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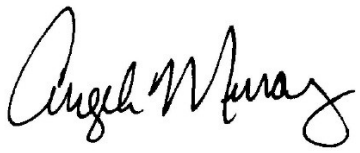
From the editor:

Welcome to the fourth volume of the *Journal of Montessori Research.* This issue brings you two thought-provoking articles that explore the perspectives of Montessori parents. The third article incorporates social network analysis in a Montessori adolescent community, which is a research approach we have not presented before.

Also, I am happy to share news about an important development for Montessori education. The University of Kansas Center for Montessori Research opened this spring within KU's Achievement and Assessment Institute. The KU Center for Montessori Research engages in collaborative research, evaluation, and dissemination activities for building a robust body of knowledge so that Montessori education and philosophy will benefit all children. The Center conducts and supports research that provides evidence specific to Montessori environments and that examines its potential influence on the broader fields of education and human development.

I hope you find this issue interesting—and stay tuned for more developments from the KU Center for Montessori Research.



Sincerely,
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Parents' Reasons for Sending Their Child to Montessori Schools

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Keywords: *School choice, Montessori education, parental decision-making, school administrators*

Abstract. Although the Montessori Method of education is more than 100 years old, the number of Montessori schools in the United States has exponentially increased since 1990. Montessori methods and practices can be complex and difficult for parents to understand, even among parents whose child attends Montessori schools. Moreover, it is unclear why parents decide to enroll their child in Montessori schools. This study presents the results of a survey administered to 124 parents whose children were enrolled in 3 Montessori schools in Massachusetts. Findings indicate that 4 reasons motivated parents' choice of Montessori education: attraction to Montessori principles, perceived fit with the Montessori philosophy or school, anticipated outcomes, and attraction to the Montessori classroom. These findings indicate that, to support parents' decision-making, Montessori administrators should invest in parental and public awareness about Montessori education and provide prospective families with specific information related to school fit, classroom environment, and long-term student outcomes.

The Montessori Method is a comprehensive, child-centered philosophy of education rooted in developmental psychology. It was created in the early 1900s by Maria Montessori in Rome, Italy. Although the Montessori Method was introduced in the United States in 1911 (Povell, 2010), resistance from progressive educators such as John Dewey and William Heard Kilpatrick caused its use and popularity to decline. The Montessori Method reappeared in the late 1950s and early 1960s (Chertoff, 2012); since then, the number of Montessori schools in the United States has continued to grow, despite a general lack of research on its benefits, outcomes, and implementation (A. Lillard, 2012; National Center for Montessori in the Public Sector, 2014). Currently, there are over 22,000 Montessori schools in 110 countries worldwide (American Montessori Society, n.d.), and approximately 4,500 of these are located in the United States (North American Montessori Teachers' Association [NAMTA], n.d.).

Despite resurgence of the Method, Montessori schools and their educational methods remain difficult for many to comprehend, and misconceptions about the Montessori Method abound (NAMTA, n.d.). In her survey of 1,520 American adults, Murray (2008) found widespread misunderstanding about how Montessori classrooms are structured, about what goes on in classrooms, and about the roles teachers play. Hiles (2015) discovered misunderstanding of Montessori theory and practice, even among parents who enrolled their child in Montessori schools. Thus, it is important to examine why parents select Montessori education for their child. For example, the 2016 incidence of the "Prince George effect," in

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which record numbers of London-area parents flocked to Montessori schools in the wake of Prince George's enrollment in Montessori preschool (Perry, 2016), suggests that parents' choice of Montessori may—for some—be the latest celebrity-inspired fad.

Given the relative lack of accurate knowledge among adults about Montessori schools, it is unclear why parents enroll their child in these schools. The author of this study set out to uncover these reasons as a means to better understand Montessori parents and to create stronger school–family relationships.

