Evidence:
A Report on the Impact of Dance in the K-12 Setting

Photo by John Spicer. Courtesy of San Francisco Ballet.

Abstract:

The National Dance Education Organization (NDEO) undertook a review of recent studies of how dance impacts learning, with particular attention to several areas determined to be under-researched in the 2004 Research Priorities for Dance Education: A Report to the Nation (Bonbright and Faber). These areas included: Creative Process, Neuroscience/Brain Research, Student Achievement, Affective Domain, Student Performance, Equity, Cultural and World Dance, and Children-at-Risk. A group of researchers combed a variety of databases, including recent theses, dissertations, and articles within the Dance Education Literature and Research descriptive index (DELRdi), the Fast Response Survey System (FRSS), and a newly discovered collection of reports from the U.S Department of Education's Arts-in-Education programs in professional development and model programs. The researchers prepared evaluations and summaries of each study, article, or report that provided insight into the evidence of how dance education impacts teaching and learning in the first decade-plus of the 21st century.

July 2013

Key Contributors:
Jane Bonbright, National Dance Education Organization
Karen Bradley, University of Maryland
National Dance Education Organization
National Endowment for the Arts

Evidence:
A Report on the Impact of Dance in the K-12 Setting

Authors:
Jane Bonbright, Ed.D.
Karen Bradley, M.A.
Shannon Dooling, M.F.A.

Reviewer of Unpublished Reports:
Valerie Durham, M.F.A.

Editors:
Sherrie Barr, M.F.A.
Lori Provost, M.A.

Senior Advisor:
James Catterall, Ph.D.

Grant Administrator:
Susan McGreevy-Nichols
Executive Director, NDEO

Funding Provided By:
National Dance Education Organization
National Endowment for the Arts

TABLE OF CONTENTS

Introduction……...5

Evidence from the DELRdi…….....5
Overview Reports…….…….....6
Ruppert, 2006…….....7
Longley, 1999……8
Catterall, 2012…….……...……...8
Reports on Kinesthetic Learning, Student Achievement, and Children-at-Risk……..……9
Boykin and Cunningham, 2001…….……..10
Reports on Dance, Overall Student Achievement, and the Affective Domain…….……...10
Sevilla, 2003……..…….....10
Carter, 2004…….……10
Soto, 2001……..…….....10
Lynch, 2007……..……...11
Mohn, 2004……...…….……11
Reports on Dance and Brain Research…….……...12
Posner, 2003…….……...12
Paulson, 2012…….……12
Seidel, 2009…….……12
Reports on Instrumental Studies: How Dance Affects Student Achievement in Other Subject Areas…….……...13
Overview…….……13
Fineberg, 1992……..……...13
Leonard, 2012 …….....14
Dance and Language Arts…….....15
McMahon, 2003…….……15
MacBean, 2001……..……..15
Dance and Math…….….....16
Moore and Linder, 2012……..16
Westreich, 2000……..….....16
Dance and Science……...…..….....18
Faber, 2011……..……18
Burke, 2009…….....18
Reports on the Additional Benefits of Dance and Arts…….…..18
Attendance……..……18
Sevilla, 2003……...……..18
Teacher Impact…….……...19
Werner, 2001…….....19
Special Education…….……...20
Stratton-Gonzalez, 2008……..…20

Evidence from the Arts-in-Education Projects.……..……..……...20

Introduction……20
Jefferson County School Board, 2005-2007……22
District 75, 2005-2008……23
PS 70, 2005-2008……23
Learning Without Borders, 2005-2008……24
Professional Development for the Arts, 2005-2008……25
Michigan Art Project, 2005-2009……26
The Art of Teaching, 2005-2008……27
BCCLA, 2005-2008……27
Arts and Arts Integration Project, 2007-2009……28
DELLTA, 2005-2008……28

Evidence from the FRSS Reports……34
Implications of the FRSS Research……36

Evidence from the Field of Neuroscience……37
Embodied Cognition……45
Dance, Brain, and Machine Interface……46

Research Recommendations……48

Conclusion……56

Appendices
Appendix 1: Evidence Review Form……57
Appendix 2: Definitions of Categories……58

References……61

INTRODUCTION

The National Dance Education Organization (NDEO) undertook a review of recent studies of how dance impacts learning, with particular attention to several areas determined to be under-researched in the 2004 *Research Priorities for Dance Education:* A *Report to the Nation* (Bonbright and Faber). These areas included: Creative Process, Neuroscience/Brain Research, Student Achievement, Affective Domain, Student Performance, Equity, Cultural and World Dance, and Children-at-Risk.

A group of researchers combed a variety of databases, including recent theses, dissertations, and articles within the Dance Education Literature and Research descriptive index (DELRdi), the Fast Response Survey System (FRSS), and a newly discovered collection of reports from the U.S. Department of Education's Arts-in-Education programs in professional development and model programs. The researchers prepared evaluations and summaries of each study, article, and report that provided insight into the evidence of how dance education impacts teaching and learning in the first decade-plus of the 21st century.

Approximately 200 documents were perused, and evaluation reports were prepared on 82 of them. Refer to Appendix 1 for more details about the Evidence Review Forms. Refer to Appendix 2 for the definitions of the categories used within this report.

EVIDENCE FROM THE DELRdi

Throughout this report, evidence of the value of dance in and as education from the areas of Creative Process, Neuroscience/Brain Research, Student

Achievement, Affective Domain, Student Performance, Equity, Cultural and World Dance, and Children-at-Risk will be presented. However, it is evident that more research is still needed, particularly within the areas of Neuroscience/Brain Research, Equity, Cultural and World Dance, Affective Domain, and Children-at-Risk.

Much of the current and most promising research on the neuroscience of movement learning is coming from the field of neuroscience itself, and databases of neuroscience research were also mined for this report. More recently, this research has been done in partnership with dancers, choreographers and dance educators, in part because neuroscientists intuitively understand that both elite and student dancers represent an area of neuroscience where the motor functions meet the communicative and expressive aspects of the human body/mind on very high ground. The authors of this report are aware that as neuroscience literature has been focusing more and more on movement as cognition, that the curiosity of these researchers drives a plethora of promising studies. This neuroscience research impacts all of the under researched issues, but especially children-at-risk.

Therefore, the report will also address some of the more promising research now coming out regarding dance and neuroscience.

OVERVIEW REPORTS ON THE BENEFITS OF ARTS IN EDUCATION

(Derived from Arts Education Partnership, The National Assembly of State Arts Agencies, and The National Endowment for the Arts)

A good amount of summative evidence of the value of and evidence for potent arts learning has been developed by both the Arts Education Partnership (Longley, 1999) and the National Assembly of State Arts Agencies (Ruppert,

2006). Both of these reports take a look across research data to highlight specific benefits and results of learning in all of the arts.

The conclusions include that the arts build capacities that develop 21st century skills in students and provide constructivist learning experiences for them. Longley concludes: (1) The arts improve the school climate; (2) The arts' comprehensive tasks challenge students; (3) The arts turn schools into communities (1999, p. 16).

In the document *Critical Evidence* (Ruppert, 2006) many benefits of arts education are listed, including:

> In a well-documented national study using a federal database of over 25,000 middle and high school students, researchers from the University of California at Los Angeles found students with high arts involvement performed better on standardized achievement tests than students with low arts involvement.
>
> The high arts-involved students also watched fewer hours of TV, participated in more community service, and reported less boredom in school.
>
> Multiple independent studies have shown increased years of enrollment in arts courses are positively correlated with higher SAT verbal and math scores. High school students who take arts classes have higher math and verbal SAT scores than students who take no arts classes. … Arts participation and SAT scores co-vary—that is, they tend to increase linearly: the more arts classes, the higher the scores. (pp. 8-9)
>
> Based on these findings, the compendium has identified six major types of benefits associated with study of the arts and student achievement:
>
> a. Reading and Language Skills
> b. Mathematics Skills
> c. Thinking Skills
> d. Social Skills
> e. Motivation to Learn
> f. Positive School Environment (p. 14)
>
> In an experimental research study of high school age students, those who studied dance scored higher than nondancers on measures of creative

> thinking, especially in the categories of fluency, originality and abstract thought.
>
> Dance also can affect the way juvenile offenders and other disenfranchised youth feel about themselves. One study demonstrated that when a group of 60 such adolescents, ages 13 to 17, participated in jazz and hip hop dance classes twice weekly for 10 weeks, they reported significant gains in confidence, tolerance and persistence related to the dance experience. (pp. 13-14)

In a general sense, both the documents by Longley and Ruppert note the role of necessary community involvement in successful arts programs. As Longley summarizes,

> It is clear that the presence and quality of arts education in public schools today require an exceptional degree of involvement by influential segments of the community which value the arts in the total affairs of the school district: in governance, funding, and program delivery. (1999, p. 4)

In 2012, the National Endowment for the Arts posted the results of James Catterall's (2012) decades of research on how the arts impact student learning instrumentally. The key findings of this study include:

> Eighth graders who had high levels of arts engagement from kindergarten through elementary school showed higher test scores in science and writing than did students who had lower levels of arts engagement over the same period.
>
> Students who had arts-rich experiences in high school were more likely than students without those experiences to complete a calculus course. Also, students who took arts courses in high school achieved a slightly higher grade-point average (GPA) in math than did other students.
>
> In two separate databases, students who had arts-rich experiences in high school showed higher overall GPAs than did students who lacked those experiences.
>
> High school students who earned few or no arts credits were five times more likely not to have graduated than students who earned many arts credits.

> Both 8th-grade and high school students who had high levels of arts engagement were more likely to aspire to college than were students with less arts engagement.
>
> Arts-engaged high school students enrolled in competitive colleges—and in four-year colleges in general—at higher rates than did low arts-engaged students.
>
> Students who had intensive arts experiences in high school were three times more likely than students who lacked those experiences to earn a bachelor's degree. They also were more likely to earn "mostly A's" in college. (pp. 12-16)

Lastly, the study notes that students from arts-rich backgrounds were also more civically engaged than those with low-arts backgrounds.

A key point to note is that Catterall took into consideration the students' socioeconomic statuses and backgrounds when analyzing this research. His results show specifically that children-at-risk (those with lower socioeconomic statuses, less family stability, etc.) benefit from arts-rich experiences in that they earn higher grades, are more likely to graduate from high school and further their education, and become engaged learners and citizens. The arts make education more equitable for all, regardless of external circumstances.

These studies include dance, but do not report separately on dance. And yet, promising evidence continues to be reported in other literature that points to the specific and discrete value of dance in schools and the habits of mind that come from dance-based habits of bodily practice as well as the contributions dance makes as one of the arts disciplines.

