Integrating the arts into head start classrooms produces positive impacts on kindergarten readiness

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A R T I C L E   I N F O

Article history:
Received 31 January 2017
Received in revised form 18 January 2018
Accepted 19 January 2018
Available online xxx

A B S T R A C T

Arts enrichment may provide important opportunities for the development of pre-academic skills, since much of what young children do as play, including singing, drawing, and dancing, engages the senses and primes the brain for learning. The Wolf Trap’s Early Learning Through the Arts program, a national program that is designed to integrate performing arts into the early childhood education (ECE) curriculum and provide instructional training on delivery strategies, is an exemplar program that provides this type of experiential learning; and program implementation and teacher training approaches vary for each individualized program.

The purpose of this study was to examine the effectiveness of the Living Arts Detroit Wolf Trap program’s approach on children’s outcomes for those in Head Start centers in Detroit Michigan. 424 students who participated in the arts program were randomly matched to 406 comparison students who did not participate in the arts program. A series of ANCOVAs on the post-test score, with the pre-test score serving as the covariate, demonstrated that arts integration provides important opportunities for child pre-academic skill development including approaches to learning; social-emotional development; language, literacy, and communication; science and technology; and social studies and saw specific gains in emergent literacy and emotion regulation: these are among the cornerstone competencies that are necessary for future success in school. These findings provide further support for the benefit of arts integration in early childhood.

1. Introduction

Children are born ready to learn and form 85% of their intelligence and personality by age five. Those first years of life are the most important for lifelong development (NRCIM, 2000) and preschool achievement is regarded as a predictor for later school success (Ramey & Ramey, 2004). Students from low socio-economic (low-SES) environments are often behind in academics even before they enter school, thus the establishment of the Head Start program during President Johnson’s “War on Poverty” in 1965. Although there are numerous studies on the positive impact Head Start has for low-SES preschool children, those same studies also recognize that despite the gains they make, Head Start children enter kindergarten still substantially below national averages on assessments (Zill et al., 2003). In 2006, the US Department of Health and Human Services’ Administration on Children, Youth and Families reported Head Start attendance alone does not eliminate elementary school achievement gaps (Zill et al., 2006). Others note that at-risk students often are stressed by a variety of problems while in school that lead to emotional barriers to learning as well as loss of attention (Willis, 2008).

Arts integration’s impact on academic achievement has been studied for decades. In the 1990s, a 4-year study of 25,000 secondary school students, using the National Educational Longitudinal Survey, found significant connections between students who had high involvement in arts learning and general academic achievement (Fiske, 1999). In the early 2000s, a compilation of research found that arts education and learning in the arts helps at-risk students “close the achievement gap”, improves literacy skills (including reading and language development), and impacts students’ motivation to learn (Deasy, 2002). Recently, The International Literacy Association (2016) redefined literacy as “the ability to identify, understand, interpret, create, compute, and communicate using visual, audible, and digital materials across disciplines and in any context” (para. 1) pointing to a link between the arts and literacy. In fact, studies conducted by cognitive neuroscientists show strong links between arts learning and cognitive
development and control (D’Esposito, 2008). Students who are in arts integration classrooms reap initial and long-term benefits; 10 additional years of data from the 1999 cohort of the students in the longitudinal study referenced above found significant advantages later in life. Students from that study who were from low-SES backgrounds and engaged in the arts were positively impacted in the number matriculating to college and in their types of employment (Catterall, 2009).

At the Pre-K level, the arts are of particular importance. Much of what young children do as play, including singing, drawing, and dancing engages the senses and helps the brain get ready to learn. Students develop thinking tools needed in early learning, including pattern recognition and development; representations in multiple cognitive arenas; and observation skills among others (Sousa, 2006). Arts integration has also been shown to provide important opportunities for children of varied developmental levels to grow in pre-academic skills (Gregoire & Lupinetti, 2005).

Finally, the arts add an additional advantage for Pre-K students’ “readiness for kindergarten”: students in the arts develop higher order attention skills than students who do not participate in the arts (Posner, Rothbart, Sheese, & Kiers, 2008). In fact, three year olds who were in music training classrooms were found to have the ability to “selectively attend to auditory information” at a higher level than those not in a musical classroom (Neville, 2008). It has been noted that these attention skills influence child development, in general, and school readiness in particular (Blair, 2002).

