

What Does Research Say About Montessori Theory and Practice ?

SATURDAY, MARCH 11 8:00 AM - 9:15 AM

Presenters



Angela Murray, PhD

- University of Kansas
- AMS Senior Researcher

Katie Brown, PhD

- National Center for Montessori in the Public Sector
- Research Associate

NATIONAL CENTER for
MONTESSORI in the PUBLIC SECTOR



Brooke Culclasure, PhD

- Furman University
- Center for Education Policy and Leadership's Research Director

Agenda

Evaluating overall Montessori outcomes

Examining specific Montessori practices

New research initiatives

Evaluating overall Montessori outcomes

Growing body of evidence on Montessori effectiveness

Studies show children in Montessori environments have as good as if not better outcomes in academic and non-academic domains.

Summary Policy Brief is available:

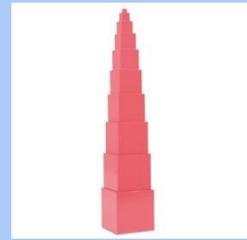
- “Expanding Access to Montessori Education: An Opportunity for Disadvantaged Students” available at www.amshq.org/research



CUNY Institute for Education Policy

AT ROOSEVELT HOUSE

Removing supplementary materials improved growth



Experiment: Non-Montessori materials removed from two of three classrooms

Pretests given as baseline, retest after four months

Children in “supplementary removed” classrooms

- Grew significantly more in early reading and EF
- Grew directionally more in early math
- No differences in growth in vocabulary, social knowledge, or social problem-solving skills tests

Lillard, A. S. and Heise, M. J. (2016). “Removing Supplementary Materials from Montessori Classrooms Changed Child Outcomes.” *Journal of Montessori Research 2016, Volume 2, Issue 1.*

African American students scored higher in reading

African American 3rd graders
Public Montessori and other
magnet schools

Montessori students scored
higher in reading, but no
difference in math on end of
year state tests scores



Large, urban
district in North
Carolina

Brown, K., & Lewis, C. (2017). A Comparison of Reading and Math Achievement for African American Third Grade Students in Montessori and Other Magnet Schools. In Press, *Journal of Negro Education*, 86(4)

Latino children saw most benefit



14,000 Title-1 pre-K Montessori & High/Scope in Miami

Beginning and end of 4-year-old pre-K year

- Socio-emotional and behavioral skills
- Pre-academic skills (cognitive, motor, and language)

Latino Montessori children

- began at most risk but had greatest gains
- ended above national averages

Black Montessori children had healthy gains but slightly greater in conventional

Ansari, Arya; Winsler, Adam (2014). "Montessori public school pre-K programs and the school readiness of low-income Black and Latino children." *Journal of Educational Psychology*, 106(4), Nov 2014, 1066-1079.

Culturally congruent success with Navajo children



Arizona public charter serving Navajo children in impoverished rural area

Montessori-based curriculum congruent with Navajo cultural values

Strong growth in math, language, and social development over 3 years for Pre and K students

Entered more than a year behind in math and language, but by end virtually all at or above grade level in math

Sorensen, M. & Price, D. (2016). Accelerating the Mathematical Development of Young Navajo Children. Chapter in Rural Education Research in the United States, Eds. Nugent, G. C., Kunz, G. M., Sheridan, S.M., Glover, T. A., & Knoche, L. L., Springer, pp. 145-165.

Enhanced place value knowledge



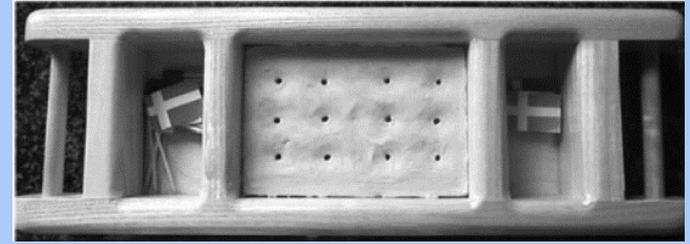
Experiment examined whether concrete models support place value learning.

“Montessori students, for whom concrete models play a major role in mathematics instruction, also demonstrated better understanding of base-10 structure than did their matched peers enrolled in mainstream elementary schools.”