Montessori Education

The Montessori Method was introduced in the United States in 1911 amid enthusiasm and excitement for the novel teaching approach (Povell, 2010). However, the onset of World War I and criticism from prominent American educators, particularly John Dewey and William Heard Kilpatrick, arrested the spread of the movement until its reemergence in the late 1950s and early 1960s (Chertoff, 2012; Whitescarver & Cossentino, 2008). Considerable expansion of the Method occurred in recent decades in the United States (Dohrmann, 2003), where today there are approximately 4,500 Montessori schools (NAMTA, 2014). The majority of these schools serve children in preschool through kindergarten, with fewer extending to eighth grade and even fewer including high school years.

Underlying the Montessori Method are six interdependent and interacting Montessori principles that inform how classrooms are structured and organized, the roles of teachers and children, and how learning transpires (see Table 1).

Few peer-reviewed studies have examined the efficacy and outcomes associated with Montessori education in the United States (Marshall, 2017). Moreover, the majority of existing studies are plagued by methodological limitations, such as absence of longitudinal data, difficulty in determining causality for any observable outcomes, use of small homogenous samples, problems with defining the essential characteristics of a Montessori classroom, and differences in the number of years each participant surveyed had attended Montessori schools. The evidence base for Montessori education also lacks randomized control trials.

Early studies from the 1970s through the 1990s largely focused on preschool-age children and are of little research significance due to poor design, limited scope, and small sample sizes (Chattin-McNichols, 1992; A. Lillard & Else-Quest, 2006). Four later studies examined academic outcomes for elementary and middle school Montessori students (Dohrman, 2003; A. Lillard & Else-Quest, 2006; Lopata, Wallace, & Finn, 2005; Rathunde, 2003). Results from these later studies indicated that Montessori students enjoy learning and working hard and appreciate a positive, community-based classroom environment. Although results were mixed across the four studies, evidence also suggested that Montessori students perform better than traditionally educated children in mathematics, language arts, and problem-solving.

Rathunde (2003) examined comparative groups of middle school students attending Montessori and traditional middle schools. Students recorded their mood, energy levels, feelings of importance, sense of enjoyment, and flow eight times a day for 7 consecutive days. Results indicated that Montessori middle school students overall had a higher quality educational experience than did traditional middle school students. Rathunde concluded that Montessori students had learned to better enjoy working hard, liked their teachers more, and felt more connected to their classmates compared to students in traditional schools.

Dohrmann (2003) compared standardized test scores and grade point averages for high school graduates (N = 201), including an experimental group that attended Montessori programs through at least fifth grade and a control group that attended traditional programs. The Montessori group significantly outperformed the control group in math and science on the ACT and on the Wisconsin Knowledge and Concepts Examination (a national standardized test administered in tenth grade). Differences in grade point averages also approached significance, favoring Montessori students. In contrast, Lopata et al.'s (2005) study of academic achievement of 543 urban fourth- and eighth-grade students who attended either Montessori or traditional education programs revealed mixed results for math and language arts achievement.

Table 1

Montessori Principles, Manifestations, and Outcomes

Principle	Observable manifestations	Purported outcomes
Respect for the child (Morrison, 2014; Schmidt & Schmidt, 2009)	Children are supported in: Doing and learning things for themselves without unnecessary help or interruption Having long time blocks during the day Choosing their own materials Working at their own pace Becoming fully engrossed in what they are working on	Learning autonomy Positive self-esteem Self-discipline
Support for absorbent mind (Morrison, 2014; Montessori, 1995)	Classroom environment and experiences help children soak up as many experiences as possible	Heightened learning experience
Allowance of sensitive periods (Enright, 2010; Seldin & Davies, 2006)	Children are allowed to intensely focus their energy and attention on specific aspects of the environment to the exclusion of others	Passion Commitment Often leads to mastery
Support for auto-education (International Montessori Council, n.d.; Morrison, 2014)	Curriculum features: Children teaching themselves Self-directed curriculum Avoidance of external rewards Absence of preselected courses of study	Natural curiosity Intrinsic motivation to learn
Prepared environments (NAMTA, 2014; Schmidt & Schmidt, 2009)	Well-organized and equipped classroom Availability of didactic, hands-on, and developmentally appropriate materials Immediate learning feedback	Stimulate brain development Independent learning and exploration Engagement of all sensorial functions
Protection of child's right to learn (Enright, 2010; Montessori, 1995)	Lead teacher: Closely monitors each child's development Keeps child supplied with appropriately challenging learning opportunities Keeps child supplied with materials and works suitable to the child's strengths	Steady development and learning