2. Getting “ready to learn” through the arts

Wolf Trap Foundation for the Performing Arts Institute for Early Learning Through The Arts offers professional development to Pre-K teachers training them in integrating performing arts into their teaching. Several research studies conducted with Wolf Trap have shown that this methodology has promise for improving student outcomes (Burnaford, Brown, Doherty, & McLaughlin, 2007; Goff & Ludwig, 2013; Rabkin & Redmond, 2004). A recent study of their program in professional development and using the arts in mathematics instruction showed the following: 1) the intervention positively impacted the teachers’ use of the methodology in their classrooms, and 2) student outcomes in mathematics were positively impacted. Students in this study had significantly higher scores on standardized math tests than those from non-intervention classrooms in years 1 & 2 of the program despite the fact that not all students from year 1 continued in intervention classrooms. “The first-year impact is equivalent to 1.3 additional months, or 26 additional days, of learning for students whose teachers had participated in the program. The second year impact amounts to 1.7 additional months, or 34 additional days, of learning” (for review, see Ludwig, Marklein, & Song, 2016).

Another study focused on Wolf Trap programs showed that at-risk students in an arts-integrated preschool achieved statistically significantly higher improvements in Language and Literacy, Approaches to Learning, Creative Arts and on the Overall Early Learning Standards Inventory test than a comparison group. This was a quasi-experimental study conducted in two Pennsylvania preschools, an arts integrated school and a traditional school, which were both Head Start programs serving low-SES students (Phillips, Gorton, Pinciotti, & Sachdev, 2010).

All of these studies confirm that arts integration has shown its potential to positively impact academic achievement for low-SES students and appears to have long-term impact. This study of Pre-K classrooms in Detroit Head Start programs that incorporate Wolf Trap Early Learning Through the Arts integration residencies was undertaken to test the strength of the methodology in impacting two early childhood indicators of future academic success: 1) emergent literacy and 2) social-emotional learning. These two areas of skill development are essential elements in further success in school. In areas such as Detroit, with high poverty and high dropout levels, positively impacting these Pre-K indicators could decrease the dropout rate and, if implemented on a larger scale, could potentially change the academic achievement of at-risk students in other urban areas.

2.1. Emergent literacy

“Emergent literacy” refers to early knowledge about language, reading, and writing most of which is acquired during preschool. Early literacy is particularly important among school-readiness skills because instruction and learning in formal schooling is typically language-reliant (Phillips et al., 2010). An accurate predictor of school success, for example, is the number of book words a child has in their vocabulary at age five, because it is during the early childhood period when the foundation is laid for language development (Gee, 2008). Although Head Start does close the gap in letter recognition and other pre-reading skills, these students are still behind the national average upon entering kindergarten (Zill et al., 2003).

The arts help children build vocabulary and letter recognition and all of the art forms have proven impact on emergent literacy skills. For example, a meta-analysis of peer-reviewed studies of music training was conducted in 2015 and found modest gains in phonological awareness and specifically noted that there are correlations between music aptitude and phonological skills in children (Phillips et al., 2010). Further, music training strengthens basic auditory and speech processing, which in turn influences phonological perception and reading skills (Tierney & Kraus, 2013). Similarly, another study of 4- and 5-year-old children showed that the more music skills children had, the greater their phonological awareness and reading development skills (Sousa, 2006).

The breadth of arts integrated into the Detroit residencies is extensive as is the custom for Wolf Trap Early Learning Through the Arts programs and includes music as a daily part of the curriculum. Our study should show similar results as those mentioned above demonstrating the intervention has a positive impact on emergent literacy identified as “phonological awareness, alphabetic knowledge, reading” among other skills.

2.2. Social emotional learning

Students’ emotional health is strongly related to learning and has been studied for years. Over 40 years ago, a study of differential emotion theory and its effect on learning (Izard, 1971) showed Head Start programs promote skill building exercises for positive emotion and emotion regulation for low-SES children (Brown & Sax, 2013). Although Head Start aides students in adjusting their behavior and regulating emotions (Zill et al., 2003), many current studies suggest that the arts in particular help children dealing with poverty experience positive social-emotional outcomes (for a recent review, see Menzer, 2015) and promote regulation of emotions and behavior (Grytting, 2000; Gregoire & Lupinetti, 2005; Lobo & Winsler, 2006).

