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AMS Research Committee White Paper: Overview of Research on Montessori Education: An Evidence-Based Curriculum (Updated)

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One of the goals of AMS is to disseminate research relevant to Montessori education. The AMS Research Committee is publishing this white paper to summarize literature that exists about the effectiveness of Montessori education. Studies of the outcomes of Montessori education are often the ones most frequently requested by legislators, school administrators and even prospective parents. As Montessori education is focused on educating the whole child, research on Montessori outcomes must not be limited to academic outcomes or, even more narrowly, to results of standardized tests. While the United States seems obsessed with standardized assessments as the sole indicator of educational success, Montessori research must participate in but not be confined to these definitions of success. Montessori research has historically been limited, but the number of studies has been increasing in recent years. Many of the more current articles discussed in this paper balance academic as well as socio-emotional outcomes of Montessori education.

A key challenge to conducting research on Montessori education is the great diversity that exists across Montessori schools and teachers even among those who are trained and certified by major Montessori organizations like the AMS or the AMI (Lillard, A., 2005). Another challenge is controlling for the impact of parental choice on educational outcomes. Since it is difficult to randomly assign children to particular types of education, it is often impossible to completely control for the possible influence on outcomes of parents who pursue Montessori education for their children compared to those who do not. Due to the

potential confounding element of parental selection of Montessori education, it can be particularly difficult to identify an appropriate “control group.” The quality of the available research varies depending on the degree to which these issues are addressed. The body of work summarized here includes the most well-designed and influential research regarding the evidence of Montessori outcomes.

Early Montessori Outcome Research

Initially, Montessori research in the U.S. focused on the preschool level with an emphasis on Head Start programs. In the late 1960s and early 1970s, a number of studies included Montessori as one of several programs to which preschoolers were randomly assigned in order to assess the effectiveness of various programs for low income students (DiLorenzo, Salter, & Brady, 1969; Karnes, Shwedel, & Williams, 1983; Kohlberg, 1968). Although Montessori programs showed superiority on some measures, these studies were of limited value in evaluating Montessori education because of poor or unspecified implementation of the approach (Lillard, A. & Else-Quest, 2006). Furthermore, most studies included programs of only a few months in duration and/or very short daily exposure to the Montessori approach, and many also had very small sample sizes (Chattin-McNichols, 1998).

A more robust study from this time period tracked a group of Head Start students who spent at least a year in several “prekindergarten” programs in the late 1960s into their middle and high school years (Miller, Dyer, Stevenson, & White, 1975; Miller & Bizzell, 1983; Miller & Bizzell, 1984). The study was a true experimental design with students randomly assigned to four different programs and with a control group. Two Montessori classrooms were included in the study of over 200 students. The results reported in a series of articles found no difference in classroom achievement or IQ for the Montessori students at the end of the program, but the Montessori students emerged as superior in school achievement in math and reading as well as IQ by the end of second grade and continuing into the middle school years (Miller, et al., 1975; Miller & Bizzell, 1983; Miller & Bizzell, 1984).

John Chattin-McNichols (1981) provided an extensive summary of research on the effects of Montessori school experience through the 1970s concluding that, “Montessori preschool training over a period of approximately one year has positive short-term effects upon general intelligence as measured by tests which are heavily based on verbal performance.” (Chattin-McNichols, 1981, p. 54). Furthermore, he found evidence to suggest that

Montessori education produces positive effects in visual-motor coordination and increasing children's ability to pay prolonged attention to school-related tasks.

Renewed Interest in Montessori Research

The period from the late 1970s through the 1990s was virtually devoid of robust studies of Montessori outcomes. However, the visibility of Montessori outcome research in mainstream academic journals began a resurgence in the 2000s. A meta analysis study found Montessori to have one of the largest effects on achievement of all the programs evaluated (Borman, Hewes, Overman, & Brown, 2003). A quasi-experimental study found superior performance for fourth grade Montessori students in math but inferior performance of eighth grade students in the Montessori school compared to the other schools on language arts achievement (Lopata, Wallace, & Finn, 2005).

Other research during this timeframe explored differences between adolescents in traditional and Montessori middle schools concluding that Montessori students had more positive perceptions of their school environments and teachers and more often perceived classmates as friends. They also reported greater affect, potency (feeling energetic), intrinsic motivation, flow experience, and undivided interest (combination of high intrinsic motivation and high salience or importance) (Rathunde & Csikszentmihalyi, 2005a; Rathunde & Csikszentmihalyi, 2005b).

