take ownership of their dance creations and enter a world in which they are in control, no matter what else is going on in their lives. They can take risks and bring others into a realm they cannot verbalize. Once students are anchored in dance, other educational options present themselves (Sanders, 2005). With its need for strength, flexibility, and endurance, besides the opportunity for release and emotional expression, dance also promotes fitness and helps students to resist, reduce, and escape stress (Hanna, 2006).

It is easier to teach a subject with material that children are fully invested in, especially when the learner generates the material to be mastered rather than passively receiving it. A well-developed dance education program propels students to become aware of a need to know the “3Rs.” In the 21st-century technological era, dancers must be able to read, write, and calculate. The language of dance fosters multilingualism in its role as a medium of learning other subjects. Although some students may be inspired to

become professional artists, few actually realize dance career aspirations. More become motivated to go into dance-related careers, such as becoming a dance program fundraiser, promoter, writer, administrator, photographer, or therapist, or they acquire an appreciation of the arts and preparation for careers outside dance.

Assessing nondance knowledge. Given a student’s familiarity with dance elements, dance may be a means of testing a student’s understanding of nondance subject material. Translating emotions, ideas, and data from one medium to another, such as thinking metaphorically through a physical embodiment of written or spoken text, requires an understanding of subject matter that includes being able to use it in new contexts. This creative process can reveal knowledge acquired and what further instruction is necessary. Students’ evaluations of each other’s work can sharpen the assessment. Recall Dewey’s and Goldin-Meadows’s findings that gesture offers insight into knowledge a child possesses but does not verbalize.

Teaching for transfer of learning. Significant to dance as an applied art in K–12 education is the transfer of learning, which is the foundation of schooling: using past learning in both similar and new situations. The Root-Bernsteins (2005) write that “tools for thinking are inherently transdisciplinary, that is, they forge links of common creative process between disparate endeavors that content-focused studies cannot easily connect” (p. 194). The development of connoisseurship in dance, “to know how to look, to see, and to appreciate” (Eisner, 2002, p. 215), is a key tool for thinking beyond dance. Being able to transfer knowledge and use it in new situations (also referred to as domains and conceptual fields) is closely related to truly understanding a concept (Housen, 2001–2002; Shepard, 2002).⁸

Teaching for the transfer of learning in dance education may facilitate or enhance learning of other academic disciplines and life skills only if there is a sufficient degree of in-depth dance education and if teachers teach explicitly for transfer to occur (Burton, Horowitz, & Abeles, 2000; Haskell, 2001; Mayer & Wittrock, 1996; Perkins, 2001; Perkins & Salomon, 1988). The failure of transfer of learning is often the failure of the initial learning. Problems with children utilizing knowledge appear to be due primarily to the incomplete acquisition of relevant knowledge, its representation, and its organization (Bialystok & Craik, 2006, p. 9).

Following principles found in research on transfer of learning, some teachers rely on educational theorist Benjamin S. Bloom’s taxonomy to convey new information sequentially (L. W. Anderson & Krathwohl, 2000; Beech, 1997; Bloom, Engelhart, Frost, Hill, & Krathwohl, 1956).⁹ Teachers use questioning strategies about dance for the cognitive (remembering knowledge, comprehending, analyzing, evaluating, and creating), affective (perceiving, responding, valuing, organizing), and psychomotor (modeling correctly, mastering movement mechanics) domains. Through class instruction, student discovery, apprenticeship, or coaching, teachers can make explicit to students, and promote their reflection on, the rationale of what is taught in dance and how they can use the processes, skills, and concepts they master through dance education in other academic subjects

and aspects of life, including the world of work. Giving students opportunities to practice applying dance knowledge and skills to different fields helps them build relational webs and use metaphorical and analogical reasoning.

For example, a student might use spatial thinking learned in dance class (such as moving in different directions and at different levels) to enhance understanding of geography, organizational hierarchy, information flow, and transportation. A dance student learning mathematical skills through dance might anticipate how the design elements of dance, which are three dimensional, can be used to represent multidimensional problems. An illustration of backward-reaching transfer is a youngster who, while confronting a mathematics problem, thinks reflectively and searches for relevant knowledge already acquired in earlier dance classes to discover that an understanding of rhythmic patterns learned in dance is applicable to solving a math problem. Students might apply their understanding of ways of encoding meaning in dance to analysis of literature.

Reviewing the research on transfer retrospectively and prospectively, Bransford and Schwartz (1999) argue that prevailing theories and methods of measuring transfer have been inadequate. Rather than real transfer, meaning the direct application of previous learning, Bransford and Schwartz propose conceiving of transfer as “the ability to learn during transfer” and mechanisms for transfer as “knowing with,” which provides a context that guides noticing and interpreting. Their view encourages a dynamic rather than static approach to assessment that can provide new insights into what it means to learn (see also Catterall, 2002). Preparation for future learning, including letting go of previous approaches, resisting easy interpretations, and asking sophisticated questions, leads to learning activities that are most likely to help people acquire expertise in a field. Such activities are the staples of creative dance classes.

The Impact of Dance Education Practices

A curriculum theory of dance as nonverbal multisensory communication, meritorious in itself and integrated with other subjects, is implicitly tested in the following illustrative programs. Research studies (e.g., in Deasy, 2002, and in Temple University’s Center for Research in Dance Education database of 2,548 dissertations, theses, conference proceedings, and journal articles since 1926) suggest the potential for K–12 dance education to provide a variety of beneficial outcomes in intellectual and social development.