(Inconsistent with results from a study published in the *Journal of Montessori Research* that found a benefit only in Kindergarten-age children)

Smith, L. B., Stockton, J. D., Cheng, Y. & Barterian, J. A., (2016). Grounding the Symbols for Place Value: Evidence From Training and Long-Term Exposure to Base-10 Models. *Journal of Cognition and Development*.

Superior fine motor development



Five year olds in 4 Montessori schools and one high-performing suburban school

Practical life impact on fine motor development

Montessori moderate to large effects on fine motor development

- accuracy, speed, consistent use of dominant hand

Punum Bhatia, Alan Davis & Ellen Shamas-Brandt. (2015). Educational Gymnastics: The Effectiveness of Montessori Practical Life Activities in Developing Fine Motor Skills in Kindergartners. *Early Education and Development*.

Montessori preschoolers more active

301 children in 9 Montessori and 8 traditional preschools in SC using accelerometers

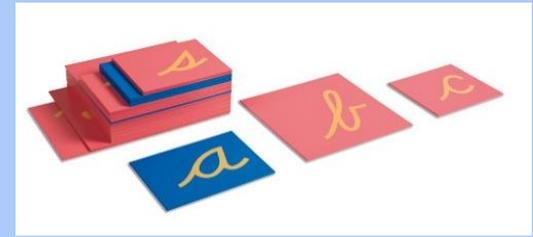
- Adjusted for sex, race/ethnicity, body mass index, parent education and neighborhood poverty index
- In-School light, MVPA and total PA higher
- Non-School and All Day MVPA higher



Russell R. Pate PhD, Jennifer R. O'Neill PhD, Wonwoo Byun PhD, Kerry L. McIver PhD, Marsha Dowda, DrPh, and William H. Brown PhD. (2014). "Physical Activity in Preschool Children: Comparison Between Montessori and Traditional Preschools." *Journal of School Health*, 84(11). pages 716–721.

Specific Montessori practices

Embodied pedagogy (tracing)



Finger tracing elements showed benefit

Experiment with over 100 students

- Triangle geometry (adolescents)
- Order of operations (4th graders)

Tracing students

- correctly solved more practice problems
- made fewer errors on follow-up test

Ginns, P Fang-Tzu Hu, Erin Byrne and Janette Bobis. (2015). "Learning By Tracing Worked Examples." Applied Cognitive Psychology, Appl. Cognit. Psychol. (2015) DOI: 10.1002/acp.3171

Prioritizing development of attention

Materials enhance attention in children with ADHD

15 non-Montessori preschoolers with ADD and ADHD

Pre-post test design experiment with a control group

Used tactile boards, sound boxes, binomial cubes and color tablets



Significant improvement on FTFK Attention test

S, Sunay YILDIRIM DOGRU (2015) "Efficacy of Montessori education in attention gathering skill of children" *Journal: Educational research and reviews*, 10(6)



Mixed age groups

School readiness of nationally representative sample of 3's & 4's

4-year-olds fewer gains in academic skills when more 3-year-olds (4 to 5 months worth of development)

Age composition unrelated to 3-year-olds' school readiness

Author acknowledges not applicable to Montessori

Ansari, A., Purtell, K. & Gershoff, E. (2016). Classroom Age Composition and the School Readiness of 3- and 4-Year-Olds in the Head Start Program. *Psychological Science* 2016, Vol. 27(1) 53 –63.

Handwriting



Brain activation different with *handwriting* vs *typing or tracing* letters using MRI (preliterate, five-year olds)

