

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

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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 later 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

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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. The superior performance of the Montessori students was driven largely by the strength of the boys. The authors conclude that, "The most reasonable explanation for the obtained program effects seems to be that some aspect of the Montessori experience itself was quite beneficial for these disadvantaged boys" (Miller & Bizzell, 1983, p. 739). In a later article, the stable trends persisted with the Montessori males performing highest in IQ and school achievement out of all the groups. The authors hypothesize that the boys benefitted more than the girls from the "kinesthetic methods of instruction and/or more hands-on manipulation of materials" in the Montessori program (Miller & Bizzell, 1984, p. 1586). They suggest that this is because the girls may have been more ready to process observational and verbal instruction because they mature faster during the preschool years (Miller & Bizzell, 1984).

John Chattin-McNichols (1981) provided an extensive summary of research on the effects of Montessori school experience through the 1970s in the Journal *Young Children*. Based on the studies mentioned above as well as others, he concluded 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. The studies examined by Chattin-McNichols (1981) produced conflicting results on generalizing findings regarding Montessori education and creativity. Montessori children did less well than other students on originality, elaboration, activity, and title accuracy in drawing, but performed better than control groups and other programs on divergent production.

Over the years, a number of unpublished dissertations have investigated outcomes for Montessori students, but most of these lack adequate controls for the impact of parental choice and/or sufficiently matched comparison groups. Many of these are available on the AMS website.

Current Montessori outcome research

The period from the late 1970s through the 1990s was virtually devoid of robust studies of Montessori outcomes. However, visibility of Montessori outcome research in mainstream academic journals has begun a resurgence in recent years. Montessori education was included as one of almost thirty comprehensive school reform programs evaluated in a meta-analysis conducted by Borman (2003) and published in *Review of Educational Research*. Although only two Montessori studies were included, the Montessori programs analyzed demonstrated one of the largest effects on achievement of all the programs evaluated (Borman, 2003).

Results of a 2005 study published in *Journal of Research in Childhood Education* were more mixed, finding that Montessori students did not surpass students in other types of schools in a large urban district in western New York (Lopata, Wallace, & Finn, 2005). This study attempted to control for parental choice through comparing the Montessori school to two other magnet schools with similar selection criteria as well as one nonmagnet school. In addition, schools were matched on gender, ethnicity, and socioeconomic status, and individual child demographic characteristics were included as covariates. These results showed 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).

Two recent articles explored differences between traditional and Montessori middle schools in terms of motivation, quality of experience, time use, and perceptions of schools, teachers, and friends (Rathunde & Csikszentmihalyi, 2005a, Rathunde & Csikszentmihalyi, 2005b). These articles, published in *American Journal of Education* and *The Elementary School Journal*, presented results from studies with 290 demographically matched Montessori and traditional middle school students using surveys as well as the Experience Sampling Method (ESM). Montessori students reported 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). While Montessori students spent more time in school on school related tasks, chores, collaborative work, and individual projects, traditional students spent more time at school engaged in social and leisure activities and in didactic educational settings (listening to lecture, note taking, watching instructional videos) (Rathunde & Csikszentmihalyi, 2005a, Rathunde & Csikszentmihalyi, 2005b).

Probably the most high profile study to date was published in 2006 in the journal *Science* (Lillard, A. & Else-Quest). The study evaluated the impact of Montessori education on social and academic outcomes for children at the end of the two most widely available Montessori age groups: primary (three- to six-year-olds) and elementary (six- to twelve-year olds). The study experimental and control groups were established based on students selected through a lottery to attend a public Montessori school in Milwaukee, Wisconsin. The school served predominantly urban minority children, had been in operation for nine years, and was recognized by AMI. Results showed superior outcomes for the children who attended the Montessori school. Montessori children in the younger 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 older 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). Angeline Lillard is currently in the process of replicating this study in Hartford, Connecticut with a grant from the Brady Education Foundation (http://www.bradyeducationfoundation.org/, n.d.).

Dohrmann and colleagues (2007) examined the long term impacts of two public Montessori elementary programs in Milwaukee Public Schools in an article in *Journal of Research in Childhood Education*. The study included a large number of subjects, 201, and a control group matched on gender, race/ethnicity, socioeconomic status, and high school attended. Using structural equation modeling the study found the students who had attended the Montessori schools from the approximate ages of 3 to 11 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, 2003). While this study was unable to control for parental influence, its size and careful matching make it an important contribution to the body of research on Montessori education.

Learning and Individual Differences published an article examining creativity of 211 children enrolled in first through fifth grade in a Paris school (Besançon, M., & Lubart,2008). Creativity was assessed by five judges who work regularly in the field and evaluated drawing or story creativity. Children who had attended a Montessori program showed better performance than children schooled in Freinet or traditional pedagogy. This was true for all children of all 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, M., & Lubart,2008).

Significant momentum seems to be building 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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