A. Lillard and Else-Quest (2006) examined standardized testing results for Montessori and traditional students at ages 5 and 12. Montessori students at age 5 performed significantly better in letter-word identification, word attack, and math skills. Picture vocabulary, basic thinking, and concept skills showed no difference. Among the group of 12-year-olds, Montessori students had more sophisticated

writing and language skills and displayed a stronger sense of both community and caring for their peers but did not exhibit higher test scores (A. Lillard & Else-Quest, 2006).

A. Lillard and Heise (2016) examined the effect of using only Montessori materials in a preschool classroom compared to using both Montessori and non-Montessori materials. They found that students from classrooms in which non-Montessori supplementary materials had been removed made greater gains on assessed measures over 4 months than students from the classrooms with mixed materials. This study is critical in light of other studies that have reported little or no difference in gains for students from Montessori versus non-Montessori classrooms (Laski, Vasilyeva, & Schiffman, 2016).

More recently, A. Lillard et al. (2017) conducted a longitudinal study of two public Montessori magnet schools in a high-poverty American city. The sample consisted of 141 students, 70 of whom were enrolled in the two Montessori schools. Students were tested four times in 3 years (i.e., annually from ages 3 to 6) on various cognitive and socioemotional measures. Notably, no significant differences emerged on the initial tests. However, the Montessori preschool students scored better on subsequent tests of academic achievement, social understanding, and mastery orientation, and they reported liking scholastic tasks more. Differences in academic achievement between lower-income Montessori students and higher-income, traditionally schooled students shrank at each assessment and were not statistically significant by the end of the study period. Students with lower and higher executive function also scored equally on assessments of academic achievement. This result is notable because researchers have suggested that executive function predicts academic achievement (Koster-Hale & Saxe, 2013). Based on their own findings, A. Lillard et al. (2017) concluded that Montessori education can elevate and equalize important outcomes.

Choice of Educational Options

Parents in the United States have a wide variety of choices for educating their child, including several types of public and private schools, as well as home- and self-education options.

Public Schools

Public schools are universally available and are government-run via state-level departments of education, local school districts and school boards, and federal oversight. Because tuition is paid through tax revenue, parents of enrolled students do not pay tuition directly to the school. Oversight and funding for public schools occur at the federal level by the U.S. Department of Education, at the state level by state-based departments of education, and at the local level by the school districts. As of the 2014–2015 school year, there were 13,601 public school districts and nearly 98,176 public schools across all 50 states (U.S. Department of Education, 2016b). Each state directs its school districts in matters concerning educational standards and standardized testing, while each school district manages the curricula, funding, and employment for the schools within its boundaries. There are three main types of public schools: neighborhood schools, charter schools, and magnet schools. Public Montessori schools also exist.

Private Schools

Private schools are revenue-generating schools that charge tuition and tend to control curriculum requirements more than public schools do (Anderson & Resnick, 1997). Several different options are available within private schools, such as traditional preparatory schools, parochial schools, and alternative schools (including Montessori and Waldorf schools).

Parental Choice

During the 2013–2014 school year, there were an estimated 131,890 K–12 schools in the United States, including 98,271 public and 33,619 private schools (U.S. Department of Education, 2016b). In the same year, more than 50 million students attended public elementary and secondary schools (U.S.

Department of Education, 2016c), and 5.8 million students attended private schools for pre-Kindergarten through grade 12 in 2015 (U.S. Department of Education, 2016a). Although statistics on student enrollments are available across the various educational options, the issue of why parents choose one option over another would benefit from continued exploration (Hiles, 2015).