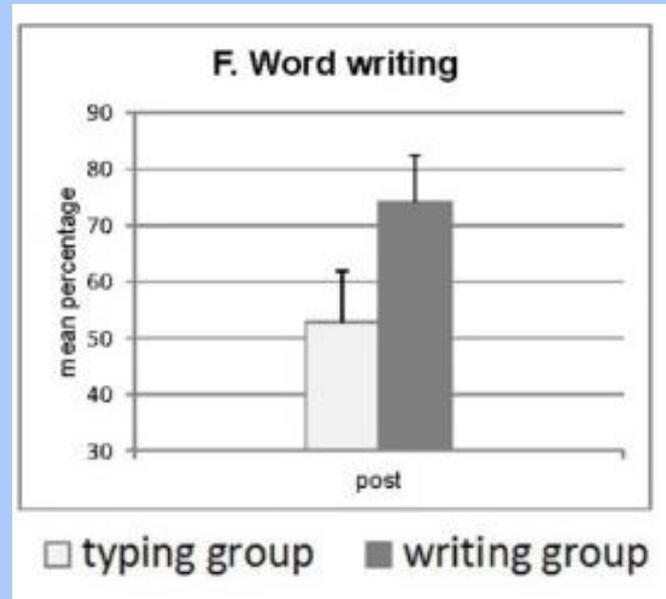
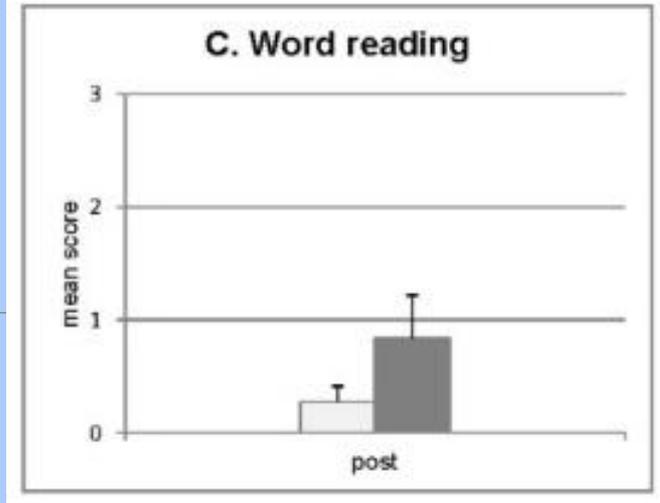
“Reading circuit” recruited during letter perception only after handwriting—not after typing or tracing experience

James, K. H., & Engelhardt, L. (2012). The effects of handwriting experience on functional brain development in pre-literate children. *Trends in Neuroscience Education*, Dec; 1(1): 32–42

More Handwriting

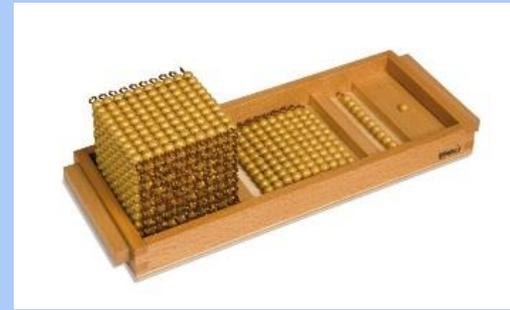
Handwriting superior to typing training in word writing, and, directionally, in word reading

Suggests “action-perception coupling” facilitates “sensory-motor representations established during handwriting on reading and writing.”



Kiefer, M., Schuler, S., Mayer, C., Trumpp, N. M., Hille, K. & Sachse, S. (2015). Handwriting or typewriting? The influence of pen- or keyboard-based writing training on reading and writing performance in preschool children. *Advances in Cognitive Psychology* Dec 31;11(4):136-46

Math “manipulatives”



Principles for effective use of mathematics manipulatives from cognitive science

1. Use of manipulative consistently, over a long period of time
2. Begin with highly transparent concrete representations and move to more abstract representations over time
3. Avoid manipulatives that resemble everyday objects or have distracting, irrelevant features
4. Explicitly explain the relation between the manipulatives and the math concept

Laski, E., Jor'Dan, J., Daoust, C. & Murray, A. (2015). What Makes Mathematics Manipulatives Effective? Lessons From Cognitive Science and Montessori Education. Sage Open, Volume: 5 issue: 2,

Philosophy of children's autonomy



“...incapacities for autonomy are best understood as consequences of an absence of external conditions necessary for children to exercise capacities they already have internally, rather than intrinsic limitations based on their stage of life.”

Montessori theory implications for “who has responsibility for establishing the conditions under which children can flourish.”

Frierson, P. R. (2016). “Making Room for Children’s Autonomy: Maria Montessori’s Case for Seeing Children’s Incapacity for Autonomy as an External Failing.” *Journal of Philosophy of Education*, Vol. 50, No. 3.