In this period, the most high-profile study on Montessori education to date was published in the journal *Science* (Lillard, A. & Else-Quest, 2006). Based on a randomized study using the school lottery, the study showed superior outcomes for children who attended the Montessori school. Montessori children in the six-year old age group performed better on standardized tests of reading and math, engaged in more positive interaction on the playground, and showed more advanced social cognition and executive control. They also expressed more concern for fairness and justice. The twelve-year old Montessori children wrote more creative essays with more complex sentence structures, selected more positive responses to social dilemmas, and reported feeling more of a sense of community at school (Lillard, A. & Else-Quest, 2006).

The following year, Dohrmann and colleagues examined the long term impacts of high school students who had attended Montessori schools from the ages of 3 to 11. Former Montessori students significantly outperformed the control group on Math/Science scores on

standardized assessments in high school with no differences found on English/Social Studies scores or grade point average (Dohrmann, Nishida, Gartner, Lipsky, & Grimm, 2007).

In 2008, a study was published assessing creativity differences based on school environment. Children who attended a Montessori program showed better performance than children schooled in other approaches regardless of initial creative ability levels and for integrative tasks (drawing and story) and divergent thinking tasks (unusual uses for a cardboard box, improvement of a toy and parallel lines) (Besançon & Lubart, 2008). Follow-up analysis continued to show a positive impact on creativity for Montessori students (Besançon, Lubart, & Barbot, 2013).

Current Montessori Outcome Research

The past ten years have seen more comparative research, particularly among urban and minority populations in public Montessori programs. For example, test scores in reading and math were statistically in favor of Montessori students in a study by Mallett and Schroeder (2015) which compared Montessori and non-Montessori elementary public school students from grades 1 to 5. The emphasis of other recent outcome research typically falls into one of two areas: impact of Montessori fidelity or equity outcomes.

Montessori Fidelity Impact

Much of Angeline Lillard's current work examines outcomes specifically related to what she terms "authentic" Montessori. She found high-fidelity Montessori schools produced larger gains in children's executive function, reading, math, vocabulary and social problem-solving relative to both supplemented and conventional preschool classrooms (Lillard, 2012). She and her colleague also examined the impact of supplementary material availability in an experimental study finding classrooms that removed non-Montessori activities produced significantly larger gains in early reading and executive function, and early math to some degree, compared to another classroom that retained supplemental materials. There were no differences in advances in vocabulary, social knowledge, or social problem-solving skills (Lillard & Heise, 2016).

Assessment and equity outcomes. Brown and Lewis (2017) examined end-of-grade math and reading state assessment scores of minority Montessori students in urban districts in North Carolina. They found no significant difference in math scores, but Montessori students scored higher in reading (Brown & Lewis, 2017). Ansari and Winsler (2014) compared

students from different Title-I public school programs following either a Montessori curriculum or High/Scope curriculum with a literary component and assessed them on pre-academic, socio-emotional and behavioral skills at the beginning and end of the school year. They found mixed results, but all children achieved regardless of curriculum. Latino children in Montessori schools seemed to benefit the most in terms of exhibiting the highest gains in pre-academic and behavioral skills at the end of the year while Black students displayed stronger gains from attending conventional pre-K programs than Montessori ones (Ansari & Winsler, 2014).

Another study conducted by Angeline Lillard and colleagues (2017) analyzed assessment outcomes to determine if Montessori can equalize student outcomes in pre-academic, academic, executive function and behavioral skills. The study conducted in high poverty cities found that children's outcomes over time were higher on measures of academic achievement, social understanding and mastery orientation and in their enjoyment of scholastic tasks as well as on executive function at age 4 when enrolled in a Montessori preschool. Most importantly, the authors conclude Montessori early childhood education equalized outcomes on some measures for low income children and children with lower executive function suggesting future research is warranted (Lillard, et al., 2017).

Conclusion

Significant momentum continues to build supporting to support future rigorous research examining many aspects of Montessori educational outcomes. In this era of evidence-based educational reform, such research is crucial for Montessori education to continue its mission to provide optimal environments for growth and development for children across the country and around the world.

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