Kinesthetic Learning, Student Achievement, and Children-at-Risk

A number of reports have shown evidence of a connection between kinesthetic learning and student achievement, particularly for minority students who are underserved in traditional academic settings. Earlier studies (Park C. C.,

1997a; Park C. C., 1997b; Park C. C., 2000) showed evidence that non-white children in urban areas are primarily kinesthetic learners (i.e. they learn by moving). Child development research has shown that all children are kinesthetic learners as infants and toddlers; movement is how they navigate and find their way into and through the world of objects. But some children clearly remain kinesthetic learners.

Boykin and Cunningham (2001) found the same data. African American children's overall performance was significantly better under a High Movement Expression than a Low Movement Expression learning context. The research community needs to verify and validate this tantalizing data. If non-white children learn best through kinesthetic experiences, as all of these studies indicate, then they will be "left behind" in a world of seat-based and passive learning.

Further research is still needed to determine the impact of kinesthetic learning on long-term student performance, as well as more specific connections between children-at-risk (both non-white and white students) and kinesthetic learning.

Dance, Overall Student Achievement, and the Affective Domain

In an arts-integration school in New Jersey, John-Mario Sevilla (2003) found consistently higher test scores. The principal of the school stated,

> Our fourth graders, since New Jersey has been doing mandated state tests, have consistently been among the highest in the state, I mean higher than some of the affluent areas where they have the big bucks to support their education. We have been 100% [in passing] across the board on the language arts, math, science, social studies. (pp. 36-37)

Higher GPAs were found in dancers as compared to non-dancers in a dissertation by Carmen Carter (2004). Cindy Soto's (2001) thesis indicated that

students who participated in dance demonstrated more persistence, and had higher grades than those involved in non-dance (and non-academic, such as math club) activities.

However, dance integration activities are not only about higher grades and test scores. Dance activities provide deeper comprehension and more visible engagement in the learning process itself.

All arts integration activities provide for multiple perspectives and have been described as helping to create a safe atmosphere for taking risks. As one student put it in Patricia Lynch's 2007 study, "You don't have to make your drawing look real... it's great as long as you like it" (p. 36). But dance offers a special opportunity to go beyond visualization and representation into full embodiment of and discursive experiences with new information. Katherine Mohn (2004) describes the depth of her third-grade students' experiences with dancing rocks.

> Together the classroom teachers and I have explored what the children already know about rocks. Students have made a KWL chart. K is what they know already and W is what they would like to learn. Later we will fill in L – what they did learn in the unit. Our warm-up was about different kinds of rocks. For 'igneous' rock, students got into groups of three (to reinforce that ig-ne-ous is a three syllable word) and made a shape with spaces in it because igneous rock like lava can have air pockets. For 'metamorphic,' they formed groups of four and made a strong pressing shape because metamorphic rocks result from intense heat and pressure. For 'sedimentary,' groups of five and a shape with layers, the way sediment accumulates and then becomes stone.
>
> We have been exploring dance elements of shape and force. We are halfway through the Create Process that began with imagine, plan, explore. Now we will select, rehearse, perform, and reflect. We have created a rubric for what a proficient dance based on

> this assignment would look like. The foundation has been laid.
>
> 'Now, dancers, create an ABA dance study based on the rock cycle. Be ready to show your rough draft in 10 minutes. Any questions? Okay. Go to work.' (p. 123)

The students learned, created, evaluated, and reflected on their work, in the moment of their learning. Assessment of learning is through observations and in querying the reflections. But perhaps most importantly, the children in this third grade class were pervasively engaged, and they had fun in the learning process.

Dance and Brain Research

The Dana Foundation has been a leader in providing links from neuroscience to learning in and through the arts. Michael Posner (2003) speculates that through the mechanism of sustained attention, the arts provide children with the ability to make connections and stay engaged in tasks for a longer period. They conclude that "appreciation of art relates to pleasure in producing that art," "appreciation of an art form relates to general aesthetic interest," "high interest is linked to high motivation," "motivation sustains attention," "high sustained attention on conflict tasks improves cognition." (2003, n.pp.)

Pamela Paulson (2012) goes further, pointing out that a strong kinetic (dance) arts program will activate multiple systems in students' brains. She outlines the connections between emotion and learning, stating, "Emotions are processed all the time and whether positive or negative will stay linked to the learning… Emotional impact helps students learn" (p. 82). Paulson's findings are corroborated by Steve Seidel (2009) in the report, *The Qualities of quality:*

Understanding excellence in arts education. Seidel found that the arts foster a drive for quality that is "personal, passionate, and persistent (p. iii)."

Instrumental Studies: How Dance Effects Student Achievement in Other Subject Areas

Instrumental studies demonstrating that dance can impact and even facilitate learning in other subject areas (math, reading, science, social studies) abound. Most of these studies are qualitative, if not simply anecdotal, primarily because quantitative studies of the instrumental value of dance are difficult to validate. Children who dance in school may also dance after school, or in family celebrations, making the dance variable difficult to isolate. Often, children need a teacher's insight and direction in order to point out connections between dance skills and other disciplines, especially given a siloed curriculum in which each subject is both taught and tested discretely. But a serious challenge to the research on the instrumental value of dance is certainly, in part, due to questionable research methods (N.B. see Research Recommendations). And yet, there is evidence of evidence and there is enough evidence that replication, validation, and robust follow-up studies ought to be of great interest to educators and policymakers, administrators and parents.

In her dissertation, Carol Fineberg (1992) provided compelling anecdotal evidence from observations in New York City schools that showed how specific arts activities and pedagogical practices helped students meet learning objectives related to critical thinking in literature, science, mathematics, and social studies. The program she reviewed in her dissertation, Arts Partners, focused on the creation of metaphoric statements in response to concepts learned in the above areas. Reading scores improved

in the Arts Partners students over those of the non-participants. Fineberg did provide a critique of the dance component of the program, pointing out that much of the work she observed involved merely following the teacher's modeling and sequence of movement, but she also noted that, as the classes progressed, the students were encouraged to add their own phrases and to express the qualities of the characters they were dancing.

More recent anecdotal evidence of how dance impacts higher order thinking skills comes from Alison Leonard (2012). Leonard conducted a qualitative case study of a dance artist-in-residence at a diverse and inclusive K-5 school in an urban district, integrating science, social studies, physical education, music, and visual arts school curriculum and culminating in two public performances. The study focused on how students made meaning through the dance experiences and how education might be improved through dance and movement.

Leonard noted the positive impact on student engagement, knowledge, and collaboration within the school community. The dance residency was an intervention, one that caused a positive disruption of the normative school context in a way that created new opportunities.

By the same token, according to Leonard,

> The students in the program integrated curricular concepts in sophisticated and intellectual ways, exhibiting complex, higher order thinking skills. For example, the students exhibited complex representations of ideas such as creating new movement, demonstrating originality, fluency, and problem-solving skills versus repeating what was modeled. (2012, p. 67)

She goes on,

> The arts, in this case, dance, serve as a form of assessment that is not simply a regurgitation of content material, but is a reproduction and reshaping of content. When the students danced their abstracted phrases, they were taking

> content, using knowledge and not only applying it to dance, they were creating new knowledge through the dance. (pp. 158-159)

Dance and Language Arts

Two studies provide seminal evidence of how dance can impact learning to read and write, one study at the first-grade level and one focused on high school students.

The Basic Reading Through Dance study (McMahon, 2003) is indicative of the ways in which dance, with defined and specific movement activities, can impact early reading skills, with equally well-defined variables for those language arts skills. Moving letter shapes and sounds, creating name dances, and practicing flow from one shape to the next produced significant gains in consonant recognition, vowel recognition, and phoneme segmentation in the experimental group of first-graders in Chicago, as compared with a control group of first-graders who did not participate in the ten-week program.

At the high school level, Arianne MacBean (2001) showed how moving their writing helps students express and clarify their ideas, develop a strong sense of identity, and learn to articulate observations by viewing and talking about their peers' work.

The two studies demonstrate that authentic dance study can impact learning in and about written language and text, despite being an entirely different modality. As neuroscience begins to unpack the ways in which our brains and our bodies organize cognition from experiences, similar research studies can provide evidence of the ways in which embodied experiences not only clarify our

understanding of the world of words, but actually foster the ways in which language evolves in each young learner.

Dance and Math

The studies found in which dance activities specifically impacted learning in mathematics revealed that increased engagement and student interactions were both a result of and a galvanizer for deeper understandings of math concepts. Candice Moore and Sandra M. Linder (2012) found it encouraging to note how students refined their understandings of a number of math concepts required for the dance activities in the study.

> Overhearing a couple of discussions, I realized that the students are essentially scaffolding each other to bring their [dance] poses to a level that is accurate and acceptable by the standards of everyone in the group. I don't think you get this type of interaction among peers when students are involved in more traditional, paper–pencil instruction and assessment. (p. 107)

Galeet Westreich (2000) studied kinesthetic learners using dance to understand math concepts. As she writes,

> The overall findings of this study are that kinesthetic activities, in this case dance, facilitate the kinesthetic learners' exploration of abstract geometrical concepts, enhance their problem solving skills, and enable them to develop a mathematical-thinking process that can be verbally communicated. (p. 103)

> Students who were initially experiencing difficulty processing oral or written information by the end showed eagerness to understand information presented orally or in writing. This indicates that the kinesthetic activities assisted learners in overcoming the problems processing information they experienced in the early phases of the study. (p. 65)

> Improvements in kinesthetic learners' communication skills were evident in instances where they were able to specifically state their thoughts and intentions, as well as respond in a manner that was closely correlated to the given instructions. (p. 82)

> Analysis of the behaviors (related to communication) suggests that during the course of the study the kinesthetic learners developed reflective thinking, i.e., the ability to engage in productive verbal communication, understand what was asked of them, identify what they needed to do to solve a mathematical problem, communicate their questions, and express their thought process as they worked towards a solution. (pp. 89-90)

> The kinesthetic activities incorporated in this study helped the kinesthetic learners improve their fine motor skills, which in turn enhanced their confidence in exploring mathematics through written activities. By improving their physical writing skills, the kinesthetic learners were better able to explore mathematical problems in writing. (p. 92)

Westreich describes movement phenomenon, which she calls free shaking (a removal from the class activities and vigorous movement of the limbs) and voluntary movement (using movement to work through a problem without the direct guidance to do so by the researcher). She states, "After both activities … the kinesthetic learners were able to return to work with renewed focus and attention" (p. 86). She also lists several examples of how one of the three observed students benefited positively on a personal level. In particular, one student who had been suspected to be on the autism spectrum, experienced drastic changes in behavior during the course of study, to the point that he no longer demonstrated his previous symptoms.