Studies Underway

Development of Executive Function Within a Montessori Early Childhood Environment

Development of executive function in four EC children

Single-subject multiple baseline design

Executive function measured using:

- Minnesota Executive Function Scale (MEFS) iPad application
- Classic Head Toes Knees Shoulders task

AMS Mini Grant Funded

Teacher Report Fidelity Instrument Development

Instrument that can be efficiently used for future research

Based on thorough review of the literature

Initially will be tested with Montessori Teacher Research Panel

Plan to integrate into Montessori Compass Collaborative Research Project

Other Research Efforts

Applying for
inclusion in
DOAJ and
ERIC



Journal of Montessori Research

Table of Contents: Spring 2017 - Issue 4

- Students of Color and Public Montessori Schools: A Review of the Literature
- The Effects of Choice on Reading Comprehension in 2nd-3rd Grade
- Technology in the Montessori Classroom: Teachers' Beliefs and Technology Use

Access this journal online:
www.amshq.org/researchjournal

A Publication of the American Montessori Society

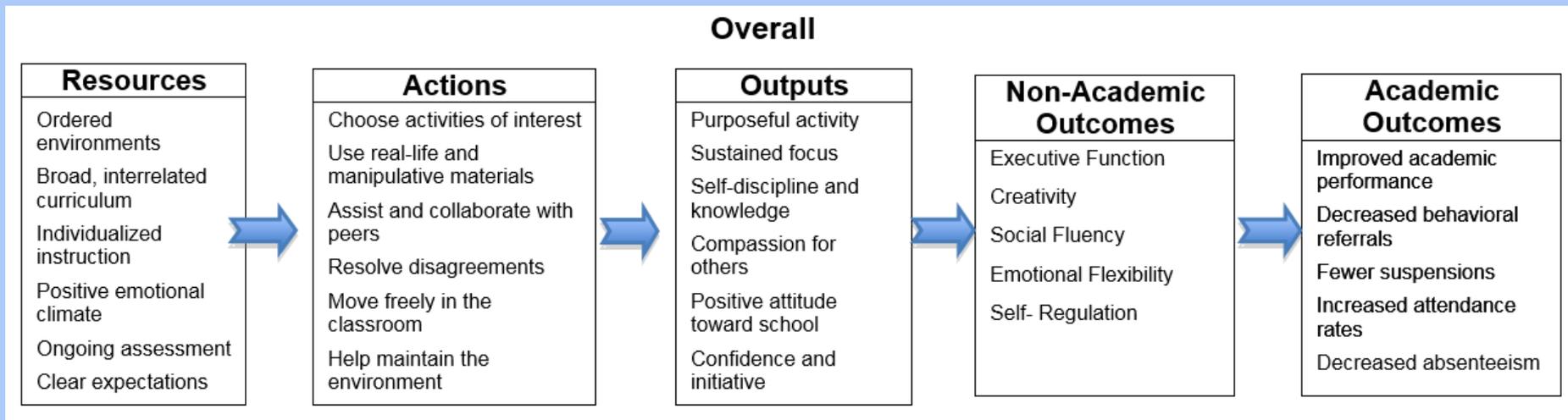
Montessori Research Retreat (outside funder)



Logic Model

A **logic model** is a tool used by funders, managers, and evaluators of programs to evaluate the effectiveness of a program.

(excerpt draft)



Resources for emerging researchers

Free AMS Membership for 20 per year

Research Mini Grants

Outstanding Thesis and Dissertation Awards

Website Resources for Grad Students

Discounted Conference Registration

Conference Sessions and Networking Opportunities

Poster Session at International Montessori Congress



The Research Poster Session is being planned and organised in cooperation with the American Montessori Society (AMS).



33 Proposal Submissions

24 Posters Accepted

American Educational Research Association



Journal Talk

Special Interest Group

Proposed Education Research Conference, *“Building a National Research Agenda for Montessori Education: Identifying Critical Gaps in the Evidence Base and Embarking on a Plan of Action”*

Did you know about...