The National Endowment for the Arts conducted a literature review and gap-analysis of studies from 2000 to 2015 (Menzer, 2015) on the social and emotional benefits of participating in the arts. Specifically, the papers reviewed focused on three areas: prosocial behaviors (i.e., helping, sharing, cooperation, empathy), reductions in internalizing behaviors (i.e., shyness, inhibitions) and externalizing behaviors (aggression). Menzer documented positive impacts for children who participate in the arts in general. Those findings echoed other findings from research including: 1) more well-developed receptive vocabulary in students (many from low-SES backgrounds) who were involved with an arts program.
which, in turn, provided them opportunities to regulate emotions and behavior (Brown, Benedett, & Armistead, 2010); 2) children in a dance program demonstrated a reduction in internalizing (shy, anxious) and externalizing (aggressive) problems (Lobo & Winsler, 2006); 3) children who participated in a drama-based education program saw decreases in disruptive behavior and improved self-regulatory behaviors compared with children who did not participate in the program (Nicolopoulou, Barbosa de Sa, Ilgaz, Brockmeyer, 2009); and, 4) toddlers in an arts integration program, compared with a matched-control group, showed improvements in teacher-rated positive and negative emotion regulation (Brown & Sax, 2013). Brown and Sax suggest that including the arts in Pre-K education for low-SES children may serve to equalize educational opportunity by making the school experience more positive because students will have a higher frequency of positive emotions and have more opportunities to practice emotional regulation. They contend that the “induction of positive emotions into educational settings through arts programming is an important piece of prevention strategy” especially in early education programs for low-SES students.

Pretend play and socio-dramatic play also have shown their impact on emotion regulation in preschoolers. In a recent study, using the Emotion Regulation Checklist (Shields & Cicchetti, 1997), a parental report tool, students who were better able to manage emotions were more eager to engage in pretend play. They were also more fluent and flexible in divergent thinking skills and were rated as having higher emotion regulation by their parents (Hoffmann & Russ, 2012).

Once again, the Wolf Trap Early Learning Through the Arts program integrates extensive experiences with performing arts in the classroom thus offering opportunities for children to develop emotion-regulating skills. Our study should show similar results in the Detroit Head Start programs as those above in that students with high arts learning will demonstrate a positive impact on social emotional development including the ability to build relationships with adults and with other children, and reductions in internalizing and externalizing behaviors.

3. Purpose of the study

Two programs came together in southwest Detroit to affect change in Pre-K education venues: Wolf Trap and Living Arts Detroit. Wolf Trap provides arts-based teaching strategies and services to early childhood teachers, caregivers, parents, and their children from ages 3–5 through the disciplines of drama, music, and movement. The Wolf Trap Institute, established over 30 years ago, is a program of the Wolf Trap Foundation for the Performing Arts located in Vienna, Virginia. While Wolf Trap has had numerous research studies conducted on their methodology, little evaluation and research has focused on the Wolf Trap and Living Arts Partnership. The researchers were particularly interested in further data on the impact of arts-integration on low-SES youth through the Living Arts Detroit Wolf Trap™ in regards to emergent literacy and emotion regulation.

Living Arts, a non-profit arts and education organization, engages Detroit youth, teachers and families in experiences in the performing, visual, literary and media arts. Through artist residencies in K–12 schools and early learning centers across Detroit and out-of-school offerings focused in Southwest Detroit, they intend to increase youth's academic achievement, develop their leadership and artistic skills, and strengthen schools and communities.

Living Arts became a regional Affiliate for the Wolf Trap Early Learning Through the Arts program in 2013 after having undergone a program review and partnership discussions with the National office. Living Arts’ Detroit Wolf Trap™ (Living Arts) Teaching Artists are trained by Master Teaching Artists from the National Institute. Living Arts brings arts integration to educational partners serving students in Head Start, Early Head Start, Pre-K and kindergarten throughout Detroit (as well as children ages 3 months through 6 years and parents at their out-of-school location in southwest Detroit).

3.1. Participants

This study focuses on Pre-K students in Head Start programs in the Midwestern urban city of Detroit, including those selected as intervention classrooms and those designated as comparison classrooms. Children in the comparison classrooms received the regular Head Start curriculum. However, students in the Living Arts intervention classrooms received additional programming geared toward ensuring that students enter school “ready to learn in kindergarten”.

Care was taken to choose comparison classrooms from high-poverty neighborhoods that were comparable to the Detroit intervention classrooms. All intervention schools are part of the federal Head Start program and all comparison schools are either Head Start or state-funded (Michigan) Great Start Readiness Program (GSRP). Head Start, a program of the United States Department of Health and Human Services established in 1965, provides comprehensive early childhood education, health, nutrition, and parent involvement services to low-income children and their families. GSRP is Michigan’s state-funded preschool program for four-year-old children with factors that may place them at risk of educational failure. The program is administered by the Michigan Department of Education, Office of Great Start and was established in 1985. Although Head Start gives priority admission to 4-year olds, there are 3 years old admitted, but GSRP only admits 4-year olds (for participant demographics and inclusion and exclusion criteria, see the Results section).