The studies are not in any way quantitative, but are tantalizing peeks into the ways in which dance activities concretize the math concepts for both typical and challenged learners. Enacting geometry by using spatial configurations, computing number functions through rhythms and patterns, and finding algorithms through movement are ways of going beyond visual representation of functions, and engaging the learning body in experiencing the processes directly.

Dance and Science

As in math and language arts, the exemplary studies in dance and science indicate engagement, retention, and comprehension in students who dance the concepts in science. Rima Faber (2011) conducted a comparative study of science students in Baltimore County schools and found that the classes with students who experienced kinesthetic activities performed better and retained knowledge 30 days later than the students who were not exposed to a kinesthetic, dance-based approach. Similarly, Jane Burke (2009) wrote about a program in which students learned chemistry through dance experiences. As evidenced from the website on which Burke's research was published:

> Students reported that the dance helped them answer questions on the state chemistry achievement exam. They closed their eyes and visualized their dance to retrieve information about chemical reactions.
>
> Besides enhancing the students' understanding of concepts, dance helped reveal their unrecognized talents. One boy had been withdrawn and unresponsive, never entering into class discussions. But when asked to show, through movement, the chemical reaction known as a single replacement, he grabbed two of his classmates to form the covalent bonds of the ion and whirled around the room to find a 'metal.' Evaluating the day's lesson later, he said, 'Dancing helped clear up chemistry ideas that had been hard for me to understand.' (n.p.)

ADDITIONAL BENEFITS OF DANCE AND ARTS IN EDUCATION

Attendance

One utterly obvious statistic, repeated again and again in the literature, is that when the arts are a major part of the school experience, students' attendance rates rise dramatically, and so, too, that of the teachers. In John-Mario Sevilla's

study (2003) he reports, “Better than-average rates of student attendance, mobility and suspension, and teacher attendance than the rest of New Jersey” (p. 30).

Teacher Impact

Linnette Werner (2001) reported on a program in Minnesota in which teachers were working in partnership with artists to find new approaches to teaching and learning, in this case, the effects of dance on math learning. The teachers’ perspectives on the classroom itself changed, specifically, they thought differently about how education can take place in the classroom, they made room for integration, and they were interested in actualizing a school-wide change.

In addition, teachers were more likely to believe in the effectiveness of value and arts integration after taking part in the program. Some also expressed an attitudinal change about movement and noise in the classroom, leading to a shift in classroom management that allowed for more kinesthetic experiences. Many teachers seemed to have a renewed commitment to their teaching, coming to enjoy and relish the extra time collaborating, reflecting, and planning new lessons with their artist partner. They spoke of incorporating similar ideas and interventions into non-math content areas as well. School-wide changes, including increased interest in co-teaching and other deep forms of integration, the creation of original curricula, the allocation of funds for such projects, and new and deepened relationships among teachers were also indicated. Dance/math teachers seemed to display high levels of authentic instruction, including focusing on higher order thinking (especially for ELL students), transference, deep knowledge, connections to the world beyond the classroom, and social support for learning, “high

expectations, challenging work, strong effort, mutual respect, and assistance in achievement for all students" (Werner, 2001, p. 132).

Special Education

Sandra Stratton-Gonzalez (2008) looked at special needs children with Individual Education Programs (IEPs) involved in an after-school dance club at an inclusive school in New York City. Of particular interest and value in this study are the comparison of dance tasks to special needs students', IEP goals, and her advocacy for the use of dance as a way to reach these goals. Stratton-Gonzalez's support for, and evidence of, the use of dance as a means of cognitive growth is also noteworthy. The detail of the class activities, types and purpose of movement taught, and pedagogical practices of the researcher within the class are useful in order to know exactly how dance was used in the pursuit of the students' personal, social, and cognitive growth.

EVIDENCE FROM THE ARTS-IN-EDUCATION PROJECTS (Funded by the U.S. Department of Education)

Introduction

In the summer of 2012, the National Dance Education Organization began a review of documents related to grants, reports, and projects that had been maintained by the Department of Education and stored at the Americans for the Arts offices in Washington, DC. These reports are considered under a separate heading in this paper because of their notable connection to governmental agencies. As Jane Bonbright suggests in *Research Priorities for Dance Education: A Report to the Nation* (2004), many studies on dance in education (including the majority of those described above) are conducted through colleges and

universities, usually as part of the thesis or dissertation. These studies are necessarily limited in scope and duration. With the support of non-academic institutions, such as government organizations and advocacy groups, larger-scale, longitudinal studies may be conducted. Many of the studies described below were conducted over a period of several years, and occasionally across several schools. The reviewer for these reports was Valerie Durham; her citations are from unpublished reports.

Some of these studies examined schools participating in the *Arts in Education Model Development and Dissemination Grant Program*, which supports the enhancement, expansion, documentation, evaluation, and dissemination of innovative, cohesive models that demonstrate effectiveness in:

1. Integrating into and strengthening arts in the core elementary and middle school curricula;
2. Strengthening arts instruction in those grades; and
3. Improving students' academic performance, including their skills in creating, performing, and responding to the arts. (n.d., n.p.)

The following schools received grants from the U.S. Department of Education in order to:

1. Further the development of programs designed to improve or expand the integration of arts education in elementary or middle school curricula;
2. Develop materials designed to help replicate or adapt arts programs;
3. Document and assess the results and benefits of arts programs; and
4. Develop products and services that can be used to replicate arts programs in other settings. (n.d., n.p.)

Jefferson County School Board, Monticello, FL.

One such grantee was the Jefferson County School Board in Monticello, Florida (Arts in Education Model Development and Dissemination Grant, 2005-7). Participants in the district's model program "outperformed the comparison students relative to individual change in the FCAT Reading scores, FCAT Math scores, Norm Reference Reading Test Scores, and Norm Referenced Math Test scores" (n.p.). As opposed to many programs which seek to integrate the arts into the academic curriculum, students in Jefferson County "took time 'away' from instruction in writing and language arts for visual, dance and dramatic arts instead, which actually increased test scores overall" (n.p.).

Additionally, "teachers and school administrators report dramatic personal changes in the participating students that cannot be quantified in the improved test scores," and "students reported feeling a dramatic change in their self-perception" (n.p.). These benefits persisted in spite of several challenges faced during the duration of the program, including "changes in school staffing, school organization (merging with a failing high school in the final year, getting a new, stricter principal after the baseline year), and lack of cooperation from parents and comparison schools for surveys on empathy and social skills" (n.p.). Though dance is indicated as being the most difficult of the arts to incorporate into the program, it was included. "To truly include dance in the curriculum as something more than a set of standards written alongside that of drama, visual arts, and music may require the inclusion of an actual dance teacher on staff, on par with the physical education, music, fine arts or other specialist teachers on staff at a K-8, or even K-

12, public school" (n.p.). However, "dance specifically seems to lag behind the other art strands in availability of proper facility, appropriate teacher training or confidence, and even student comfort or enthusiasm levels, as compared to other art strands" (Durham, 2012, n.p.).

What becomes apparent in this study, and many others, is that today's students are responding to a multi-disciplinary, cross-disciplinary approach to expression and learning, manifesting their knowledge through audio-visual productions, in this case, which encompasses writing and language arts, music and sound, dance and drama, ultimately resulting in public performances and self-affirming experiences that promote a dramatic increase in feelings of self-worth and appreciation of learning (Durham, 2012).

District 75, New York City

As previously mentioned studies have shown, such benefits of arts in education have been noted for children-at-risk and underserved populations, including special education students. This is further evidenced in a report that looks at the *Creative and Integrative Arts Educators (CIAE)* (2005-8), a project of District 75 in the New York City Department of Education that focused on special education students. As a result of this program, students showed overall improvement in arts knowledge and proficiency in all the arts disciplines, improvement in English language arts, improvement in engagement, motivation, collaboration, expressiveness, confidence and risk-taking.

PS 70, Bronx

A large number of studies found in the Department of Education reports at

the Americans for the Arts focused on professional development programs for teachers. One such project was the *Professional Development Initiative between PS 70, Flamenco Vivo, and Carlota Santana* (2005-8) in Bronx, NY. Consistent with previously described reports, this project found that incorporating arts into the school environment benefited the students, teachers, and entire school community in a number of ways. Specially, one hundred percent of teachers reported that students showed increased proficiency in dance, growth in other art forms, increased motivation and engagement in school, and improvement in academic skills. Moreover, one hundred percent of teachers reported that they gained insight into student capabilities through the arts, they were able to teach academic subjects in new and productive ways, and the program helped them increase their ability to integrate the arts into their teaching.

Additionally, project administrators reported a change in the school culture in that school administrators will create an arts/literacy traveling teacher position, to help in various classrooms and grades at the school. Teachers also reported looking forward to the professional development sessions with flamenco dance, which was apparently a different attitude from other/previous professional development sessions.

Learning Without Boarders, San Francisco

The East Bay Center in the San Francisco region's *Learning Without Borders* (2005-8) provides some lessons for dance education in the schools. For one, professional development sessions should occur after school, rather than during the day, which requires substitutes and makes teachers hesitant to leave

students. A summer institute would be valuable to prepare teachers when they are less pressured by the demands of the school year. Additionally, the report indicates that having artist educators in the classroom greatly enhanced the learning experience of the teachers as they were able to see an expert using what they had been taught.

Valerie Durham (2012) points out that teachers seem to need more in-depth and ongoing training in dance and movement forms, possibly due to the challenge of overcoming their own physical insecurities or inexperience. Lack of space or classroom crowding seem to limit teachers' enthusiasm for using dance and movement, and instead tend to favor music, visual arts, and theater.

Professional Development for the Arts, Lancaster County, SC

The *Professional Development for the Arts* (2005-9) project in Lancaster County, South Carolina was focused and comprehensive enough to make a clear difference in student test scores and grades. The professional development focused on all four art strands, and the project then included the implementation of learning through developing arts communities for teachers, increasing the amount of art supplies and resources at the schools, allowing for teaching artists to come into the schools, and having teachers create arts focused and arts integrated lesson plans in all subjects.

The project report included materials on various workshop agendas, as well as some feedback from teachers on the effectiveness of the sessions in the workshops. In all cases, dance was included in the agenda and was mentioned in

the feedback. However, dance was represented at a much lower rate than music or visual arts which "dominated" the opportunities at the workshops.