Acquisition of learning skills. In the ArtsConnection program in New York City schools (Baum et al., 1997), dance students showed learning behaviors and self-regulation processes to guide their learning, that is, transfer of learning through dance. Students took initiative (moving to a good location to observe a model); practiced (marking, or thinking through or bodily tracing movement rather than actually dancing); identified a problem not pointed out and took a risk in asking about it; persevered when a mistake was made; and engaged in critical self-assessment. Success in academics requires self-regulation processes, which dance students mostly discovered on their own, such as choosing practice techniques, using memory aides, finding suitable places to work, asking appropriate questions, and setting interim goals.

When teaching artists noticed and reinforced appropriate behaviors, they fueled student motivation and empowered students to excel. In the classroom, students shared the stage with the instructor in setting goals, developing skills, and evaluating their work. There was a mix of verbal and nonverbal learning in a democratic milieu. By contrast, in the regular classroom, the teacher is often highly directive and center stage; students assume less responsibility for their learning and are more passive or disruptive; the emphasis is on right or wrong answers; and convergent thinking is stressed.

Learning out of perceived necessity. The results of a 10-year study of a dance program in a nonschool low-income youth organization (Ball & Heath, 1993; Heath, 1998, 2001) suggest the dance program’s appropriateness for the school curriculum. Compared to engaging in sports and service activities, when youngsters engaged in dance activities for at least 3 hours on 3 days each week throughout a full year, they improved academically, increased their abilities in self-assessment and motivation, and realized the importance of planning and working for a future for themselves and their communities. Youngsters posed problems, asked questions, considered possible solutions, and evaluated how dance communicates. They took risks, developed habits of working hard, and acquired skills and knowledge.

Enhanced learning. The Reviewing Education and the Arts Project (REAP)¹⁰ investigated the validity of claims that teaching and learning in the arts lead to measures of academic achievement in other subjects. Problematically, REAP used an arcane, stringent, statistical meta-analytic calculation of effect size method not commonly used in research. Of the 3,714 potentially relevant dance studies identified through electronic database searches and queries to more than 200 researchers in arts education, only 7 dance education studies met specified scientific criteria for inclusion in the meta-analysis. The criteria included having an experimental design with a control or comparison group matched in background. REAP considered that teacher expectancy effects lowered the impact of an intervention if teachers were aware of the hypothesis that dance education should improve nonverbal skills. But academic teachers generally teach on the assumption that students will improve in a range of skills.

The 7 dance education studies represented only 3 out of more than a dozen ways of offering dance education. Two studies involved activities not considered dance education by certified dance educators who teach sequential curricula: Students made their bodies into the shapes of letters of the alphabet, repeated the pronunciation of letters after the teacher, and then moved with a quality linked to that letter. In addition, in some studies the duration of instruction was less than 6 weeks.

Based on 4 studies of “dance education,” REAP’s Mia Keinanen, Lois Hetland, and Ellen Winner found a small relationship between dance education and improved reading among 5- to 12-year-olds. Three studies found that dance education improved achievement in nonverbal reasoning (visual–spatial skills, both moving and visualizing in space).

Interestingly, students of the New York City–based National Dance Institute (NDI) showed improved academic achievement

in *all* subjects (Deasy, 2002; Hanna, 1999; Seham, 1997). Not only did NDI students experience structured dance classes and basic dance technique, but NDI worked with school classroom teachers so that dance instruction and performances were linked to school curriculum. Thus, the themes in dance and the related academic content in, for example, English or social studies, were mutually enhancing.

Importantly, REAP's study of other arts disciplines interwoven with dance suggest the greater potential of dance education. Based on 26 music studies, REAP found that listening to music led to temporary improvement in spatial-temporal reasoning, and 6 studies indicated that music training improved math and enhanced reading. REAP also found in 80 studies that classroom drama led to achievement in a variety of verbal areas, such as oral understanding of stories, reading readiness and achievement, oral language, and writing. Such positive cognitive findings from studies of music and drama apply to dance as well. After all, dancers generally move with music and embody drama. (Dance education draws upon visual arts education for costume, props, sets, and backdrops.)

A synthesis of findings from six large-scale evaluations of arts education partnerships, mostly combining several arts—(a) Arts in the Basic Curriculum, South Carolina; (b) Arts for Academic Achievement: Minneapolis Annenberg Challenge for Arts Education; (c) the Center for Arts Education, New York City; (d) the A+ Schools Program, North Carolina; (e) Transforming Education Through the Arts Challenge; and (f) the Chicago Arts Partnerships in Education—shows the positive effects of arts education practice (Horowitz, 2004). An examination of the art experiences of 2,406 children in Grades 4, 5, 7, and 8 in public schools also found increased cognitive capacities (Burton et al., 2000).

Continuum of Offerings

Many ways of offering dance education can benefit students, can be researched, and can create pathways for future programs. Historical serendipity, school leadership, teacher interest, parent involvement, and economic resources affect how students experience dance. Dance may be a distinct subject with in-depth sequential exploration of a coherent body of knowledge when guided by highly qualified dance teachers.¹¹ At the other end of the continuum are brief introductions to dance, a way of filling gaps in school curricula (Bleiberg, 2002). Teachers may be state certified in dance, professional dancers with teaching experience, nondance subject matter teachers with training to use dance in their classrooms, and nondance teachers coteaching with dance teachers. Student involvement in dance education varies from learning, creating, and understanding the history and anthropology of dance (Hanna, 2002) to merely observing dance performances and discussing them.