Montessori Research Facebook Interest Group



Online Research Library

www.amshq.org/research



Funding

- Research Mini Grants
- Outstanding Thesis and Dissertation Awards

Creative Potential in Montessori Students

KATIE BROWN, PHD

NATIONAL CENTER FOR MONTESSORI IN THE PUBLIC
SECTOR

What is creativity?

Creative potential: “a latent ability to produce original, creative, adaptive work” (Besancon, Lubart, & Barbot, 2013)

Divergent thinking—generation

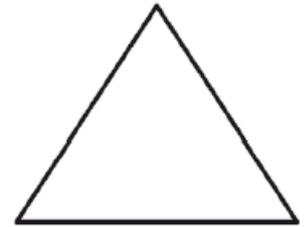
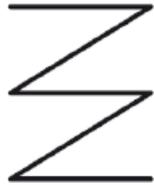
Convergent thinking—synthesis

Not well predicted by IQ

How is it measured?

Evaluation of Creative Potential (EPoC)

- Artistic-Graphic
- Mathematics



0036

7 3/6



Mathematics:Divergent



Before you begin the real task, play at dragging white shapes on the grid.

*They must not overlap.
Each new one should touch an old one by a side.
Make assemblies of five shapes.
The left arrow lets you go back.
When green, the right arrow lets you record an assembly.*

Click below to go on.



How do Montessori students perform on measures of creativity compared to their non-Montessori peers?

Montessori group

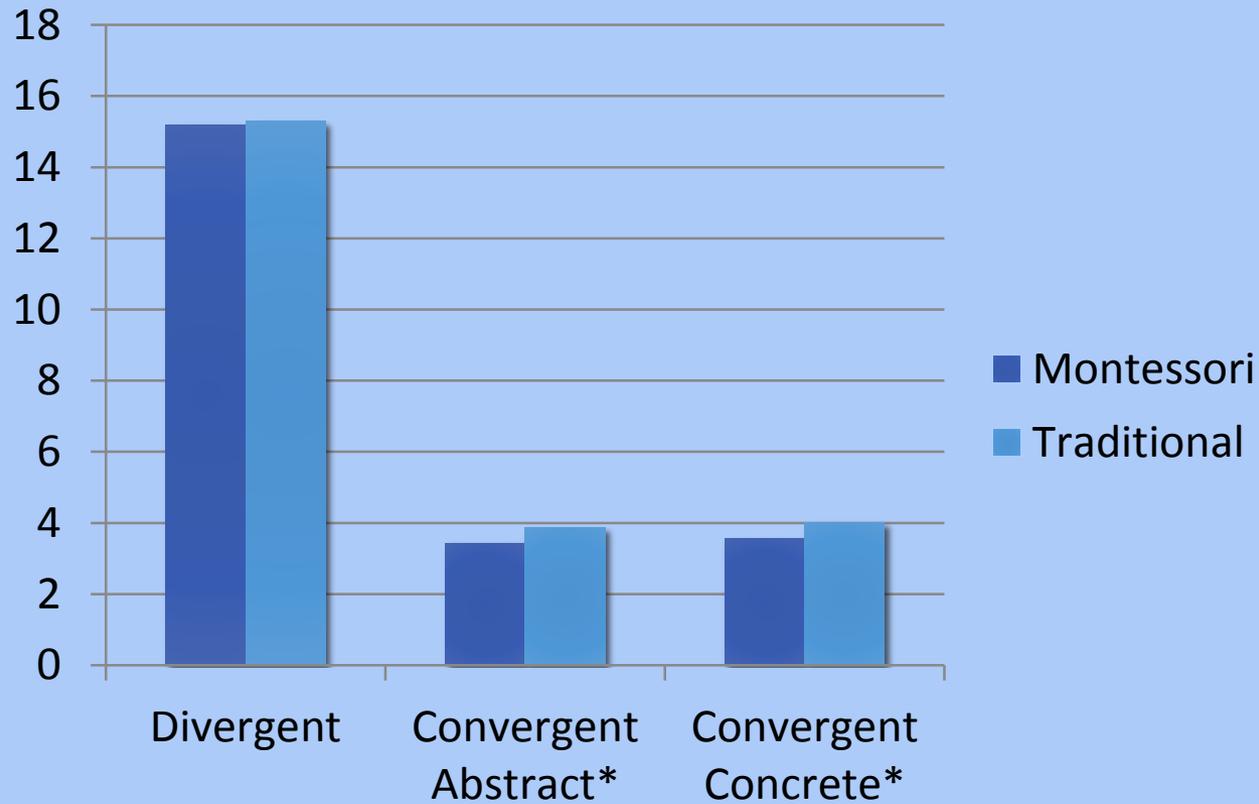
- 91 grade 8 students, large, urban Midwestern district
- 79 grade 3 students, small, rural Southern district