For example, at the Professional Development Conference held October 17, 2007 entitled *Arts Work*, three dance sessions were offered in the conference, which had 50 sessions total. By comparison, there were 14 sessions relating to music, 16 sessions on visual art, 5 sessions relating to theater/drama, and 8 sessions on arts integration techniques. Additionally, in the list of feedback and teacher comments, dance is infrequently mentioned, and when it is, the teachers are generally requesting more specific demonstrations of dance, rather than discussion.

While dance has parity as an art strand in the state and national arts standards, in practice, it seems to be at a significant disadvantage in terms of usage, training, confidence/comfort-level, applicability, and implementation (Durham, 2012).

Michigan Art Project, Lansing, MI

In Lansing, Michigan, the *Michigan Art Project* (2005-9) provided multiple levels of professional development opportunities, as well as depth of experiences (full immersion weeks, lengthy summer institutes, regular supportive professional development workshops, and collaborative sharing meetings), tied with the partnership with very high level arts organizations (such as the Lincoln Center for the Performing Arts) and seemed to provide the rigorous structure, content and opportunity for the teachers to really become knowledgeable and skilled in arts education and its practice.

A strong lesson unit around a Grand Rapids Ballet Company performance of Maurice Sendak's *Where the Wild Things Are*, complete with pre and post activities and instruction around ballet, including ballet history and movement exercises, as well as other ELA and creative activities around the book and the performance, was highlighted in the report as a significantly successful implementation of the arts integration techniques explored and offered in the professional development program (Durham, 2012).

The Art of Teaching: Promoting Professional Growth of Arts Specialists, New York City

In New York City, a project entitled *The Art of Teaching: Promoting Professional Growth of Arts Specialists* (New York City Department of Education, 2005-8) demonstrated that in terms of a broader application, the results of this program could be used to indicate that arts teachers can benefit from extensive and consistent professional development. There is clear support in the form of established protocols, processes, curriculum templates and knowledge of feedback, evaluation and review techniques (Durham, 2012).

Building Curriculum, Community and Leadership through the Arts, Chicago

Building Curriculum, Community and Leadership through the Arts (BCCLA), a project of the Chicago public schools operated from a foundational curricular theory of the "Big Idea" as well as a comprehensive approach to units of study. The project consisted of moving beyond the covering of facts to a multi-disciplinary, cross-genre approach to learning literature/reading/writing, creative drama, world dance forms, visual art, and music – both as an objective of study of

existing content, and a product of study of new content generated by the students. Based on the examples briefly given in the evaluator's report, it seems dance was effectively used in this approach to lesson planning in a specific unit of study (Durham, 2012).

Arts and Arts Integration Project, Beaufort, SC

Beaufort, South Carolina's *Arts and Arts Integration Project's* (2007-9) findings point to the need to clarify the positive impacts of arts in the educational curriculum and the goals for arts integration in the classroom (that the arts are more pertinent perhaps to life skills, personal behavior and concept, group dynamics, critical and creating thinking and learning ability than specific academic content). The effectiveness of dance needs to be more clearly tested based on application of specific genres of dance, for example creative movement versus ballet versus hip hop versus European folk dances versus West African, etc. Lastly, this study indicated that teachers need more accessibility to, knowledge of and training in dance to allow them to be more comfortable in using movement and dance in arts integrated lesson plans (Durham, 2012).

Developing English Language Learners Through the Arts, New York City

The most rigorous of the Arts in Education reports focuses on Equity and Children-at-Risk. It is from Arts Connection in New York City, *Developing English Language Learners Through the Arts (DELLTA)* (Arts Connection, 2005-8). The findings and conclusions are significant and substantial. Durham's summary below does not include all the substantial findings in this project.

Overall, the evaluation of the project revealed that the first goal of *DELLTA* was achieved, as students developed skills, strategies, and knowledge in theater and dance across cognitive, personal, and social domains that helped them become more literate human beings.

One hundred percent of teachers reported that students gained new skills in theater and dance, 92% of teachers reported that students gained a greater sense of physical awareness and control. One hundred percent of teachers also reported students learned to add expressive qualities into their work, which increased as the residency progressed.

The project evaluators identified the following areas of greatest achievement (in rank order) from among 20 indicators of learning: (1) motivation, (2) perseverance/task-persistence, (3) focus, (4) ownership of learning, (5) spatial awareness, (6) self-confidence, and (7) cooperative learning and collaboration.

Teachers and artists also reported students became cognizant of the voice and body as tools, learned to use these tools to convey emotion, learned to observe, and provide feedback to others. Further, they reported that the authentic use of language in a real context (both theater and dance) proved to be integral to students' language acquisition. One teacher commented, “dance transcends language barriers, and new immigrants were able to let physical expression speak for them” (2005-2008, n.p.).

One hundred percent of teachers reported that students incorporated vocabulary from arts workshops in their speaking in other school subjects, and that the *DELLTA* program helped their students improve their understanding and use of

English. Eighty-six percent of teachers reported use of arts vocabulary in students' writing, with increased risk-taking in their use of language. Said one teacher, "when reading and writing, it's just a bunch of words to you, but to act it out and feel it, to learn the idioms, language becomes more internalized" (2005-2008, n.p.).

Eighty-six percent of teachers reported that the theater and dance activities reflected the students' personal experience, which promoted ownership of learning.

Through its itinerary of a wide variety of evaluation methods, the *DELLTA* project showed achievement in all of its stated sub-goals. A few of those goals are summarized in the following paragraphs.

One goal was that students will develop skills in theater and dance that will help them achieve the rigorous standards of the *NYC Blueprint for Teaching and Learning in the Arts*. Students achieved this by learning to use a character's movement to tell a story, recalling and performing choreographed dance sequences, making original, creative choices in dance, learning to understand text, subtext, and the meaning of dialogue, and learning the historical and cultural significance of dances.

A second goal was that students will learn personal, social, and cognitive skills that are intrinsic to the arts such as creative expression, physical awareness and control, and working cooperatively with others. Students achieved this by becoming more confident with speaking and moving, demonstrating self-regulation and self-control, and learning to recognize the strengths of their peers and to interact with them with mutual respect and interest.

A third goal was that classroom teachers will experiment with and document ways in which they can extend the arts education experiences into the classroom to increase students' fluency in English. To this point, 87% of teachers reported seeing their students differently because of the arts residencies, 94% of teachers reported they observed different abilities in their students, and 94% of teachers reported they observed students who struggle with reading and writing succeed in other ways.

As it affects learning a second language, the findings of this project are less direct. The evaluators did not feel they could observe second language learning within the seven areas of learning, but they did feel that the arts residencies affected behaviors essential to second language acquisition. For example, learning in the arts lowers the affective filter students bring with them from home, allowing immigrant, non-English speaking or newly arrived students to express themselves non-verbally and to incorporate aspects of self not supported in the new culture and language.

A number of conclusions were surmised from the report. First, while there was a correlation between learning in the arts and second language acquisition, the findings cannot establish a cause. However, the project did find that learning in the arts offers students the opportunity to use English in an authentic context in which they're fully engaged and that is meaningful to them.

Secondly, it takes time to build a shared knowledge base from which to be able to co-construct multidisciplinary units of study. After extensive experience in the program, teachers were asked to answer the fundamental inquiry, which

allowed them to take ownership of the program. Further, the report recommends the engagement of teachers in the examination of student learning/exploration of complex ideas; the honoring of contributions of all adult participants; the formulation of inquiry questions that require input of multiple points of view in order to truly understand the question/formulate a response; the focus on acquisition of specific skills over time (not a single workshop); the allotment space for each individual's expertise; offer support; and listen.

Thirdly, it was not enough to explore and examine the nature of teaching and learning in dance and theater. The project also needed more extensive questioning and examining in the nature of teaching and learning of ELLs. This was a blind spot before the program started, which had to be addressed as the project progressed. The report recommends trying to explore potential blind spots in the planning stage: What do you know? What do you know you don't know? Who can help you?

Fourth, things will not go as planned, most often due to external changes (like the restructuring of the New York City Department of Education) or unforeseen blind spots. Expect the unexpected and don't squander the opportunities offered under an AEMDD (or other) grant.

Lastly, students learn important concepts and skills because artists and teachers give them the opportunity to learn them. Context matters. This project was extremely strong and effective because of the following elements:

1. Strength of the tools (expertise and experience of the teaching arts and project administrators at *ArtsConnection*, variety and integrity of the evaluation tools, and analysis methods).
2. Clarity and focus of the project structure (defined inquiry question, targeted only two, main project objectives, systematic program implementation in terms of number of sessions, subject areas, school locations, evaluation, and assessment tools).
3. Appropriateness of measured outcomes to the inquiry question, project goals, and purpose of the project (the project was about learning concepts and skills in dance and theater in order to have opportunities to learn English language skills for ELLs and that is what was measured: concepts and skills that related to dance and theater, changes in usage in English for ELLs, and the relationships between these two areas).
4. Because the program was so well constructed and so narrowly and clearly targeted on specific objectives, the project was able to navigate surprise changes in school location and public school system organization and unforeseen blind spots in a way that was able to still offer significant and relevant findings based on their defined research questions and inquiry. The use of high-quality arts instruction in dance and theater, regular and multiple proven evaluation and assessment methods, as well as a focus on communication and collaboration for all project participants, gave the project an overall effectiveness not only for project findings, but for the students themselves. The students learned and grew as people.

The project authors were also extremely clear in their reporting of what specifically was being taught in each genre of the art and in the English Language Arts for ELLs, as well as what was being measured (Durham 2012). For example, according to the report, the dance residencies taught African, Afro-Caribbean, Chinese folk, and modern dance. The dance residencies were integrated with lessons in spelling, sentence construction, word meaning, and personal expression. The assessments clearly pointed to a subsequent increase in risk-taking in English Language writing and speaking by ELLs, as well as increased arts vocabulary usage in English Language Arts classes/lessons.

The arts residencies in dance and theater also led to specific, measurable improvements in cognitive, social and personal behaviors, and skills such as motivation, perseverance/task-persistence, focus, ownership of learning, spatial awareness, self-confidence, and cooperative learning/collaboration. The *ArtsConnection DELLTA* program is a model of construction and execution for arts integration projects (Durham, 2012).