Midway on the continuum are programs in which dance is integrated into lessons with other arts or subjects, such as social studies, mathematics, literature, language, science, and physical education. Bresler (2004) notes that a capacity-building model encourages non-arts teachers to learn to use the arts in their own teaching. The coteaching model has teacher-artist pairs. The concepts-across-the-curriculum model works with three or more teachers from different disciplines who focus on a common unit of study.

Common types of partnerships. Dance education may be offered through partnerships with arts education organizations, local dance companies, performing artists, and independent dance school (also called studio) teachers, even though they have different missions. Working in K-12 dance education programs, they often help to implement a curriculum based on national and state standards and assessment.

Teachers who use the arts in their teaching practice. Oreck (2003) studied teachers who use the arts in their teaching practice, why and how they use them, and what keeps them from using the arts more often. His 33-item survey included 423 K-12 public school classroom teachers in 97 urban, suburban, and rural schools in six states. He found that prior arts instruction was not a significant predictor of arts use in teaching. Most teachers considered that the arts enhanced the curriculum. Their most common concerns were lack of materials, time, and lesson plans, and lack of opportunity to collaborate with colleagues and visiting artists. Teachers felt tension between the active, open-ended, individual, constructivist approaches typified by artistic experiences, and the prescribed, narrowly defined objectives of a test-based educational culture: the gulf between progressive and traditional education described by Dewey 80 years ago.

5. Finale

My wide-angle analysis of the potential of K-12 dance education has extended the work of curriculum theorists and arts educators who have articulated the importance of aesthetics, agency, release of the imagination, lived experience, the power of the arts to engender visions of alternative possibilities, transcendence, and learning through the body. I reviewed the place of dance in academe, key concepts of dance, and ways of packing and unpacking meaning. Then I explored the evolutionary importance of movement and the potency of nonverbal communication, of which dance is a category; compared verbal and nonverbal expression; and explored some cognitive, linguistic, and neurological dimensions of dance. I described practices in K-12 dance education as a performing and liberal art, distinguishing offerings for preprofessionals from curricula for dance for everyone. Regarding dance as an applied art, I addressed issues of integrating dance with other subjects, assessing nondance learning through dance, transferring skills and knowledge learned in dance to other educational subjects, and the impact of illustrative practices of K-12 dance education.

The proffered interdisciplinary constellation of nonverbal communication, cognitive, and dance theory and research advances knowledge of dance as a powerful multisensory language, a means of thinking, doing, and experiencing. Dance has been demonstrated to be an engaging cognitive way of solving problems as it communicates emotions and ideas and declarative and procedural knowledge through various devices and spheres for embodying the imagination. The theory is implicitly tested in the case studies mentioned above.

Dance education meets Foshay's (2000) criterion that the general purpose of education is self-realization: Dance education, through mind-body integration, helps empower youngsters to become aware that they are distinctly human. As students

embody abstract concepts in dance-making, they can explore their transcendent, aesthetic, physical, social, emotional, and intellectual selves. Note that nonhuman animals do not voluntarily create dances not seen before; their dancelike behavior is genetically programmed, perhaps coupled with some learning, and is an immediate emotional drive.

Awareness of the cognitive potential of dance education in the schools may make it welcome to many former skeptics. Understanding the complexity and salience of dance as nonverbal communication may provide depth to teachers' explanations as they ask students to create, perform, view, critique, and analyze dance and its place in culture and history. Of course, challenges to traditional thinking in the discipline of dance itself, as with any field, create resistance.

Because dance is a relative newcomer to academe, there is a dearth of research on dance education. Clearly, an account of dance as a tool of knowing and communicating is ripe to generate research that can further our understanding of cognition and of teaching and learning. Disparate findings from various disciplines beg theoretically and empirically based integrative research conducted by interdisciplinary teams of dance experts, anthropologists, and cognitive scientists. Raudenbush (2005) points out,

There are many more potentially interesting programs than there are resources to evaluate them with randomized experiments. By consulting expert knowledge, attempting to implement novel programs on a small scale, and making preliminary (nonrandomized) assessments, we can determine which interventions to discard or refine before trying large-scale summative tests of effectiveness. Detailed descriptions of expert practice often supply key new ideas for how to intervene. (p. 29)

Using theories and methods of cognitive science to describe aspects of choreographic thought and creativity, Stevens (2005), urges work

to develop theories and testable hypotheses to drive investigations that make use of current technologies such as Peak Motus motion-capture, the mathematics of dynamical systems theory, and brain-imaging methods such as PET, fMRI and MEG. Second, as human movement is defined by its passage in time, tools for analysis of time-varying events and multiple time-scales are needed. (p. 167)

Diffusion spectrum imaging is a new technique that allows researchers to describe the cluster of interconnecting nodes and hubs that help guide thinking and behavior (Gros 2008). Stevens and McKechnie (2005b) argue that "dance, communicative yet unspoken, provides a rich and relatively untapped setting for investigating knowledge acquisition and transfer through action, gesture and movement, through multiple codes and modalities, and through exemplars including episodes enriched by personal experience and feeling" (p. 251).

Such research might lead to moving dance education from the margins to the mainstream and suggest which K–12 dance education programs work best in particular situations. What we now know could seed programs with promising practices in dance as a discipline and dance as related to other academic subjects, in

addition to maintaining existing programs, pending rigorous evaluation and modification as new research findings come to the fore.¹²

Dance is a time-honored way of learning, knowing, and expressing. Community, religious, and governmental institutions attest to dance as a means to communicate or challenge their values. Around longer than science and the humanities, dance can also be a serious mode of inquiry and discovery. In dance education at its finest, students experience the cognitive, affective, and bodily transcendence of dance and its reverberation in their other academic and life experiences.

