

early childhood STEM LEARNING through the arts WORKS



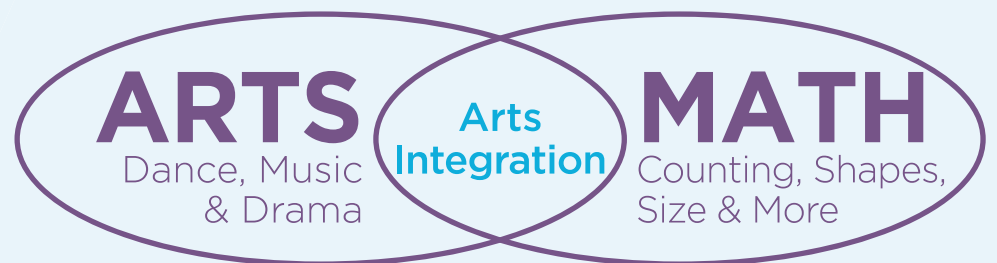
Wolf Trap students have
HIGHER
math achievement¹

EARLY MATH SKILLS
are the strongest predictor
of later academic achievement⁴

IT WORKS!

Wolf Trap's model increases an average student's math rank by **7-8 PERCENTILES**²

WHY
CHILDREN LEARN BEST BY
DOING - the arts and STEM
are natural partners



RHYTHMS/PATTERNS=PRE-ALGEBRA



HOW

Each teacher receives up to **101 HOURS** of PROFESSIONAL DEVELOPMENT

Teacher
+ Wolf Trap Teaching Artist
+ Wolf Trap Professional Development

BETTER MATH KNOWLEDGE

Wolf Trap teachers scored **62% HIGHER** on overall arts integration measures, and 150% higher in linking arts with math³

The Wolf Trap APPROACH



of classroom residencies with
WOLF TRAP
teaching artists



Teacher training, teacher and teaching artist
COLLABORATION



INSTRUCTIONAL content aligned
TO NATIONAL AND STATE STANDARDS



28
STATES
INCLUDING 17
AFFILIATE SITES



WOLF TRAP
FOUNDATION FOR THE PERFORMING ARTS

SOURCES
1. Interpretations derived from results of a four-year study of Wolf Trap's Early Childhood STEM Learning Through the Arts. Ludwig, M. and Song, M., (2014). "Final Report: Findings from the Evaluation of the Wolf Trap Arts in Education Model Development and Dissemination Grant," American Institutes for Research.
2. Ibid. Based on effect sizes of .17 in first year, and .21 in second year of Wolf Trap program. See pg. 16.
3. Ibid. See pg. 16, Exhibit 9.
4. Duncan, G. J., Dowsett, C.J., Classens, A., Magnuson, K., Huston, A.C., Klebanov, P., et al. (2007). School readiness and later achievement. *Developmental Psychology*, 43, 1428-1446.



KEY RESEARCH FINDINGS ON THE EFFICACY OF WOLF TRAP'S EARLY CHILDHOOD STEM LEARNING THROUGH THE ARTS

Overview Since 1981, Wolf Trap Foundation for the Performing Arts has been a leader in early childhood learning through the arts, offering educators the tools to implement outcomes-based, arts-integrated lessons in their classrooms for the purpose of enhancing student achievement. In 2010, Wolf Trap received a major grant from the U.S. Department of Education to implement and study a professional development (PD) model that enables teachers to infuse performing arts strategies in kindergarten and pre-k classrooms in an effort to improve math outcomes. The program, Early Childhood STEM Learning Through the Arts (Early STEM/Arts), provides arts-integrated content, which includes 16-session classroom residencies, multi-day focused art/math trainings, peer-sharing of instructional strategies and one-to-one mentoring and coaching with a Wolf Trap teaching artist.

Independent Research To implement the study, Wolf Trap partnered with Fairfax County (Virginia) Public Schools to execute a randomized, controlled study of Early STEM/Arts. Conducted by American Institutes for Research (AIR), an independent, third-party research firm, the study took place over four years (2010 – 2014).

Key Research Findings

1. *Wolf Trap's Early STEM/Arts program had a statistically significant, positive impact on students' math achievement.* Wolf Trap students outperformed peers in the control schools on the Early Math Diagnostic Assessment (EMDA).
2. *Lessons taught by Wolf Trap teachers offered more opportunities for arts integration,* and demonstrated higher levels of arts integration, particularly with respect to linking arts with math learning.
3. *Wolf Trap's Early STEM/Arts program demonstrates all features of effective, high quality PD.* In measuring Wolf Trap's model against standards of effective PD, research confirms that Wolf Trap provides high quality PD by thoroughly integrating: form, duration, collective participation, content, active learning, and coherence.

Elements of Early STEM/Arts that may have contributed to positive results:

- **Reaching children early and improved classroom interaction.** For many students, this was their first introduction to school and the first opportunity to learn English. Teachers said the use of music, movement, and dramatizing concepts was beneficial for all students, but in particular students who were shy, who had never been to school, or who were speaking another language. Additionally, the increased attention given to student participation, ongoing teacher feedback, and improved classroom structure may have contributed to student learning.
- **Giving a boost to teachers' math instruction.** The use of performing arts strategies linked to mathematics concepts may have provided an instructional boost, making abstract math concepts seem more real and accessible through the new strategies applied by the teacher and the teaching artist.
- **Teacher enthusiasm for the arts in the classroom.** It may be that the teachers in the treatment schools were highly receptive to the PD and eager to implement new strategies that could result in improved math performance.