EVIDENCE FROM THE FRSS REPORTS

Perhaps one of the most significant Fast Response Survey System (FRSS) data sources realized for dance was gleaned over the past 18 years comes from the FRSS-II (1995) and NAEP (1997*)* surveys. Both cite that 57% of elementary students do not have access to dance education and that, of the 43% of students who do, 36% receive dance training from teachers in physical education and 7% receive their training from dance specialists. These statistics have not changed much in 18 years (1995-2013) and even current NDEO data from membership

records, K-12 databases, and those of independent state surveys generally support these findings; 7% of U.S. elementary school children and 12-13% of high school children receive dance training during school hours as part of regular school curriculum.

Additional data were gleaned from the Fall 2009 *FRSS* data in which principals reported that 16% of high school students received dance training; 14% of schools followed the Local Education Agency (LEA) curriculum; and 10% had dedicated studio dance space and 7% used gym facilities. High school principals also reported that 30% of schools taught after-school dance programs. Statistics on professional development indicated that 9% of *LEAs* offered professional seminars with artists and arts' groups, 7% of teachers attended in-school seminars and workshops, and that 12% attended off-site conferences and seminars. Data revealed that 7% of teachers received instructional and curricular support, and 7% of teachers received instructional resources and equipment support. Only 5% of high schools reported having received financial support from outside sources.

In the FRSS 2009 Elementary School survey, data reported that 44% of schools taught dance as part of the physical education program; that 36% of schools included dance as part of the music curriculum; and that 29% of schools integrated dance instruction into other areas of the curriculum. In elementary school, only 3% of schools taught dance as a separate subject; 5% taught dance in other ways, and 12% offered dance classes or team in after school programs. In relation to professional development, approximately 10% of teachers received Professional Development from artists or arts' groups while 6% obtained

Professional Development on-site, and 10% obtained Professional Development off-site. Approximately 7% of teachers received curricular or instructional support in dance, and 4% received materials, supplies, and equipment from outside sources. Approximately 1-4% of schools surveyed received external funding.

Implications of the FRSS Research

On the positive side, all four art forms have been included in the reports completed by school principals that provide sparse general data, as cited above. However, on the negative side, dance and theatre have never been included in surveys completed by arts specialists and, thus, no substantive data exist on dance education. As a result, we have little understanding of the discipline in education and no trend analyses that can provide direction to a developing field.

The most significant consequence of the FRSS gathering data on only two art forms (music and visual arts) instead of four art forms (dance, music, theatre, and visual arts) has sent the message for decades that there are only two art forms in American schools – music and visual arts. The ramifications over decades have allowed states to rationalize that they meet state mandates for arts education if they provide students opportunity to study either music or visual arts. There is no need to expand the arts programming to include dance or theatre especially when budgets are tight, personnel are reduced, and facilities remain status quo. Such messaging is dangerous and unacceptable. FRSS and U.S. Department of Education must support new ways of thinking and doing, expansion, and improvement in the arts.

Secondly, by not including dance in the FRSS arts' specialist surveys, dance has little or no national contextual data on dance in US education. Who teaches dance? What are their credentials? What is the curriculum? Is it standards-based? What about assessments? How often is dance offered? What is the frequency or duration of dance instruction? What professional development is available to teachers, and what is being taught? How often is it available, to whom, and taught by whom? What is student enrollment in dance classes or programs in-school, or after school? What percentages of schools provide dedicated space for dance? What instructional resources are available to students and teachers? The questions go on and on; and, after several decades, we still have no federal support to understand dance as a discipline or as an art form U.S. public education.

In twenty-four years of discussing this with the federal agencies, specifically National Center for Education Statistics (NCES) and U.S. Department of Education, their prime deterrent is the research methodology they use (generally stratified sample groups) to gather and generalize data across populations. However, excellent and useful data could be gleaned if *NCES* and *USDOE* executed targeted surveys in dance and theatre. Critical data would be collected and analyzed; and federal dollars would support the inclusion of four arts forms in American education.

EVIDENCE FROM THE FIELD OF NEUROSCIENCE

Svetlana Nikitina, in her work *Movement Class as an Integrative Experience: Academic, Cognitive, and Social Effects* (2003), provides the

following introduction to some of the pedagogical implications of the intersections between dance and neuroscience, writing,

> I would like to propose that what lies at the core of integrative capacity of a performing arts course, like the one Claire Mallardi teaches at Harvard, is the inherent tendency of the arts to transcend the boundary of body with the mind, and to seek unity of self as both the subject and the object. In a dance, in the words of Margaret H'Doubler, the body is seen "as the outer aspect of personality, for it is the agent through which we receive impressions from the external world and by which we communicate our meaning." This basic translation between body and mind, mental and physical, artistic and academic that went on in Mallardi's class, resulted in integrative and transformational experiences for her students. "I never until this class" — comments one student — "equated emotions with movement or saw them in a reciprocal relationship, where a movement could create an emotion or you could be so precise in your mind that movement flows! That's a new idea, that I like and am very compelled by." Mallardi's course places students in the space of seeking connections and balance between mental intent and physical action, and thus makes the experience of dance spill over and become meaningful on a great many levels — psychological, academic, and social. (p. 55)

Nikitina (2003) locates Mallardi's classes at the juncture of cognition and the movement arts.

> Neuroscience proceeds from the belief in the inherent unity of mind and body and attempts to discover the nature of the relationship between them. In a different way and with a different goal than arts courses, neurosciences also try to cross the boundary of subjective and objective experience, mind and body, physical technique and personal interpretation, which are at the heart of teaching and learning in the performing arts. (p. 55)

In *How the Arts Develop the Young Brain*, David A. Sousa (2006) also addresses the connections between neuroscience and the arts, with an emphasis on how the arts can impact the young person's brain and overall cognitive, emotional, and social growth. He explains,

> During the brain's early years, neural connections are being made at a rapid rate. Much of what young children do as play -- singing, drawing, dancing -- are natural forms of art. These activities engage all the senses and wire the

> brain for successful learning. When children enter school, these art activities need to be continued and enhanced. Brain areas are developed as the child learns songs and rhymes and creates drawings and finger paintings. The dancing and movements during play develop gross motor skills, and the sum of these activities enhances emotional well-being. And sharing their artwork enhances social skills. The arts are not just expressive and affective, they are deeply cognitive. They develop essential thinking tools -- pattern recognition and development; mental representations of what is observed or imagined; symbolic, allegorical and metaphorical representations; careful observation of the world; and abstraction from complexity. (n.p.)

When it comes specifically to the neurological benefits of dance and movement in schools, Sousa (2006) writes,

> Even short, moderate physical exercise improves brain performance. Studies indicate that regular physical activity increases the number of capillaries in the brain, thus facilitating blood transport. It also increases the amount of oxygen in the blood, which significantly enhances cognitive performance. … Not only does the movement increase cognitive function, but it uses up some kinesthetic energy so students can settle down and concentrate better later. ... Dance techniques help students become more aware of their physical presence, spatial relationships, breathing, and of timing and rhythm in movement. Movement activities are also effective because they involve more sensory input, hold the students' attention for longer periods of time, help them make connections between new and past learnings and improve long-term recall. (n.p.)

Finally, Sousa hints at an area of neuroscience and brain research that has major implications for the benefits of dance in schools. This area concerns the capacity for dance and other arts to change the way people think about and experience the world around them. As he writes, “The arts also contribute to the education of young children by helping them realize the breadth of human experience, see the different ways humans express sentiments and convey meaning, and develop subtle and complex forms of thinking” (2006, n.p.).

There is increasing evidence that these kinds of changes may actually be happening at the neurological level. A promising avenue of brain research

involving mirror neurons shows that the same neurological changes happen when a person performs an action and when he or she observes another person performing the action. Dr. Emily Cross and her team (Cross, Hamilton, & Grafton, 2006), summarize,

> When dancers observed and simulated another dancer's movements [via fMRI], brain regions classically associated with both action simulation and action observation were active, including inferior parietal lobule, cingulate and supplementary motor areas, ventral premotor cortex, superior temporal sulcus and primary motor cortex. Critically, inferior parietal lobule and ventral premotor activity was modulated as a function of dancers' ratings of their own ability to perform the observed movements and their motor experience. These data demonstrate that a complex motor resonance can be built de novo over 5 weeks of rehearsal. Furthermore, activity in premotor and parietal areas during action simulation is enhanced by the ability to execute a learned action irrespective of stimulus familiarity or semantic label. (n.p.)

The implication for dance here is that when the trained dancer observes complex dance movement that has been rehearsed, mirror neuron centers are activated and therefore, movement learning is faster and more effective. This study reinforces the idea that physical learning increases cognitive recollection, and the increased activation of the mirror neuron brain centers can lead to greater recognition and conceptual “chunking” of information.

Furthermore, some researchers believe that there is a link between these mirror neurons and the development of empathy in humans. As Cynthia Berrol (2006) wrote,

> Various researchers posit that because of the trans-modal nature of the mirror neuron system, not only can the actions of others be understood and embodied, but likewise their intentions. [Paul] Ekman points out that all humans share common emotional feelings and empathize with those with whom they feel a strong identity. (p. 8)

The development of empathy is an important part of a child's development, and working with students on this goal has benefits for the entire school community. Mirroring involves the dance/movement therapist imitating the movement of the client, but similar activities can be adopted in the K-12 dance classroom. The teacher can mirror the students as they express themselves through movement, and the students can mirror one another. This allows them to "step into the shoes" of their peers, and to feel accepted and validated as their own movements are followed by the group. While this will benefit all students, it would be particularly beneficial for children-at-risk, especially for children on the autism spectrum or with other cognitive and emotional challenges, and in dealing with conflict resolution, school violence, and diverse populations where students may not fully be able to understand the situations of the other students in their learning group.

Kalila B. Homann (2010) continues the discussion in the following quote from her paper,

> Dance/movement therapy provides compelling resources for both the clinician and the patient, and neurobiology helps us understand both its value and potential more deeply. As we learn more about how the mind functions, it is clear that consciousness cannot be severed from the body, but is itself an integration of the functioning of the mind and body. Vagal regulation affects basic perception of experience. Mirror neurons track nonverbal body communication and are part of the complex system that allows us to understand each other's intentions. Intentions, memory, and emotions are thus integrated through sensory processing. (p. 95)

Though she writes specifically about dance in a therapeutic setting, her ideas can be applied to the importance of well-mediated dance sessions in K-12 schools

to benefit children in terms of emotional health, school readiness, conflict resolution, multicultural education, inclusion classrooms, and the affective domain.