Traditional group

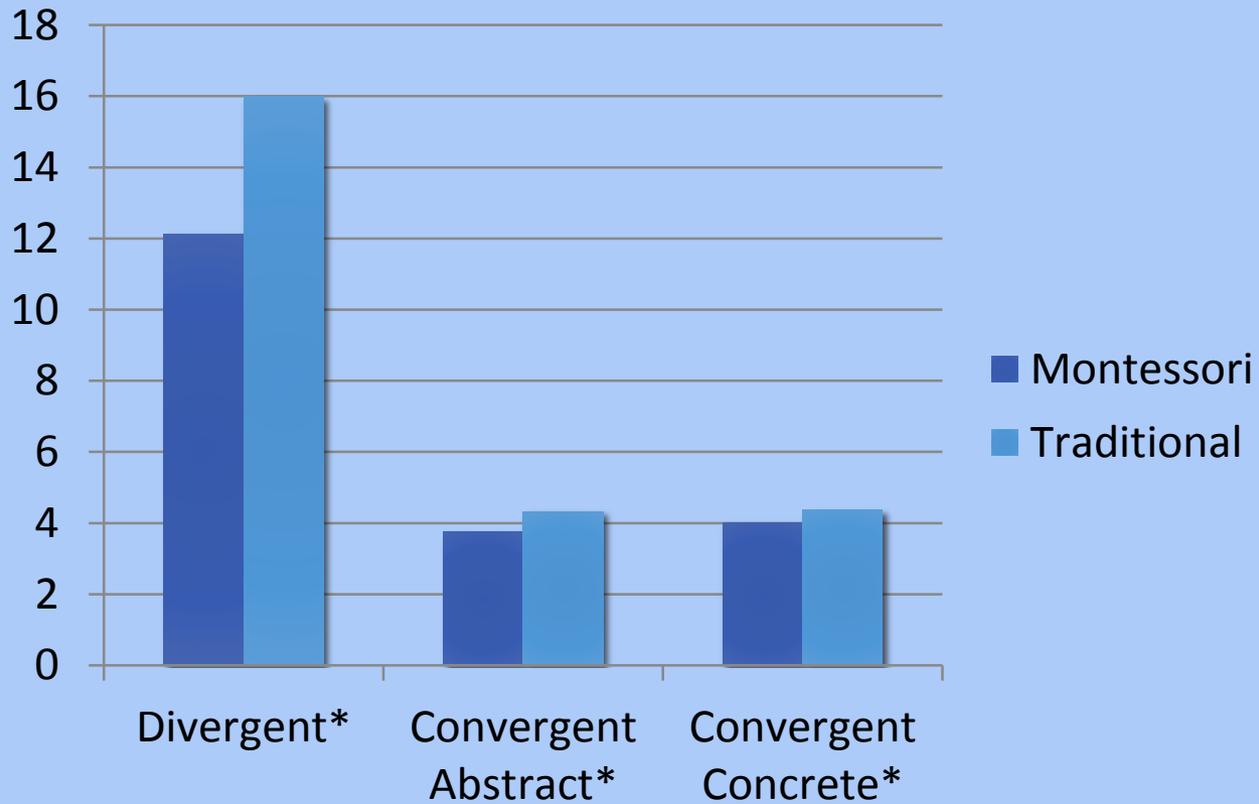
- Small, suburban district in the West
- 297 grade 8 students
- 198 grade 3 students