3.2. Procedures

The intervention program includes direct service to children, their teachers, caregivers, parents, and teaching artists through mini-residencies, teacher training, artist training, and family workshops:

1. Residencies: The residencies consist of sixteen 30-min sessions, two per week for 6–8 weeks, in the classroom. There is one Teaching Artist assigned to each classroom to ensure consistency over the duration of the residency period (typical session is shown in Table 1).

2. Individual Teacher Trainings: After each session, the Teaching Artist and Classroom Teacher meet for approximately 15–20 min to deconstruct the lesson, highlight successes and challenges, and plan for future sessions. Embedded in each residency are two planning sessions consisting of 1) the Teaching Artist and classroom teacher preparing arts integrated lesson plans and 2) two classroom-teacher-led sessions in the classroom utilizing the arts strategies demonstrated over the course of the residency. During these sessions, the Teaching Artist actively coaches and assists with the lessons.

3. Professional Development Trainings for teachers: Professional Development for Classroom Teachers is a key component of the program. In addition to the individual meetings with Teaching Artists, every early childhood teacher with a residency in their classroom is eligible for a three-hour professional development workshop provided by Living Arts Detroit Wolf Trap™.

4. Teaching Artist Trainings: Living Arts provides a comprehensive, hands-on 30-h training for new Teaching Artists with a Wolf Trap National Master Trainer. The training consists of a
Table 1
Typical Living Arts Classroom Residency Session.

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 min</td>
<td>Welcome Song</td>
<td>Consistent for every session.</td>
</tr>
<tr>
<td>15–20 min</td>
<td>Focused Activity: movement,</td>
<td>Often inspired by an age-appropriate book (examples include:</td>
</tr>
<tr>
<td></td>
<td>music, and literacy</td>
<td>“Squirrels Busy Day” by Lucy Barnard and “Boot Weather” by</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Judith Vigna), these connect to a focused theme or curricular focus.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Example: The teacher is focusing on social emotional learning,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>especially self regulation/body control, and the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>teaching artist leads an activity where the children use their</td>
</tr>
<tr>
<td></td>
<td></td>
<td>bodies to dramatize animal characters from a story.)</td>
</tr>
<tr>
<td>5 min</td>
<td>Ending song</td>
<td>To reflect and bring session to close</td>
</tr>
<tr>
<td>15–20 min</td>
<td>Debrief with teacher</td>
<td>Discussing the arts strategies modeled, the successes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and challenges of the session, and student needs. This informs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the next session’s goals.</td>
</tr>
</tbody>
</table>

mini-residency where the trainer and trainees are physically in a classroom with children for 30 min per day. Training artists observe the Trainer using the Wolf Trap model and, after the observation, devote 4–5 h with the Trainer to deconstruct their observation, develop their teaching tools (i.e., lesson plans) and learn strategies to take into the classroom. This training is required before a teaching artist begins to work in classrooms.

5. Family Involvement Workshops: For every five residencies contracted by a school, Living Arts offers a Family Involvement Workshop to engage parents and children together in a series of activities typical in the classroom residency. Parents leave with a worksheet of activities and songs to use at home.

3.3. Measures

The impact evaluation was confirmatory, meaning the intention of study was to demonstrate the effectiveness of Arts-Integration education, and to determine if the Living Arts’ intervention had an impact on advancing school readiness in Pre-Kindergarten children ages 3 & 4, as measured by the HighScope COR Advantage (2014) overall and to determine if there was a link to the results with others in the field showing the impact that the arts have on language development/emergent literacy (Phillips et al., 2010) and emotional health (Gryting, 2000; Greigorre & Lupinetti, 2005; Lobo & Winsler, 2006; Menzer, 2015; Zill et al., 2003).

The COR Advantage (COR-A, Highscope, 2015), a tool developed by HighScope Educational Research Foundation and approved by Head Start and state-funded programs, was used to collect teacher observations on students on the following subscales: Approaches to Learning (AL), Social and Emotional Development (SED), Physical Development and Health (PDH), Language, Literacy, & Communication (LLC), Mathematics (M), Creative Arts (CA), Science and Technology (ST), and Social Studies (SS).

The COR-A was administered by classroom teachers (or other providers). Teachers at the intervention and comparison sites were provided training from HighScope on this observational checklist by their Head Start employer through either a one-day face-to-face training with a two-week online follow-up, or a four-week online course. As noted in the COR Advantage FAQs (2014) certification in the use of the tool is recommended for teachers. Certification requires a pass rate of at least 80% on the reliability assessment that accompanies the training. Certification will assure a more accurate and fair comparison of children across different classrooms.