NOTES

Anthropological research in Africa, from 1962 to 1963, first called to my attention the important role of dance in education. I appreciate the helpful comments of Pamela Squires; O. J. Davis Jr.; Frances Spaltro; the Choreography and Corporeality Working Group, 2005, of the Federation for International Research in Theater; Päivi Pakkanen-von Nandelstadh; and the reviewers of *Educational Researcher* on earlier drafts of this article. I focus on examples from the United States because, as Bamford (2006) noted in her survey of 151 key people in 75 countries, each country has its own arts education system and historical roots. Although context is germane to showing the development and diversity of dance education, Bamford reports an internationalization of curriculum. And there is a universal character to human development and to dance as expression, symbolic communication, and cultural agent.

¹Americans for the Arts (2003): "No wonder people think Martha Graham is a snack cracker: There is not enough art in our schools."

²Some emotions expressed in dance are not universally understood (see Hanna, 1983, 1988b).

³Although there were various notation systems to describe physical movement, there was no tool to probe for meaning in dance. To fill this gap, I developed a semantic grid with devices and spheres as a tool to probe for meaning in dance, and I have used the grid in various studies of dance (Hanna, 1979, 1988b).

⁴Hall (1966) showed how people's spatial distances between each other communicated different meanings. Burgoon, Buller, and Woodall (1996) reported that physical proximity in a social interaction conveys a message and an expectation about the level of intimacy appropriate or desired for that interaction. Touch is part of the communication of attentiveness that includes gaze, smile, direct face-to-face body orientation, and forward lean. Thayer (1982) stated, "Even a fleeting, impersonal touch between strangers can have a powerful emotional impact" (p. 281). Special nerves register (Vedantam 2002). Stoddart (1991) addressed meaning in olfaction. Roth (2001) argued for educational research that focuses on the role of gestures in knowing and learning. Hanna (2005) summarized the meaning of nonverbal communication in everyday life and in dance.

⁵Dance, however, is not a universal language. Peter Martins, director of the New York City Ballet, said that classical ballet and modern dance are the same language with a different dialect (quoted in Solway, 1988). By contrast, classical Indian dance, with its ancient, elaborate system of codified gestures, is a different language, sometimes more similar to prose than to poetry.

⁶See Doherty-Sneddon (2003). Judith Berck (2004), in a *New York Times* article, reports on the views of Elizabeth Bates from the Center for Research in Language at the University of California, San Diego.

⁷The National Standards for Dance Education, in the Consortium of National Arts Education Associations' (1994) *National Standards*

for Arts Education: Dance, Music, Theatre, Visual Arts—What Every Young American Should Know and Be Able to Do in the Arts, specify what students should know and be able to do in developmentally appropriate sequential curricula.

⁸In her longitudinal study, Housen (2001–2002) found that a visual arts curriculum accelerated aesthetic growth and that student learning moved beyond the interpretation of images.

⁹See also *Theory Into Practice*, 4(4), 2002, entire issue.

¹⁰See special issue, “The Arts and Academic Achievement: What the Evidence Shows,” of the *Journal of Aesthetic Education*, 34(3/4), 2000. See Catterall 2001, 2002.

¹¹Hanna (1999) describes various models of offering dance education.

¹²Articles that briefly make this case are Hanna 2000, 2001a. See www.judithhanna.com.