Spring semester 2016

EPoC Graphic Scores: Grade 3

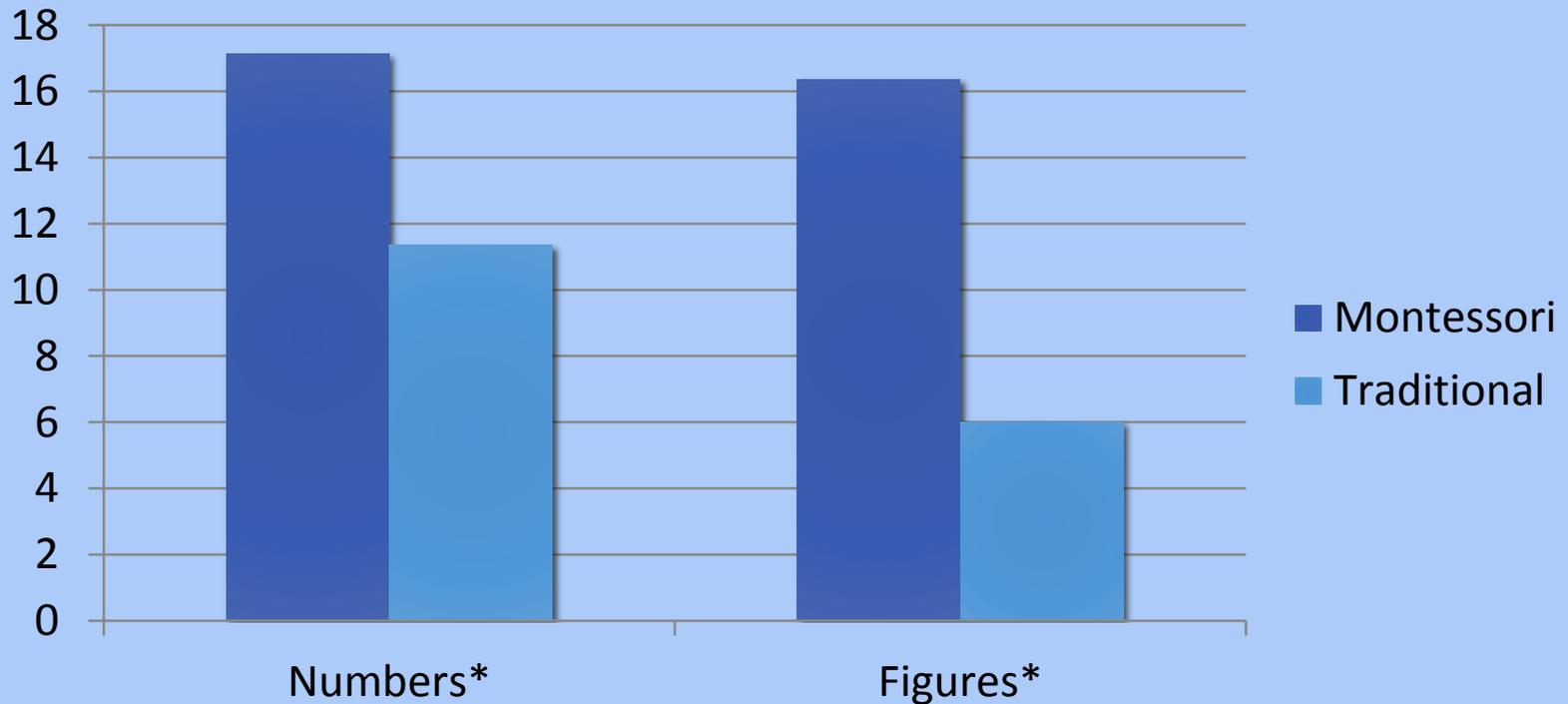


EPoC Graphic Scores: Grade 8



EPoC Math Scores: Grade 8

Divergent Tasks



EPoC Math Scores: Grade 8

Convergent Tasks



Conclusions

Montessori students exhibited greater creative potential in math, but less in artistic/graphic

Limitation: demographic differences

EPoC as measure for Montessori math

Future research

- Is there something about Montessori math?
- Montessori inputs



AMERICAN MONTESSORI SOCIETY
education that transforms lives

[tinyurl.com/ Montessori
TeacherPanel](https://tinyurl.com/MontessoriTeacherPanel)



Help with Montessori
research and get coffee
on us!

**First 65 teachers to register
online will receive a \$5
Starbucks e-gift card.
Complete a Sign-Up card to
receive the link via email.**