3.4. Reliability and validity

All intervention sites are Head Start programs, and the comparison sites are either Head Start/Great Start Readiness Program groups. There was no turnover of teachers between the two administra
tions of the COR-A in either the Living Arts Detroit Wolf Trap™ or comparison classrooms, providing assurances of consistency in assessments. Reliability of the COR-A (Highscope, 2015) was computed on the study sample. Cronbach Alpha (α), a measure of internal consistency reliability, was computed for the 34 item COR-A, with N = 1134, comprising of the Living Arts Detroit Wolf Trap™ and comparison students. The COR-A pretest (Time 1 Assessment) Total Score α was 0.953, and the posttest COR-A Total Score α was 0.970. The subscale α estimates, corrected to full-scale length of N = 34 items with the Spearman-Brown prophecy formula, are presented in Table 2. Based on commonly used rules of thumb, all reliability estimates are considered to be extremely high. These reliability results counter the concern for potential variation that might arise due to non-uniform learning outcomes and expertise on the part of the teachers from their training on the use of the COR-A.

In classical measurement theory, internal consistency is a necessary but insufficient condition for validity (Sawilowsky, 2003a, 2003b). No independent validity study was undertaken in the current study. Previously, however, Highscope (2015) conducted validity studies in two phases: (1) the 2013 initial or pilot study, and (2) the 2015 multi-state validation study. Prior to the first phase, a panel of 26 experts was convened to examine the initial draft of the instrument, and revisions were made based on their recommendations. This draft was piloted in the initial phase with 71 teachers representing 34 classrooms. Rasch item difficulties were used to align item content with literature links that provided the theoretical constructs of the subscales (or dimensions). External validity was determined based on comparisons with the Woodcock-Johnson III Tests of Achievement (Mather & Woodcock, 2001), Bayley Scales of Infant and Toddler Development (Bayley, 2005), and the Social Skills Improvement Systems (Graham & Elliott, 2008). In the second phase, data were collected on about 15,000 children representing about
4000 classrooms of which approximately 70% were Head Start. Multi-dimensional Rasch (and Rasch partial credit) models were obtained on the eight subscales, using standard parsimony indices (e.g., Akaike Information Criterion, Bayesian Information Criterion, and Consistent Akaike Information Criterion), all of which were supportive of the eight subscales. Of particular note, these indices were replicated for Spanish and Spanish bi-lingual children.

4. Results

Initially, data were available for \( n_1 = 837 \) students in the Living Arts Detroit WolfTrap\textsuperscript{TM} program, and \( n_2 = 1315 \) in the comparison group. Because 71% of the students in the comparison group were non-White versus 99.7% in the Living Arts group, the first step in the sampling plan was to randomly sample to obtain a similar proportion of non-White students in the comparison groups to make both groups more homogeneous on ethnicity.

Students with an age code of 0–12 months, 13–18 months, and not specified, were then eliminated, leaving only students aged 3, 4, or in Kindergarten. Students who were coded as IEP/IFSP (e.g., special needs indicators) were also deleted from the analysis. Hence, for the purposes of all analyses below, there were \( n_1 = 719 \) students in the Living Arts Detroit Wolf Trap\textsuperscript{TM} group, and \( n_2 = 733 \) students in the comparison group. Note, however, that due to missing values either on the COR-A pretest (i.e., Time 1 administration) or COR-A posttest (i.e., Time 2 administration), the sample sizes changed depending on the specific analysis conducted. The demographic breakdown for the Living Arts Detroit Wolf Trap\textsuperscript{TM} and comparison groups are compiled in Table 3.

Fisher’s exact test based on gender was not statistically significant \((p = 0.319)\). Due to matching on ethnicity, there was no statistical difference in proportion of non-White students \((p = 0.6644)\). The Chi-squared test on age code was statistically significant, \( \chi^2 (2, N = 1462) = 36.72, p < 0.001 \), due to a greater number of older (i.e., kindergarten) students in the comparison group. In addition, the comparison group had a statistically significantly smaller proportion of students who were bilingual (English & Spanish) or whose primary language was Spanish. Further refinement to matching scheme to pair Living Arts Detroit Wolf Trap\textsuperscript{TM} students with comparison group students could have been conducted by reducing considerably the sample size (and hence statistical power). However, it was considered inadvisable because (a) it would destroy the randomized sampling from the comparison group on matching characteristics of the Living Arts Detroit Wolf Trap\textsuperscript{TM} students, lowering the design to a quasi-experiment, and (b) in any case the statistical significance in age (older) and bilingual (fewer) favored the comparison group. Thus, any superior outcomes that would accrue to the Living Arts Detroit Wolf Trap\textsuperscript{TM} students would have occurred despite the matching scheme that favored the comparison group on age and language.