REFERENCES

- Alibali, M. W., Flevaris, L., & Goldin-Meadow, S. (1997). Assessing knowledge conveyed in gesture: Do teachers have the upper hand? *Journal of Educational Psychology*, 89(1), 183–193.
- Americans for the Arts. (2003, January 22). No wonder people think Martha Graham is a snack cracker: There is not enough art in our schools. *New York Times*, p. 10.
- Anderson, J. R. (1990). *Cognitive psychology and its implications* (3rd ed.). New York: W. H. Freeman.
- Anderson, L. W., & Krathwohl, D. R. (Eds.). (2000). *A taxonomy for learning, teaching and assessing: A revision of Bloom's taxonomy*. Boston: Allyn & Bacon.
- Armstrong, D. F., Stokoe, W. C., & Wilcox, S. (1995). *Gesture and the nature of language*. New York: Cambridge University Press.
- Asbury, C., & Rich, B. (Eds.). (2008). *Learning, the arts, and the brain: The Dana Consortium Arts and Cognition report*. New York: Dana Foundation.
- Ball, A., & Heath, S. B. (1993). Dances of identity: Finding an ethnic self in the arts. In S. B. Heath & M. W. McLaughlin (Eds.), *Identity and inner-city youth: Beyond ethnicity and gender* (pp. 69–93). New York: Teachers College.
- Bamford, A. (2006). *The wow factor: Global research compendium on the impact of the arts in education*. Berlin: Waxmann.
- Barko, C. (1977). The dancer and the becoming of language. *Yale French Studies*, 54, 173–187.
- Baum, S., Owen, S., & Oreck, B. 1997. Transferring individual self-regulation processes from arts to academics. *Arts Education Policy Review*, 98(4), 32–39.
- Beech, T. (1997). Consensus: Yes, we need a preschool syllabus. *Dance Teacher Now*, 19(4), 88–92, 94–95.
- Berck, J. (2004, January 6). Before baby talk, signs and signals. *New York Times*, p. D5.
- Bialystok, E. 2001. *Bilingualism in development: Language, literacy, and cognition*. New York: Cambridge University Press.
- Bialystok, E., & Craik, F. I. M. (Eds.). (2006). *Lifespan cognition: Mechanisms of change*. New York: Oxford University Press.
- Blieberg, L. (2002). Dancing around arts education: How can kids learn about art without doing it themselves? *ARTicles*, No. 8, 88–97.
- Bloom, B. S., Engelhart, M. D., Frost, E. J., Hill, W. H., & Krathwohl, D. R. (1956). *Taxonomy of educational objectives: Handbook I. Cognitive domain*. New York: David McKay.
- Blumenfeld-Jones, D. (1995). Curriculum, control, and creativity. *Journal of Curriculum Theorizing*, 11(1), 73–96.
- Bonbright, J. M., & McGreevy-Nichols, S. (1999). NAEP and dance: On contextual data, process, and problems in dance assessments, and recommendations for the field. *Arts Education Policy Review*, 100(6), 27–32.
- Bransford, J. D., & Schwartz, D. L. (1999). Rethinking transfer: A simple proposal with multiple implications. In A. Iran-Nejad & P. D. Pearson (Eds.), *Review of research in education* (Vol. 24, pp. 61–100). Washington, DC: American Educational Research Association.
- Bresler, L. (Ed). (2004). *Knowing bodies, moving minds: Towards embodied teaching and learning*. Boston: Kluwer Academic.
- Brown, S., Martinez, M. J., & Parsons, L. M. (2006). The neural basis of human dance. *Cerebral Cortex*, 16(8), 1157–1167.
- Burgoon, J. K., Buller, D. B., & Woodall, W. G. (1996). *Nonverbal communication: The unspoken dialogue*. New York: HarperCollins.
- Burton, J. M., Horowitz, R., & Abeles, H. (2000). Learning in and through the arts: The question of transfer. *Studies in Art Education*, 41(3), 228–257.
- Calvo-Merino, B., Glaser, D. E., Grèzes, J., Passingham, R. E., & Haggard P. (2005). Action observation and acquired motor skills: An fMRI study with expert dancers. *Cerebral Cortex*, 15(8), 1243–1249.
- Calvo-Merino, B., Glaser, D. E., Grèzes, J., Passingham, R. E., & Haggard P. (2006). Seeing or doing? Influence of visual or motor familiarity in action observation. *Current Biology*, 16, 1905–1910.
- Catterall, J. S. (2001). Main points in response to mute those claims: No evidence (yet) for a causal link between the arts and academic achievement. In E. Winner & L. Hetland (Eds.), *Beyond the soundbite: Arts education and academic outcomes* (pp. 32–37). Los Angeles: J. Paul Getty Trust.
- Catterall, J. S. (2002). The arts and the transfer of learning. In R. J. Deasy (Ed.), *Critical links: Learning in the arts and student academic and social development* (pp. 151–157). Washington, DC: Arts Education Partnership.
- Catterall, J. S. (2005). Conversation and silence: Transfer of learning through the arts. *Journal for Learning Through the Arts: A Research Journal on Arts Integration in Schools and Communities*, 1(1), 1–12.
- Clegg, M. (2004). Evolution of language: Modern approaches to the evolution of speech and language. *General Anthropology*, 10(2), 1, 8–11.
- Consortium of National Arts Education Associations. (1994). *National standards for arts education: Dance, music, theatre, visual arts—What every young American should know and be able to do in the arts*. Reston, VA: Music Educators National Conference.
- Corballis, M. C. (2002). *From hand to mouth: The origins of language*. Princeton, NJ: Princeton University Press.
- Coyle, J. T. (2003). Use it or lose it. Do effortful mental activities protect against dementia? *New England Journal of Medicine*, 348(25), 2489–2490.
- Cross, E. S., de C. Hamilton, A. F., & Grafton, S. T. (2006). Building a motor simulation de novo: Observation of dance by dancers. *Neuroimage*, 31, 1257–1267.
- Cross, E. S., Kraemer, D. J. M., de C. Hamilton, A. F., Kelley, W. M., & Grafton, S. T. (2008, May 30). Sensitivity of the action observation network to physical and observational learning [Electronic version]. *Cerebral Cortex*.
- Cummins, J. (2003). Bilingual education: Basic principles. In J. Dewaele, A. Housen, & L. Wei (Eds.), *Bilingualism: Beyond basic principles* (pp. 56–66). Clevedon, UK: Multilingual Matters.
- Damasio, A. (1994). *Descartes' error: Emotion, reason, and the human brain*. New York: Bard/Avon.
- Davis, J. H. (2008). *Why our schools need the arts*. New York: Teachers College Press.
- Deasy, R. J. (Ed.). (2002). *Critical links: Learning in the arts and student academic and social development*. Washington, DC: Arts Education Partnership.