Homann's work is just one of several recent papers focusing on the relationship between neuroscience, movement, and emotional health. This research can be directly related to the affective potential of dance on students' school readiness and preparedness to learn. Recent reports in the media, such as a special episode of the Public Radio International program *This American Life* in September 2012 and a May 2013 story on the transformation of a Massachusetts elementary school by *NBC Nightly News* have highlighted the fact that many students, particularly children-at-risk, come to school from home lives that are ravished by fear, abuse, poverty, and violence. These issues are not left behind when the morning bell rings. Some students, like Kewauna Lerma, the subject of one of the *This American Life* stories, spend their entire school day in a heightened "fight or flight" mode, a natural response to the stresses of their after school lives. As a result, they are often more likely than their peers to be disruptive, violent, and unable to concentrate and learn.

Additional research from the field of dance-movement therapy highlights the positive impact movement, particularly dance, can have on a person's emotional well-being, even at the neural level. Young-Ja Jeong (2005) writes,

> The literature suggests that DMT (Dance Movement Therapy) produces both subjective and objective improvements including redefining and strengthening body image; clarifying ego boundaries; providing an outlet for relief of physical tension, anxiety, and aggression; reducing cognitive and kinesthetic disorientation; increasing the capacity for communication, pleasure, fun, and spontaneity; and support for therapeutic medical goals. (p. 1713)

Jeong and research team tested these theories in a study which examined the impact of DMT on teenage girls in Korea who reported symptoms of depression. They wanted to determine if DMT works at the neurological level to cure depression, or if the results are purely physical and psychological. The subjects were divided into two groups, with one receiving DMT treatment, while a control group received traditional psychotherapy treatment. The DMT treatment was provided in three 45-minute sessions a week for twelve weeks and focused on "awareness of the body, the room, and the group; movement expressions and symbolic quality of movement; movement, feeling, images, and words; and differentiation and integration of feelings" (p. 1715).

Specifically, they measured plasma serotonin and dopamine in the research subjects pre- and post-treatment. Jeong's research team (2005) describes their results.

> This study was designed to measure the effects of DMT on the psychological symptoms and plasma concentrations of neurohormones in adolescent female students with mild depression. It was found that the negative psychological symptoms were improved by 12 weeks of DMT, but not in the control group. Furthermore, there were significant changes in the levels of serotonin and dopamine. The DMT group showed significant improvements in negative psychological symptoms such as somatization, obsessive–compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. These results are consistent with previous reports showing that DMT reduces emotional disturbance, relieves tension, and improves self-esteem. (p. 1717)

While leading students through dance-movement therapy sessions in-school is impractical and beyond the scope of educators, there are implications in this study that may be used to argue for the inclusion of movement in the school setting. A well-designed movement session, considering the foci of body, space

and group awareness, movement expression and symbolism, and the relationship between emotion and movement may work at a neurological level to help improve students' emotional health so that they are more prepared to learn.

Lily Thom (2010) demonstrated how principles of dance-movement therapy can be used in the classroom. Though Thom's work deals mostly with children in the pre-kindergarten age range, her ideas would be applicable to older students as well. As she writes,

> Cognition and emotion are often viewed as a dichotomy, fulfilling the Western concept of a divide between mind and body…However, many psychologists challenge the dichotomy and assert that emotion plays an integral role in processing information and making rational decisions. Such findings help explain why the developmental-interaction approach is an effective way to address children's development. According to this approach, a child cannot begin to meet the cognitive challenges of school without also meeting social and emotional demands… (p. 103)

Movement can serve as a way to meet those social and emotional demands of the students, as Thom (2010) explains in citing the 1998 work of R. Thomas Boone.

> Because the body is such a crucial part of emotional expression, movement is a powerful way to represent emotions and to help connect the conscious appraisal system to the autonomic aspects of emotion (Boone, 1998). However, a carefully designed movement program, drawing from the principles of dance-movement therapy, could engage the student cognitively as well as emotionally and socially. (Thom, 2010, p. 104)

The idea of employing dance-movement therapy practices may seem daunting, even to school dance specialists. However, Thom (2010) assures us that even simple movement activities may prove beneficial.

> In dance/movement therapy, the therapist helps to expand the patient's bodily and emotional repertoire using rhythmic structure, repetition, and consistency …Within the classroom, certain practices can be used to mark transitions, such as a slow arm-stretch accompanied by a song that signals

> the start of morning meeting. Over time, the stretch can be altered in speed, level, or movement quality and can be led by students in the class, who may further expand on it. This expansion gives one the sense of flexibility, relaxation, and resilience in responding to the unfamiliar, but depends upon the student's increasing ability to attend to somatic cues from the body. With recognition of internal feelings and needs, the student can respond to and regulate emotional experiences. He feels he can depend upon his own body to meet new challenges, to heal, to take care, and know limits. (pp. 105-106)

Embodied Cognition

The abundance of literature on embodied cognition spans the fields of artificial intelligence, robotics, psychology, and learning theory. Perhaps the most influential writer on the topic is the neuroscientist, Antonio D'Amasio, author of such books as *The Feeling of What Happens: Body and Emotion in the Making of Consciousness* (Harcourt, 1999), *Looking for Spinoza: Joy, Sorrow, and the Feeling Brain* (Harcourt, 2003), and *Self Comes to Mind: Constructing the Conscious Brain* (Pantheon, 2010). D'Amasio lends support to the notion that what we think of as a localized brain that is both in charge of, as well as separate from, the moving body, is an error in perception, or, as he called it in the title of an earlier book, *Descartes' Error (*Putnam, 1994; revised Penguin edition, 2005). He proposes that emotions and behaviors are at the center of how we learn and think, and these need to be accounted for in our schools.

Therefore, the notion that all cognition is embodied, and that the brain lives in and with a complex, thinking and feeling organism that sweats, feels, moves, and learns should lead all educators to understand the value of dance education.

But, to understand embodied cognition in dance, researchers in neuroscience have turned to functional MRI (fMRI) studies of elite dancers

observing remembered and novel dance movements. Scott Grafton and Emily S. Cross (Grafton & Cross, 2008) use the term action observation network to describe all of the brain regions involved in observing, remembering, and replicating complex movement patterns.

> Behavioral research on action learning conducted during the past half-century suggests that the final option, learning from observing and simultaneously reproducing another individual's movements, results in the quickest and most accurate learning …
>
> This past research has demonstrated that not only is observation of a model helpful for learning, but also that physical practice is more beneficial than mere observation of new movements...
>
> …Overall, our results indicate that at the neural level, learning by observing and physical learning lead to the same action resonance and prediction. This strong link between learning by doing and by observing suggests that early exposure to dance might enhance this link. (n.p.)

Action resonance and prediction are key to active learning in many ways. If children-at-risk are primarily kinesthetic learners, their ability to move in an organized, refined, and predictive way might be the key to engagement, retention, and perseverance at task.

Dance, Brain and Machine Interface: Using the machine to choreograph, choreographing the machine

More recently, neuroscientists, engineers, brain-machine interface and human-computer interaction designers, and others have become interested in learning from and working with dancers in order to understand exactly how elite movement skills impact and are impacted by cognitive and communicative processes.

Perhaps one of the earliest projects, and one that impacted both the dance field and dance education significantly, was the development of the computer program called LIFEFORMS (T.W, Welman, Gaudet, Schiphorst, & Lee, 1991). The figure could be moved and designed, and was based on the movement of dancers, but not on a particular form or style of dance. Many programs followed, most of which were based on a bank of dance steps that were specific to a particular style or genre of dance. One of those authors, Thecla Schiphorst, went on to work with the choreographer, Merce Cunningham, on his motion-captured dancers (Schiphorst, 1997), developing the means whereby the essence and traceforms of his dancers were captured and replicated onstage as ghostly figures. The LIFEFORMS project has evolved into DANCEFORMS, with the figure able to execute more complex movement patterns, and most recently, into IDanceforms. The analysis has impacted the fields of animation design, robotics, and human-computer interaction by providing a machine-based language for movement analysis.

One of those projects is a Montreal-based project called “The Dancing Genome Project” (LaPointe & Crump, 2005). Sub-titled “Generation of a Human-Computer Choreography Using Genetic Algorithm”, it references the Merce Cunningham-generated technology, but does not build on it. The “genetic algorithms” are the basic locomotor movements of run, jump, turn, and fall. The program developed from this basic structure is called *LIFEanimation*.

One concern about all of the current programs purporting to “capture” dance movements for the general purpose of creating proprietary programs to

generate choreography is that, like the dance education research in general, it does not build on prior knowledge. Thus the challenges of capturing all of the elements of dance, especially the subtleties of expression and interactions, weight-sharing, and other nonverbal relationships, are not solved.[1]

Why is this important to dance education, and what are the implications of this early research for the evidence of how dance impacts learning?

As stated above, children-at-risk can learn to engage, predict, retain, and persevere if they move to learn. In terms of the world of technology, as neuroscientists and engineers look to elite movers in order to understand human interactions and expression, children and young adults who dance will use that technology to create movement for avatars that is not limited by anatomical constraints, will design new interactive machines, will allow students who cannot physically express themselves to "move" and respond, and, in general, will help them to be designers of new technology rather than simply consumers of such.

Research Recommendations

As has been shown throughout this report, there is evidence of evidence of the value of learning in and through the arts, specifically dance. This evidence shows that incorporating dance into the curriculum can, among other benefits,

[1] A project currently addressing these challenges is a pilot project called "Your Brain on Dance: the neural symphony of expressive movement", being conducted at the University of Houston in partnership with the University of Maryland, for which one of the authors of this paper is a Principal Investigator. It is offered here as an indication that the fields of neuroscience, computer engineering, and dance are on to the challenges of how to capture the practices of and learn from elite dancers. The implications for the primacy of movement as intelligence and as a fundamental aspect of human interaction and communication are important for the future of dance education as a core subject area.

improve student test scores, lower drop-out rates, facilitate knowledge transfer, foster teacher morale, and support the learning of underserved populations such as kinesthetic learners, special education students, and minorities. While the currently available evidence is promising, as a field, dance education research can take several steps to further improve up on its validity and robustness. The field needs further research in the categories of Creative Process, Neuroscience/Brain Research, Student Achievement, Affective Domain, Student Performance, Equity, Cultural and World Dance, and Children-at-Risk, particularly within Neuroscience/Brain Research, Equity, Cultural and World Dance, Affective Domain, and Children-at-Risk. Additionally, the kinds of robust research needed to further argue for dance in K-12 education would contain the following elements:

1. Mixed quantitative and qualitative research designs should be considered whenever possible, both to more fully capture the many and diverse benefits of dance in education and to help validate the research in fields outside of our own.
2. Research should consult available literature about the current state of dance education research, such as the *Research Priorities for Dance Education Report to the Nation*, for guidance on what kinds of research are most needed in the field, and consider accepted "best practices" for designing a research projects, collecting and analyzing data, and authentic assessment based on the research questions. In many cases pulled from the U.S. Department of Education Arts in Education reports, projects were implemented without proper design and planning, data was not properly collected or accurately

reported, and students were assessed in areas that were not addressed in the treatment (Ex: testing reading and math when lessons integrated dance and social studies.).