The analysis of the COR-A data is based on a series of ANCOVAs on the posttest score (“Time 2” administration), with the pretest score (“Time 1” administration) serving as the covariate. Repeated Measures ANOVA is used when the statistical hypothesis pertains to gain or change in both the intervention and comparison groups. In contradistinction, ANCOVA is used when the hypothesis pertains to a posttest difference between the two groups after adjusting for variation at the pretest, (applicable when there is at least some form of randomization; see e.g., Sawilowsky, 2007), which is the hypothesis of interest in the current study.

Table 4 contains the results for the COR-A Total Score as well as broken down by each COR-A subscale (also known as COR-A dimension). Note the Living Arts Detroit Wolf Trap\textsuperscript{TM} students scored statistically significantly higher than the comparison students for all COR-A subscales, as well as the COR-A Total score. The average effect size (partial eta squared, \( \eta_p^2 \)) was 0.038. Although there is no absolute standard for interpreting this measure of effect size, the de facto interpretation is 0.01 is small and 0.08 is medium. Therefore, the average effect size of the Living Arts Detroit Wolf Trap\textsuperscript{TM} intervention, which was consistent for all subscales, is about midway between medium and small. Graphs of the COR-A Subscale scores for the Living Arts Detroit Wolf Trap\textsuperscript{TM} and Comparison group, as well as the Total COR-A score, are presented in Figs. 1 and 2.

Another approach is to analyze the subscales via a single MANCOVA. This method has the advantage of generally being statistically more powerful, and is particularly useful if theoretically the COR-A subscales are considered to be intricately intertwined (i.e., “multi-variate”). The disadvantage is the commonly conducted univariate step-down tests are no longer theoretically valid, and hence, a statistically significant MANCOVA should only be analyzed with all subscales taken together. However, as an aid to understanding the subscale comparisons between Living Arts Detroit Wolf Trap\textsuperscript{TM} and comparison students, estimated marginal means are also presented.

Box’s M, an underlying test of the assumption of equality of covariance matrices, was statistically significant \((M = 287.12, F = 7.912 (36, 3539408.6), p = 0.000)\). Although some caution is warranted in interpreting the MANCOVA, this violation commonly occurs with large sample sizes, and is somewhat mitigated because Levine’s test of equality of error variances was not statistically significant \((p > 0.05)\) for half of the constituent dependent variables (i.e., COR-A subscales AL, PDH, CA, and SS subscales).

Pillai’s Trace \((F = 11.989 (8, 1020) = 0.086)\) is statistically significant \((p < 0.001)\), indicating again the superior performance of the Living Arts Detroit Wolf Trap\textsuperscript{TM} students. The partial eta squared, \( \eta_p^2 = 0.086 \), is a moderate effect size and is consistent with the univariate ANCOVAs described above. The pairwise comparisons of estimated marginal means for the COR-A subscales are compiled in Table 5.

Ancillary to the primary purpose of this study, feedback surveys were administered to participating teachers and parents of students in the intervention classrooms. Survey responses indicate subsequent to the workshops, 96% of the teachers involved in the intervention continued using the teaching methods on a regular basis. This suggests there is a systemic transformation of their teaching methods. As noted in Table 6, teacher feedback provided some qualitative and anecdotal evidence that echoed the advantage that the arts integration has to help students who are shy and for those who need to regulate behavior.

Parents who participated in workshops were also administered a survey. As noted in Table 7, 94% of parents reported that they would continue to use the strategies at home. This will provide reinforcement during the school year, and also during those months when schools are not in session.

In the initial study randomized matching was carried out at the student level. Subsequently, a replication study was conducted where randomized matching was based on classroom means. On
Table 4
COR-A Estimated Marginal Means (Adjusted Post Score) and Related Statistics For Living Arts Detroit (LADWT) Wolf Trap™ and Comparison Students.