- Dehaene, S. (2002). Verbal and nonverbal representations of numbers in the human brain. In A. M. Galaburda, S. M. Kosslyn, & Y. Christen (Eds.), *The languages of the brain* (pp. 179–190). Cambridge, MA: Harvard University Press.
- DePaulo, B. M. (1992). Nonverbal behavior and self-presentation. *Psychological Review*, 111, 203–243.
- Dewaele, J., Housen, A., & Wei, L. (Eds.). (2003). *Bilingualism: Beyond basic principles*. Clevedon, UK: Multilingual Matters.
- Dewey, J. (1934). *Art as experience*. New York: Perigree.
- Doherty-Sneddon, G. (2003). *Children's unspoken language*. London: Jessica Kingsley.
- Dilworth, J. (2004). Internal versus external representation. *Journal of Aesthetics and Art Criticism*, 62(1), 23–36.
- Efland, A. (2002). *Art and cognition: Integrating the visual arts in the curriculum*. New York: Teachers College Press.
- Eisner, E. W. (2002). *The educational imagination: The design and evaluation of school programs* (3rd ed.). Upper Saddle River, NJ: Merrill Prentice Hall.
- Foshay, A. W. (2000). *The curriculum: Purpose, substance, practice* (Foreword by O. L. Davis Jr.). New York: Teachers College.
- Galaburda, A. M., Kosslyn, S. M., & Christen, Y. (Eds.). (2002). *The languages of the brain*. Cambridge, MA: Harvard University Press.
- Garber, P., Alibali, M. W., & Goldin-Meadow, S. (1998). Knowledge conveyed in gesture is not tied to the hands. *Child Development*, 69(1), 75–84.
- Gardner, H. (1983). *Frames of mind: A theory of multiple intelligences*. New York: Basic Books.
- Gazzaniga, M. S. (2008). *Human: The science behind what makes us unique*. New York: Ecco/HarperCollins.
- Geake, J. (2008). Neuromythologies in education. *Educational Research*, 50(2), 123–133.
- Goellner, E. W., & Murphy, J. S. (Eds.). (1995). *Bodies of the text: Dance as theory, literature as dance*. New Brunswick, NJ: Rutgers University Press.
- Ghosh, M. G. (Trans.). (1950). *Natyasastra*. Calcutta, India: Royal Asiatic Society of Bengal.
- Goldin-Meadow, S. (1997). When gestures and words speak differently. *Current Directions in Psychological Science*, 6(5), 138–143.
- Goldin-Meadow, S. (1999). The role of gesture in communication and thinking. *Trends in Cognitive Sciences*, 3(11), 419–429.
- Goldin-Meadow, S. (2000). Beyond words: The importance of gesture to researchers and learners. *Child Development*, 71(1), 231–239.
- Goldin-Meadow, S. (2002). Constructing communication by hand. *Cognitive Development*, 17, 1385–1406.
- Goldin-Meadow, S., & Mylander, C. (1998, January 15). Spontaneous sign systems created by deaf children in two cultures. *Nature*, 391, 279–281.
- Goldin-Meadow, S., & Sandhofer, C. M. (1999). Gestures convey substantive information about a child's thoughts to ordinary listeners. *Developmental Science*, 2(1), 67–74.
- Goldin-Meadow, S., & Singer, M. A. (2003). From children's hands to adults' ears: Gesture's role in teaching and learning. *Developmental Psychology*, 39(3), 509–520.
- Grafton, S., & Cross, M. (2008). Dance and the brain. In C. Asbury & B. Rich (Eds.), *Learning, the arts, and the brain: The Dana Consortium Arts and Cognition report* (pp. 61–70). New York: Dana Foundation.
- Greene, M. (1995). *Releasing the imagination: Essays on education, the arts and social change*. San Francisco: Jossey-Bass.
- Gros, L. (2008). From structure to function: Mapping the connection matrix of the human brain. *PLoS Biology*, 6(7).
- Grove, R., Stevens, C., & McKechnie, S. (Eds.). (2005). *Thinking in four dimensions: Creativity and cognition in contemporary dance*. Carlton, Australia: Melbourne University Press.
- Hacker, A. (2003, June 20). How the B.A. gap widens the chasm between men and women. *Chronicle of Higher Education*, pp. 10–11.
- Hall, E. T. (1966). *The hidden dimension*. New York: Doubleday.
- Hallam, E., & Ingold, T. (Eds.). (2007). *Creativity and cultural improvisation*. Oxford, UK: Berg.
- Hämäläinen, S. (2002). Evaluation in choreographic pedagogies. *Research in Dance Education*, 3(1), 35–45.
- Hanna, J. L. (1979). Toward semantic analysis of movement behavior. *Semiotica*, 25(1-2), 77–110.
- Hanna, J. L. (1983). *The performer-audience connection: Emotion to metaphor in dance and society*. Austin: University of Texas Press.
- Hanna, J. L. (1986). Interethnic communication in children's own dance, play, and protest. In Y. Y. Kim (Ed.), *Interethnic communication: Vol. 10. International and Intercultural Communication Annual* (pp. 176–198). Newbury Park, CA: Sage.
- Hanna, J. L. (1987). *To dance is human: A theory of nonverbal communication* (Rev. ed.). Chicago: University of Chicago Press.
- Hanna, J. L. (1988a). *Dance, sex, and gender: Signs of identity, dominance, defiance, and desire*. Chicago: University of Chicago Press.
- Hanna, J. L. (1988b). *Disruptive school behavior: Class, race, and culture*. New York: Holmes & Meier.
- Hanna, J. L. (1989). African dance frame by frame: Revelation of sex roles through distinctive feature analysis and comments on field research, film, and notation. *Journal of Black Studies*, 19(4), 422–441.
- Hanna, J. L. (1992). Moving messages: Identity and desire in dance. In J. Lull (Ed.), *Popular music and communication* (2nd ed., pp. 176–195). Newbury Park, CA: Sage.
- Hanna, J. L. (1999). *Partnering dance and education: Intelligent moves for changing times*. Champaign, IL: Human Kinetics Press.
- Hanna, J. L. (2000). Learning through dance. *American School Board Journal*, 187(6), 47–44.
- Hanna, J. L. (2001a). Bringing magic into your school. *Principal Leadership*, 2(3), 21–24.
- Hanna, J. L. (2001b). The language of dance. *Journal of Physical Education, Recreation and Dance*, 72(4), 40–45, 53.
- Hanna, J. L. (2002). Playing dance anthropologist in dance education. *Journal of Dance Education*, 2(3), 100–103.
- Hanna, J. L. (2005). Body language and learning: Insights for K–12 education. In L. Y. Overby & B. Lepczyk (Eds.), *Dance: Current selected research: Vol. 5. Dance education* (pp. 203–220). New York: AMS.
- Hanna, J. L. (2006). *Dancing for health: Conquering and preventing stress*. Lanham, MD: AltaMira.
- Haskell, R. E. (2001). *Transfer of learning: Cognition, instruction, and reasoning*. San Diego: Academic Press.
- H'Doubler, M. N. (1925). *Dance and its place in education*. New York: Harcourt, Brace.
- Heath, S. B. (2001). Three's not a crowd: Plans, roles, and focus in the arts. *Educational Researcher*, 30(7), 10–17.
- Heath, S. B. (with Soep, E., & Roach, A.). (1998). Living the arts through language and learning: A report on community-based youth organizations. *Americans for the Arts Monographs*, 2(7).
- Hewes, G. W. (1973). Primitive communication and the gestural origin of language. *Current Anthropology*, 14(1-2), 5–24.
- Hockett, C. F., & Asher, R. (1964). The human revolution. *Current Anthropology*, 5, 135–168.
- Horowitz, R. (2004). *Summary of large-scale arts partnership evaluations*. Washington, DC: Arts Education Partnership.
- Housen, A. C. (2001–2002). Aesthetic thought, critical thinking and transfer. *Arts and Learning Journal*, 18(1), 99–131.