3. Researchers should also consider checking the *National Dance Education Organization's* citation index, the *Dance Education Literature Research descriptive index (DELRdi)* for projects that relate to their research interests, and consider replicating or expanding on existing studies or at least referencing them within their own work. We should work on building a collection of evidence that supports our common cause, as well as a strong network of connected researchers who are contributing to it.
4. In planning, implementation, and reporting, the researcher must be clear and detailed about what "movement" is being used, how it is being used, who is teaching it, and why it is being used.
5. Researchers must be clear about the connections between dance and learning that are being tested within their study. These must be made apparent to the teachers implementing the lessons and the students participating in them, as well as in the reporting of the research.
6. Researchers should also look beyond the field of dance to find exciting and provocative new partners for dance education research, particularly in the fields of neuroscience, engineering, and technology design, since those fields have already demonstrated a deep interest in dance processes.

This report alludes to the fact that much of the available evidence is qualitative, if not purely anecdotal, in nature. While dance research and related

fields have pushed for the acceptance of qualitative research within the academic community, in many fields, including education, quantitative research is still privileged. Therefore, in order to best capture both the raw data that is privileged by education policy makers today and the deep, meaningful anecdotal evidence that more closely describes the immeasurable nature of the lived dance experience, mixed quantitative and qualitative research designs are recommended. There is certainly great value to the many stories of increased student engagement, teacher satisfaction, and school transformation correlated with the inclusion of arts in schools. Such evidence gives meaning to statistics, humanity to theory, and explains the multitudinous benefits of dance education that cannot be wrapped up into figures and charts. However, this information, whenever possible, should be backed up by thorough experimental designs which include, when applicable, treatment and control groups, pre- and post-testing, surveys, interviews, observation, and analysis. These quantitative measures will help us make our case for the benefits of dance education in fields beyond our own. A mixed research design is supported in the National Dance Education Organization's 2004 document, *Research Priorities for Dance Education* (Bonbright and Faber), which states,

> The National Dance Education Organization supports models of research that embrace a continuum of qualitative to quantitative research methods and techniques; and, there are aspects of the intrinsic dance experience that may be revealed through quantitative inquiry. Recommendations for both evaluation and research suggest a multi-perspective assessment involving student, teacher, parent, and administrator as well as the observer. There are also research designs that provide a triangulation of research methodologies in order to substantiate a variety of aspects of the dance experience. Quantification becomes part of the total spectrum. (p. 90)

Another component of dance education research that would be well-served by highly structured, mixed quantitative and qualitative research designs is the ability to replicate existing research. Many promising studies have been conducted on small, highly specific groups of subjects. This is to be expected, in part, because many researchers within the field of dance education in K-12 schools are graduate students who are limited by the constraints of time, budget, and location (Bonbright, 2004, p. 22). While ideally, universities would offer more support for longitudinal, large-scale research (Bonbright, 2004, p. 27), the current economic and academic climate does not bode well for such developments. What might prove to be an acceptable alternative, at least in the near term, would be to replicate existing smaller-scale research designs on different populations in different communities. The replication of research studies would serve many purposes. It could be used to validate the existing research, to find or fix flaws in the original design, and to test its relativity across geographic, socioeconomic, and cultural divides.

In order for research to be replicated, however, the published report must be written thoroughly and disseminated widely. Many of the studies reviewed for this report lacked detail about the research design and implementation, the pool of participants, the process of data collection and analysis, and the role of dance within the study. This final point is particularly salient. In our effort to make visible the evidence of the value of dance in education, we must make certain that the dance itself is visible within the research studies we claim as evidence. In a surprising number of studies, it was difficult for the researchers to determine what

kind of dance/movement was used, how it was incorporated into the classroom activities, how the lessons were conducted, and what qualifications of the person leading the dance/movement activities held. Including details about the type of movement and how it was incorporated into the curriculum, the specific dance teaching methods and lesson plans used, and the theoretical grounding for those choices would be most advantageous in proving the benefits of dance in and as academic learning. Such details can clarify the role of dance within the design, illuminating the effectiveness of dance for classroom teachers and administrators and making the study more easily replicable for other researchers.

Wide dissemination of the research findings is also necessary. The National Dance Education Organization's Dance Education Literature and Research descriptive index is a useful vehicle for the dissemination of theses, dissertations, and other unpublished projects. Additionally, the index serves as a valuable research tool, where researchers can find citations and abstracts for thousands of studies ranging from published articles to conference proceedings. By making effective use of the Dance Education Literature and Research descriptive index, dance education researchers can find the most up-to-date studies in the field. It is vital that researchers be aware of what is currently being addressed in the field. Many projects that are similar in nature have been conducted across the country in recent years; however, the authors of these studies rarely reference one another's work. More effective referencing of related studies and communication between researchers would further strengthen the body of evidence and the network of scholars working on it.

With the support of a colloquium of colleges, or under the auspices of government agencies or private foundations, smaller, specific research designs reviewed for this report could be reimagined more broadly, testing a wide subject population in a number of different ways over a significant duration of time. Case studies that were limited to a single classroom could be repeated school-wide, district-wide, and beyond, looking at the effectiveness of dance in and as education beyond the particulars of any one group of students or teacher. Similarly, those that were limited to a single semester could be extended into longitudinal studies, looking at the long-term benefits beyond the immediacy of test scores. Such large-scale, long-term research would particularly benefit from mixed quantitative and qualitative research designs as they could measure changes in test scores and other easily measurable factors while deeply observing the in-class conditions that lead to such changes. This would widen the highly specific body of evidence, many pieces of which are being used broadly to speak about the benefits of "art in education," when they in and of themselves do not prove this conclusively.

In 2004, NDEO published *Research Priorities for Dance Education*, which discussed the development of the then-newly published Dance Education Literature and Research descriptive index and its implications for the field of dance education research. Of particular interest is the report's listing of under-represented Educational Issues, Populations Served, and Areas of Service within the indexed literature. While an updated list may be in order as much new research has been conducted in the past decade, researchers would do well to consult this list in order to develop study designs that would add to the literature in

these underserved topics. Topics include K-12 related areas such as: Equity, National Content Standards, Funding, Student Performance, Children-at-Risk, Certification, Teacher Standards, Uncertified Teachers, Brain Research, Community and Family, Administrators and Policy Makers, World Cultures, Different Abilities, Children-at-Risk, After School and Outreach, Interdisciplinary Education, Opportunity-to-learn, Artists-in-schools, Child Development, Critical Analysis, Cognitive Development, Higher Order Thinking and Problem Solving, Teacher Preparation and Training, Assessments, Program Effectiveness, and Certification.

Of particular note, the field of Early Childhood Education is also listed as an area in need of further research. With the contemporary political discourse surrounding preschools and President Obama's allocation of funds within the FY2014 Budget to make Pre-K education available to all, it would serve our interests as a field to publish literature that fits into this discourse and argues for the inclusion of dance into preschool curriculum. As Bonbright states in *Research Priorities for Dance Education*, "Research in Early Childhood remains minimal considering the important links between motor development and learning in the early years of childhood" (Bonbright, 2004, p. 71). Chissom's (1971) study in search of links between motor skill development and academic aptitude and achievement further supports the argument for research in this area, and serves as an example of a rather narrow, outdated study that could be easily reimagined to serve the present needs of our field.

Conclusion

The evidence has been growing for the ways in which dance impacts learning, as a part of the arts, and as a separate and unique discipline. Much of the evidence is tantalizing and promising, and should be further developed. Indications exist that the instrumental use of dance is powerful and long-lasting, despite the fact that the mode used is nonverbal and is seen as an example of far transfer. In fact, it would appear that the evidence of the efficacy of embodied learning is significant and worthy of further investigation. The impact of the programs reviewed on schools and teachers is also significant. In schools where dance programs flourish, students' attendance rises, teachers are more satisfied, and the overall sense of community grows.

However, as promising as the research is, it can and must get better: more rigorous methods, more clearly defined variables, and more references to existing research are necessary.

For better research to be developed, funding is required. It is the hope of the authors of this report that the promising evidence herein will encourage such funding to be developed. The National Dance Education Organization stands ready to lead this effort.

Appendix 1: Evidence Review Form

Date:

Evidence Researcher:

Database Name:

CITATION INFO –title-author- citation specifics- location-

Evidence Title:

Author(s):

Journal/Citation info:

Location:

Abstract:

Brief Overview of the Study/Project:

Findings/Conclusions:

Assessment of the value of the EVIDENCE: (This section was an evaluation by the researcher of the value of and evidence within the report, article, or study).

Appendix 2: Definitions of Categories

For the reports, the following definitions and guidelines were used to determine which underrepresented areas of dance education research were being addressed by the evidence:

Creative Process ~ the process of teaching and learning using experience, information, stimuli, data, and ideas in new and different combinations to invent new and different, ideas, products or combinations.

Key search words include: teaching and learning to find solutions to problems or questions; intuitive sensing-feeling-thinking; and scientific process, innovation, imagination, HOTS, Bloom's taxonomy, metacognition, dance-making, improvisation, choreography, problem-solving, problem-finding, inquiry, and divergent thinking.

Neuroscience/Brain Research ~ studies that examine changes in structure, function or development of the brain in relation to, or stimulated by, bodily movement or dance. Key search words include: cognition, kinesthetic learning, Brain Dance, mental coordination, synchronization of dance and music, mental skills in dance, representation of space, dance aesthetics & the brain, perception, sensory, cognitive, and emotional brain processes.

Student Achievement ~ looking at student progress and learning over time as defined through set standards/curriculum using samples of student work (portfolio, performance, journal entries, self-review, documentation of process, etc.); quantitative analyses (GPAs, grades, any test score, state testing, developed rubrics, checklists); and/or observation, peer review,

anecdotal, etc. Key search words include: transfer of learning, student reflection, inquiry, increased test scores, SAT scores, assessment, student portfolios, and 21st century skills.

Affective Domain ~ changes in preferences, attitudes, and values. Key search words include: intrinsic motivation, personal values, building school culture, group dynamics, socialization, emotional value of dance, habits of mind, and self-image.