<table>
<thead>
<tr>
<th>COR-A Subscale</th>
<th>AL</th>
<th>SED</th>
<th>PDH</th>
<th>LLC</th>
<th>M</th>
<th>CA</th>
<th>ST</th>
<th>SS</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>LADWT</td>
<td>13.76</td>
<td>23.12</td>
<td>15.65</td>
<td>30.73</td>
<td>22.61</td>
<td>18.92</td>
<td>18.49</td>
<td>13.97</td>
<td>158.91</td>
</tr>
</tbody>
</table>


![COR-A Subscale Estimated Marginal Means](image1)

**Fig. 1.** Living Arts Detroit Wolf Trap™ vs. Comparison Student COR Subscale Means.

![COR-A Post Test Total Score Adjusted Marginal Means](image2)

**Fig. 2.** Living Arts Detroit Wolf Trap™ vs. Comparison Student COR-A Total Score Means.

the basis of a new set of \( n_1 = 424 \) students in the Wolf Trap group, and \( n_2 = 406 \) students in the comparison group, Cronbach alpha for the COR-A was 0.954 and nearly identical with the initial study. There were no statistically significant differences between the two groups based on gender. As occurred in the initial study, there were statistically significant factors favoring the comparison group, such as all programs were full-day (whereas some intervention programs were half-day), more students’ primary language was English, and there were fewer Hispanic/Latino students. The results of the replication study followed the general trend of the initial study. Students who received the Wolf Trap intervention scored statistically significantly higher than comparison students who did not receive the intervention, although the average subscale effect size was slightly lower in the replication study.
Table 5
Pairwise Comparisons of Estimated Marginal Means for Living Arts Detroit Wolf Trap™ vs. Comparison Groups.

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>(I) Grp</th>
<th>(J) Grp</th>
<th>Mean Difference [I−J]</th>
<th>SE</th>
<th>p</th>
<th>95% Confidence Interval for Difference</th>
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<tr>
<td></td>
<td>postAL</td>
<td>postAL</td>
<td>−0.89</td>
<td>0.13</td>
<td>0.000</td>
<td>−1.14 − 0.64</td>
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<td></td>
<td>Living Arts</td>
<td>Living Arts</td>
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<tr>
<td></td>
<td>postSED</td>
<td>postSED</td>
<td>−1.78</td>
<td>0.21</td>
<td>0.000</td>
<td>−2.20 − 1.37</td>
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<td>0.14</td>
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<td>−1.38</td>
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<td>postST</td>
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<td>−1.83 − 1.13</td>
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<td>−0.75</td>
<td>0.136</td>
<td>0.000</td>
<td>−1.02 − 0.49</td>
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</table>

Notes: AL = Approaches to Learning, SED = Social and Emotional Development, PDH = Physical Development and Health, LLC = Language, Literacy, and Communication, M = Mathematics, CA = Creative Arts, ST = Science and Technology, and SS = Social Studies. SE = Standard Error, and the value is identical for both Comparison and LADWT groups. All p values are statistically significant after Bonferroni adjustment for multiple comparisons.

Table 6
Living Arts Detroit Wolf Trap Teacher Survey Responses.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Always</th>
<th>Mostly</th>
<th>Sometimes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Was the content developmentally appropriate?</td>
<td>90%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Was the delivery of content developmentally appropriate?</td>
<td>90%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>How often did your student COR notes come from these sessions?</td>
<td>87%</td>
<td>13%</td>
<td></td>
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</tbody>
</table>

Table 7
Living Arts Detroit Wolf Trap Parent Survey Responses.

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Very Much</th>
<th>Somewhat</th>
<th>Not at all</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did this workshop demonstrate a clear connection between the arts and its support of learning?</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did this workshop give you information to support your child’s learning outside a school setting?</td>
<td>94%</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>Did the leader engage adults and children?</td>
<td>99%</td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>Will you use this again with your child?</td>
<td>94%</td>
<td>6%</td>
<td></td>
</tr>
</tbody>
</table>

Notes: N = 62 (Some did not answer all questions and/or indicated more than one answer). Anecdotal examples of emergent literacy growth:

“This child expanded his language by using the words ‘back’ and ‘jump’ that he learned in this activity.”

“One child expanded his language using colors that he wasn’t too sure of before.”

“This introduces the children to the alphabet as well as different animals.”

“One of our students is speech-delayed. We saw his vocabulary and speech getting better.”

Examples of emotional growth:

“One very shy child never wanted to participate or go in front of the others. After the intervention, he volunteered a couple of times to act out a story in front of the class.”

“One child, more reserved, started becoming more interactive by the middle of the program.”

“One of our students is better able to control impulses.”

“One girl, who cannot sit still, sat through an entire lesson and participated with the group.”

5. Conclusion

The results of this study demonstrate uniformity of success of the Living Arts Detroit Wolf Trap™ intervention for all COR sub-scales and COR total score. Based on the univariate and multivariate approaches, the magnitude of the effectiveness of the intervention, by conventional standards, is about a medium effect size. Hence, the intervention of the Living Arts Detroit Wolf Trap™ resident artists successfully increased students’ Approaches to Learning; Social and Emotional Development; Physical Development and Health; Language, Literacy, and Communication; Mathematics; Creative Arts; Science and Technology; and Social Studies scores on the COR as compared with 3–5 year old students who do not have this program in their schools.