- Hughes-Freeland, F. (2007). "Tradition and the individual talent": T. S. Eliot for anthropologists. In E. Hallam & T. Ingold (Eds.), *Creativity and cultural improvisation* (pp. 207–235). Oxford, UK: Berg.
- Iverson, J. M. (1998). Gesture when there is no visual model. *New Directions for Child Development*, 79, 80–100.
- Johnston, D. (2006). Private speech in ballet. *Research in Dance Education*, 7(1), 3–14.
- Lakoff, G. (1993). The contemporary theory of metaphor. In A. Ortony (Ed.), *Metaphor and thought* (2nd ed., pp. 202–251). Cambridge, UK: Cambridge University Press.
- Lakoff, G., & Johnson, M. (1999). *Philosophy in the flesh: The embodied mind and its challenge to Western thought*. New York: Basic Books.
- Leathers, D. (1986). *Successful nonverbal communication: Principles and applications*. New York: Macmillan.
- McLaren, P. & Kincheloe, J. L. (Eds.). (2007). *Critical pedagogy: Where are we now?* New York: Peter Lang.
- McMahon, G. T., Meng, O. M., Kritek, P. A., & Katz, J. T. (2006). Effect of a physical examination teaching program on the behavior of medical residents. *Journal of General Internal Medicine*, 20(8), 710–714.
- Mayer, R. E., & Wittrock, M. C. (1996). Problem solving transfer. In D. C. Berliner & R. C. Chalfee (Eds.), *Handbook of educational psychology* (pp. 47–62). New York: Macmillan.
- McCutchen, B. P. (2006). *Teaching dance as art in education*. Champaign, IL: Human Kinetics.
- Minton, S. (2003). Assessment of high school students' creative thinking skills: A comparison of dance and nondance classes. *Research in Dance Education*, 4(1), 31–49.
- Minton, S. (2008). *Using movement to teach academics: The mind and body as one entity*. Lanham, MD: Rowman & Littlefield Education.
- Moore, E. (1975–1976). A recollection of Margaret H'Doubler's class procedure: An environment for the learning of dance. *Dance Research Journal*, 8(1), 12–17.
- Moore, S. C., & Oaksford, M. (Eds.). (2002). *Emotional cognition: From brain to behaviour* (Advances in Consciousness Research, No. 44, Series B). Philadelphia: John Benjamins.
- National Public Radio. (2002, September 20). *Talk of the Nation, Science Friday*.
- Oreck, B. (2003, April). *The arts in learning: An investigation of factors influencing teachers' use of the arts in the classroom*. Paper presented at the Annual Meeting of the American Educational Research Association, Chicago, IL.
- Ortony, A. (Ed.). (1993). *Metaphor and thought* (2nd ed.). Cambridge, UK: Cambridge University Press.
- Overby, L., Post, B. C., & Newman, D. (2005). *Interdisciplinary learning through dance: 101 MOVEntures*. Champaign, IL: Human Kinetics.
- Parviainen, J. (1998). *Bodies moving and moved: Phenomenological analysis of the dancing subject and the cognitive and ethical values of dance art*. Tampere, Finland: Tampere University Press.
- Parviainen, J. (2002). Bodily knowledge: Epistemological reflections on dance. *Dance Research Journal*, 34(1), 11–26.
- Perkins, D. (2001). Embracing Babel: The prospects of instrumental uses of the arts for education. In E. Winner & L. Hetland (Eds.), *Beyond the soundbite: Arts education and academic outcomes* (pp. 117–124). Los Angeles: J. Paul Getty Trust.
- Perkins, D. N., & Salomon, G. (1988). Teaching for transfer. *Educational Leadership*, 46(1), 22–32.
- Phillips, S. B. V. D., Goldin-Meadow, S., & Miller, P. J. (2001). Enacting stories, seeing worlds: Similarities and differences in the cross-cultural narrative development of linguistically isolated deaf children. *Human Development*, 44, 311–336.
- Rabkin, N., & Redmond, R. (2006). The arts make a difference. *Educational Leadership*, 63(5), 60–64.
- Ratey, J. (with Hagerman, E.). (2008). *Spark: The revolutionary new science of exercise and the brain*. New York: Little, Brown.
- Raudenbush, S. W. (2005). Learning from attempts to improve schooling: The contribution of methodological diversity. *Educational Researcher*, 34(5), 25–31.
- Root-Bernstein, M., & Root-Bernstein, R. (2005). Body thinking beyond dance. In L. Y. Overby & B. Lepczyk (Eds.), *Dance: Current selected research: Vol. 5. Dance education* (pp. 173–201). New York: AMS Press.
- Roth, W.-M. (2001). Gestures: Their role in teaching and learning. *Review of Educational Research*, 71(3), 365–392.
- Rothenberg, A. (1979). Einstein's creative thinking and the general theory of relativity. *American Journal of Psychiatry*, 136(1), 38–43.
- Sanders, R. E. (2005, February 7). The steps that led to success. *Washington Post*, p. C10.
- Schmid, D. W. (2003). Authentic assessment in the arts: Empowering students and teachers. *Journal of Dance Education*, 3(2), 65–73.
- Seham J. (1997). *The effects on at-risk children of an in-school dance program*. Unpublished doctoral dissertation, Aldephi University, Garden City, New York.
- Seitz, J. A. (2005). The neural, evolutionary, developmental, and bodily basis of metaphor. *New Ideas in Psychology*, 23(2), 74–95.
- Shearer, B. (2004). Multiple intelligences theory after 20 years. *Teachers College Record*, 106(1), 2–16.
- Shepard, L. A. (2002). The role of assessment in a learning culture. *Educational Researcher*, 29(7), 4–14.
- Simonton, D. K. (1994). *Greatness—Who makes history and why*. New York: Guilford.
- Simonton, D. K. (2004). *Creativity in science: Chance, logic, genius and zeitgeist*. New York: Cambridge University Press.
- Singleton, J. L., Morford, J. P., & Goldin-Meadow, S. (1993). Once is not enough: Standards of well-formedness in manual communication created over three different timespans. *Language*, 69(4), 683–715.
- Smith-Autard, J. (2002). *The art of dance in education* (2nd ed.). London: A & C Black.
- Solway, D. (1988, April 24). City ballet moves in an American beat. *New York Times*, pp. H1, 40.
- Stevens, C. (2005). Trans-disciplinary approaches to research into creation, performance and appreciation of contemporary dance. In R. Grove, C. Stevens, & S. McKechnie (Eds.), *Thinking in four dimensions: Creativity and cognition in contemporary dance* (pp. 154–168). Carlton, Australia: Melbourne University Press.
- Stevens, C., Malloch, S., McKechnie, S., & Steven, N. (2003). Choreographic cognition: The time-course and phenomenology of creating a dance. *Pragmatics and Cognition*, 11, 299–329.
- Stevens, C., & McKechnie, S. (2005a). Minds and motion: Dynamical systems in choreography, creativity, and dance. In J. Birringer & J. Fenger (Eds.), *Tanz im Kopf: Yearbook 15 of the German Dance Research Society, 2004* (pp. 241–252). Münster, Germany: LIT Verlag.
- Stevens, C., & McKechnie, S. (2005b). Thinking in action: Thought made visible in contemporary dance. *Cognitive Processing*, 6(4), 243–252.
- Stevenson, L. M., & Deasy, R. J. (2005). *Third space: When learning matters*. Washington, DC: Arts Education Partnership.
- Stinson, S. W. (1997). A question of fun: Adolescent engagement in dance education. *Dance Research Journal*, 29(2), 49–69.
- Stoddart, M. D. (1991). *The scented ape: The biology and culture of human odour*. New York: Cambridge University Press.