Student Performance ~ broader concept of measuring student progress through indicators beyond student achievement (i.e., socio-economic indicators such as dropout rate, college entrance rate, vocational choices, employment rate, sick days, etc.) Key search words include: career pathways in dance, school attendance, student tardiness, students entering higher education dance programs, and dropout prevention.

Equity ~ equal access and opportunity for students to study dance regardless of gender, age, size, shape, interest, ability, race, ethnic origin, or religious belief. Key search words include: access to dance classes, delivery of dance classes, after school programs, interventions, Opportunity to Learn (OTL), gender issues, biases and dance, arts integration, extended day programs, and culturally responsive pedagogy.

Cultural and World Dance ~ teaching and learning that embraces more than one cultural perspective or view; understanding same or different viewpoints or perspectives from two or more cultures; and learning from a variety of cultures. Key search words include: Historical & Cultural

Contexts, dance of anthropological/ethnographic, world dance, folk dance, cultural dance, historical dance, subcultures & dance, and dance genre.

Children-at-Risk ~ students who are identified as children most likely not to complete K-12 education. Shared characteristics among at-risk students include: single parent homes, homeless, drug use, high pregnancy rate, qualify for free lunch programs, and students for whom English is a second language (ESL). Key search words include: free and reduced lunch, dropout prevention, teen pregnancy, social/emotional development, Title I, homeless, drug prevention, eating disorders, anti- gang strategies, academic interventions, literacy/ESL, and student retention.

REFERENCES

Arts and Arts Integration Project. (2007-9). NCES ED#: 450110. Beaufort, SC. Unpublished.

Arts Connection, New York City. (2005-8). Developing English Language Learners Through the Arts (DELLTA). New York City. Unpublished.

Arts in Education Model Development and Dissemination Grant. (2005-7). NCES ID # 1200990. Jefferson County, FL. Unpublished.

Berrol, C. (2006). Neuroscience meets dance/movement therapy: Mirror, the therapeutic process and empathy. *The Arts in Psychotherapy, 33* (4), 302-315.

Bonbright, J. & Faber, R (2004). *Research priorities for dance education: A report to the nation.* Retrieved March 30, 2013, from National Dance Education Organization: http://documents.clubexpress.com/documents.ashx?key=Y6koaH8f5N96MqKH3wF6yqByQk5eGATMqmIfRcFIk1ylKfncBzbkz%2b2VO45G0eNX6lipbZT%2fB8ofLF4%2fYBZmtoSDnCPjBXyL

Boone, R. T. (1998, September). Children's decoding of emotion in expressive body movement: the development of cue attunement. *Developmental Psychology, 34* (5), 1007-16.

Boykin, W. & Cunningham, R. (2001). The effects of movement expressiveness in story content and learning context on the analogical reasoning performance of African American children. *The Journal of Negro Education, 70* (1/2), 72-83.

Building Curriculum, Community and Leadership Through the Arts (BCCLA). (2005-8). NCES ID #: 1709930. Chicago. Unpublished.

Burke, J. S. (2009). *Chemistry meets choreography to enhance student comprehension.* Retrieved April 6, 2013, from Edutopia: http://www.edutopia.org/arts-education-chemistry-dance-visualization

Carter, C. S. (2004). *Effects of formal dance training and education on student performance, perceived wellness, and self-concept in high school Students.* University of Florida, Gainesville. Unpublished.

Catterall, J. (2012). *The arts and achievement in at-risk youth: Findings from four longitudinal studies.* Retrieved April 2, 2013, from National Endowment for the Arts: http://www.nea.gov/research/arts-at-risk-youth.pdf

Chissom, B. (1971). A Factor-analytic study of the relationship of motor factors to academic criteria for first- and third-grade boys. *Child Development, 42* (4), 1133-1143.

District 75, New York City. (2005-8). Creative and Integrative Arts Educators (CAIE), NCES ID #: 3600135. New York City. Unpublished.

Cross, E., Hamilton, A., & Grafton, S. (2006). "Building a motor simulation de novo: observation of dance by dancers." *NeuroImage, 31* (3), 1257-1267.

Durham,V. (2012). *Reviews of U.S department of education arts-in-education projects.* Washington, DC. Unpublished.

East Bay Center. *Learning without borders,* 2005-8. San Francisco Bay Area. Unpublished.

U.S. Department of Education (2009). *Arts in education—model development and dissemination Grants program*. Retrieved April 14, 2013, from US Department of Education: http://www2.ed.gov/programs/artsedmodel/index.html

Faber, R. S. S. (2011). Science with dance in mind: A collaboration with primary movers and Baltimore County public schools 2009-2011. *National Dance Education Organization Conference.* Minneapolis.

Fineberg, C. (1992). *The arts and cognition: A study of the relationship between arts partners programs and the development of higher level thinking processes in elementary and junior high school students.* New York University. Unpublished.

Grafton, S., & Cross, E. S. (2008). *Dance and the brain*. Retrieved June 25, 2013, from The Dana Foundation: http://www.dana.org/news/publications/detail.aspx?id=10744

Grossmann, T. E. (In Press). Action observation in the infant brain: The role of body form and motion. *Social Neuroscience*, TBA.

Homann, K. B. (2010). Embodied concepts of neurobiology in dance/movement therapy practice. *American Journal of Dance Therapy, 32* (2), 80-89.

Jeong, Y. (2005). Dance movement therapy improves emotional responses and modulates neurohormones in adolescents with mild depression. *International Journal of Neuroscience*, *115* (12), 1711-1720.

LaPointe, F., & Crump, M. (2005). Generation of a human-computer choreography using genetic algorithm. Retrieved June 24, 2013, from The Dancing Genome Project: http://www.mirlab.org/conference_papers/International_Conference/ACM%202005/docs/mm555.pdf

Leonard, A. E. (2012). *Moving the school and dancing education: Case study research of K-5 students' experiences in a dance residency.* University of Wisconsin-Madison. Unpublished.

Longley, L. (1999). *Gaining the arts advantage: Lessons from school districts that value arts education.* Retrieved March 31, 2013, from nmarts.org: http://www.nmarts.org/pdf/arts_advantage.pdf

Lynch, P. (2007). Making meaning many ways: An exploratory look at integrating the arts with classroom curriculum. *Art Education, 60* (4), 33-38.

MacBean, A. (2001). Scripting the Body: The simultaneous study of writing and movement. *Journal of Dance Education, 1* (2), 48-54.

McMahon, S. D. (2003). Basic reading through dance: The impact on first-grade students' basic reading skills. *Evaluation Review, 27* (1), 104.

Michigan Art Project. (2005-9) NCES ID #: 2621150. Lansing, MI. Unpublished.

Mohn, K. (2004). Rocking the curriculum: Dance and academics at an A+ School. *Journal of Dance Education, 4* (4), 121-123.

Moore, C. and Linder, S. (2012). Using dance to deepen student understanding of geometry. *Journal of Dance Education, 12* (3), 104-108.

New York City Department of Education. (2005-8). The Art Of Teaching: Promoting Professional Growth of Arts Specialists. New York City. Unpublished.

Nikitina, S. (2003). Movement class as an integrative experience: Academic, cognitive, and social effects. *Journal of Aesthetic Education, 37* (1), 54-63.

Park, C. C. (1997a). Learning style preferences of Asian American (Chinese, Filipino, Korean, and Vietnamese) students in secondary schools. *Equity and Excellence in Education, 30* (2), 68-77.

Park, C. C. (1997b). Learning style preferences of Korean, Mexican, Armenian-American and Anglo students in secondary schools. *National Association*

of Secondary School Principals Bulletin (NASSP), 81 (585), 103-111.

Park, C. C. (2000). Learning style preferences of southeast Asian students. *Urban Education, 35* (3), 245-268.

Paulson, P. (2012). The brain and learning. *Journal of Dance Education, 12* (1), 81-83.

Posner, M. M. (2003). *How arts training influences cognition.* Retrieved April 8, 2013, from The Dana Foundation: http://www.dana.org/news/publications/detail.aspx?id=10762

Professional Development for the Arts. (2005-9). NCES ID# 4502580. Lancaster County, SC. Unpublished.

Professional Development Initiative Between PS 70 and Flamenco Vivo Carlota Santana. (2005-8). NCES ID #: 360086. New York City. Unpublished.

Ruppert, S. (2006). *Critical evidence: How the arts benefit student achievement.* Retrieved March 31, 2013, from National Association of State Arts Agencies: http://nasaa-arts.org/Research/Key-Topics/Arts-Education/critical-evidence.pdf

Schiphorst, T. (1997). Making dances with a computer. *Choreography and Dance: An international journal, 4* (3), 79-98.

Seidel, S. S. (2009, June). *The qualities of quality: Understanding excellence in arts education.* Retrieved April 12, 2013, from The Wallace Foundation: http://www.wallacefoundation.org/knowledge-center/arts-education/arts-classroom-instruction/Documents/Understanding-Excellence-in-Arts-Education.pdf

Sevilla, J.M. (2003). One school's application of the theory of multiple intelligences: When one flower blooms. *Journal of Dance Education, 3* (1), 34-44.

Soto, C. (2001). *Academic achievement, self-concept, and dance in 8 to 12 year olds.* California State University. Fullerton. Unpublished.

Sousa, D. A. (2006, December). How the arts develop the young brain. Retrieved June 10, 2013. *The School Administrator:* http://www.aasa.org/SchoolAdministratorArticle.aspx?id=7378

Stratton-Gonzalez, S. (2008). *The impact of the participation in the creative dance clubs on social, personal, and cognitive growth of fourth and fifth grade students at PS 722.* SUNY Empire College. NY. Unpublished.

Thom, L. (2010). From simple line to expressive movement: The use of creative movement to enhance socio-emotional development in the preschool curriculum. *American Journal of Dance Therapy, 32* (2), 100-112.

T.W, C., Welman, C., Gaudet, S., Schiphorst, T., & Lee, C. (1991, May). Composition of multiple figure sequences for dance and animation. *The Visual Computer: International Journal of Computer Graphics, 7* (2-3), 114-121.

Werner, L. (2001). *Using dance to teach math: The effects of a co-teaching arts integration model on teacher practice and student learning.* University of Minnesota. Minneapolis. Unpublished.

Westreich, G. B. (2000). *An Analysis of Kinesthetic Learners' Responses: Teaching mathematics through dance.* American University. Washington, DC. Unpublished.

National Dance Education Organization
8609 Second Ave., Suite #203-B
Silver Spring, MD 20910
www.ndeo.org