In terms of getting students “Ready to learn,” as in previous studies where arts integration was shown to provide important...
opportunities for children of varied developmental levels to grow in pre-academic skills (Gregoire & Lupinetti, 2005), similar findings were obtained. The Language, Literacy, and Communication subscale of the COR-A had an effect size of 0.042 η², demonstrating increased observed speaking, listening and comprehension, phonological awareness, alphabetic knowledge, reading, book enjoyment and knowledge, and writing. These are all key elements of emergent literacy and are the cornerstones of our language-reliant educational system. Hence, students in arts-integrated education programs visibly increase letter recognition, phonological awareness, and vocabulary acquisition.

A similar effect size, 0.043 η², was obtained favoring intervention students on the COR-A Social and Emotional Development subscale. The elements of that subscale include building relationships with adults, building relationships with other children, community, and conflict resolution. All of these are cornerstones of emotion regulation, a key indicator of future school success, especially for those living in poverty.

The methodology in this study is scalable, and the results indicate a positive impact on Pre-K children’s preparation for academic success. This study is a more rigorous echo of previous studies in language development and emergent literacy (Phillips et al., 2010; Sousa, 2006; Tierney & Kraus, 2013) and social-emotional development (Brown et al., 2010; Brown & Sax, 2013; Lobo & Winsler, 2006), and an expansion to other key areas of early childhood development such as mathematics, science, social studies, and physical development.

Due to school program constraints, the sampling plan in this study was a compromise between a random sample of treatment/comparison students versus a quasi-experimental design. The participants in the intervention group, the Living Arts Detroit Wolf Trap™ program, were fixed due to the nature of providing community service to intact classrooms. However, a large reservoir of potential comparison students was obtained. After reduction of non-matching characteristics (e.g., European American non-Hispanics), the comparison group was constructed via random sampling from that reservoir, strengthening the rigor of the study.

Specifically, the Living Arts Detroit Wolf Trap™ and comparison students were not statistically significantly different based on gender or ethnicity. Other demographic proportions were of roughly equal proportion, although numerically favored the comparison group in terms of fewer Bilingual or Spanish as primary language students, and had older students (i.e., kindergarten age), as well as no known half-day programs. In contrast, the Living Arts Detroit Wolf Trap™ group contained numerically fewer English as primary language students, fewer Kindergarten age students, and some students were in half-day programs. Thus, where differences in the sampling plan existed they favored the comparison group (e.g., there were more students in the oldest of the three age codes), or there is no literature known to us that differentiates on that demographic (e.g., gender) regarding the use of the COR-A. In a replication study, however, it would be of interest to construct both groups via random sampling.

The COR-A assessment tool was highly reliable in terms of Total Score and COR-A subscale scores (i.e., COR-A dimensions). The values for Cronbach’s α (and Spearman–Brown correction for attenuation of subscale size as compared with the total length of the test in terms of number of items), were generally in the mid to upper 0.90 s, which is expected for a commercial grade instrument. These results also mitigate the potential concern for variation among the classroom teachers who administer the COR-A, although a subsequent study by HighScope or an independent researcher on the inter-rater reliability between classroom teachers and a single (or small group) of specially trained personnel to administer the COR-A might be of interest.

In light of the fact that there has been years of research proving the positive impact of arts integration for early childhood, especially through the Wolf Trap Early Learning Through the Arts program, a recommendation to add training for in-service and pre-service early childhood educators, especially those in Head Start programs, seems consistent with the findings. Providers do not need to be artists to use the methodology effectively, thus making training easily accessible to all early childhood educators. This training would help teachers positively impact their students while continuing to provide the high quality education that Head Start consistently delivers. In addition, a variety of home childcare and small organization childcare centers could also benefit from training in the methodology, thereby expanding the benefit beyond Head Start programs.

Further research into the impact of arts integration could include measuring the impact based on the effectiveness of delivery of the intervention by the trained providers and the influences that cause high or low quality delivery. Finally, it would be of interest to engage in a longitudinal study of urban students who have 3–10 years of exposure to arts integrated education, beginning at the Pre-K level, and the impact it has on dropout rates and college matriculation.

Funding disclosure

Support and funding for this study was provided by United Way for Southeastern Michigan and FYI1 appropriations from the Social Innovation Fund of the Corporation for National and Community Service, Community Foundation for Southeast Michigan, Ford Motor Company Fund, Metro West Credit Union, Detroit Pistons Game Changers presented by Belle Tire, and PNC Foundation.

References