- Thayer, S. (1982). Social touching. In W. Schiff & E. Foulke (Eds.). *Tactual perception* (pp. 263–304). Cambridge, UK: Cambridge University Press.
- Toumani, M. (2005, July 16). Flamenco lessons with a difference. *New York Times*, p. A17.
- U.S. Department of Education, National Center for Educational Statistics. (1998). *The NAEP Arts Education Framework Field Test and Assessment* (No. 98-526). Washington, DC: U.S. Government Printing Office.
- Vedantam, S. (2002, July 29). Understanding that loving feeling: In a study of the brain, special nerves registered the emotional context of a pleasurable touch. *Washington Post*, p. A2.
- Verghese, J., Lipton, R. B., Katz, M. J., Hall, C. B., Derby, C. A., Kuslansky, G., et al. (2003). Leisure activities and the risk of dementia in the elderly. *New England Journal of Medicine*, 348(25), 2508–2516.
- Vygotsky, L. S. (1962). *Thought and language*. Cambridge, MA: Cambridge University Press.
- Warburton, E. C. (2002). From talent identification to multidimensional assessment: toward new models of evaluation in dance education. *Research in Dance Education*, 3(2), 103–121.

AUTHOR

JUDITH LYNNE HANNA is a senior research scholar in the Department of Dance and an affiliate in the Department of Anthropology, University of Maryland, College Park, MD 20742; jlhanna@hotmail.com. Trained at the University of California–Los Angeles Graduate School of Education and a California-certified teacher, she taught social studies and English for the Los Angeles public schools and a dance-centered interdisciplinary course for Gill High School, Bernardsville, New Jersey.

Manuscript received March 18, 2008

Revisions received June 10, 2008, and July 18, 2008

Accepted September 2, 2008