Relevant to the present study is that many adults do not know about Montessori education (Murray, 2012), and those who do are subject to a number of misconceptions. In particular, Murray's (2008) online survey of a demographically representative sample of 1,520 adults revealed that respondents believed external incentives such as grades and stickers were necessary rewards to encourage learning, whereas Montessori philosophy asserts that learning an activity is its own reward (Hainstock, 1997). Additionally, respondents did not understand the design and structure of the Montessori classroom or children's need for long blocks of uninterrupted work time.

Common misconceptions about the Montessori Method among those who have heard about the philosophy include: (a) Montessori schools are only for preschoolers or special learners (Lopata et al., 2005; NAMTA, 2014), (b) the Montessori Method is not widely accepted, and (c) Montessori classrooms are relatively unsupervised and children are free to do whatever they want (P. Lillard, 1997; NAMTA, 2014). Other misconceptions are that Montessori schools have a religious orientation, are only for the rich, or fail to adequately challenge students (NAMTA, 2014).

Given the relative lack of accurate knowledge among adults about private Montessori schools, it is unclear why parents enroll their child in these schools. This study set out to uncover these reasons to provide better understanding of Montessori parents and to support stronger school–family relationships.

Methods

The participants in this study were parents and guardians whose child attended one of three Montessori schools that enroll toddlers through eighth graders. The three schools had a combined student population of 597 students from 375 families. Parents and guardians from the three target schools received a letter via email from their respective heads of schools inviting them to participate in a survey. Parents and guardians of each enrolled child were invited to take part in the survey. The letter included a link to a secure online survey that was available for 2 weeks. This study used a convenience sample based on voluntary responses to the survey. No other sampling procedures were used.

To maintain participant confidentiality, the only demographic information the survey gathered was the year the respondent first enrolled a child in a Montessori school. Because no other demographic data were collected, the number of families represented in the survey and the ages of respondents' children are unknown. Respondents' length of involvement with their Montessori schools ranged from 3 months to 17 years (M = 5.41 years, SD = 3.69).

The survey data for this study were gathered using one open ended question: Why did you decide to send your child to a Montessori school? Parents could choose whether or not to answer the survey questions, and 124 responses were gathered.

I examined and coded the open-ended responses using content-analysis procedures described by Miles, Huberman, and Saldaña (2013). First, I created an initial codebook by gathering and summarizing data about Montessori principles from books and articles about the Montessori Method. Based upon this examination, I outlined the six founding principles, observable characteristics, and outcomes widely associated with the Montessori philosophy and its classrooms (see Table 1).

I then examined participants' responses, extracted meaning units, and coded them using the codebook. Codes were removed, adapted, or added to the codebook as needed to best fit the data. Next, I reorganized the data by code and then reviewed and revised the results as needed until the analysis best fit the data. Upon completion of the analysis, I calculated the number of participants reporting each code. The final analysis was examined by a second coder to enhance validity.

Results

The data indicated that participants chose to send their child to Montessori school for four reasons: attraction to Montessori principles (*n* = 70, 56.5%), perceived fit with the philosophy or school (*n* = 64, 51.6%), anticipated valuable outcomes (*n* = 50, 40.3%), and attraction to the Montessori classroom (*n* = 40, 32.3%). These reasons are fully discussed in the following sections.

Attraction to Montessori Principles

Analysis of respondents' freeform responses indicated that more than half of them (*n* = 70, 56.5%) sent their child to Montessori school because of their attraction to specific Montessori principles (see Table 2). Of these 70 respondents, roughly half were attracted to the concepts of auto-education (52.9%) and respect for the child (50.0%).

Table 2

*Parents' Positive Perceptions of Montessori Principles Influencing Choice of School (*n = *70)*

Principle	*n*	%
Auto-education[a]	37	52.9%
Respect for the child[b]	35	50.0%
Prepared environments and hands-on, didactic materials	9	12.9%
Teacher role	9	12.9%
Sensitive periods	3	4.3%
Absorbent mind	1	1.4%

Note. Parents' open-ended responses were analyzed, and some parents' responses corresponded to two or more principles.
[a]Twenty-eight parents specified the subtheme of wanting their child to be able to engage in self-directed study and independent exploration. [b]Nineteen parents specified the subtheme of wanting their child to be able to work at their own pace, whether that was faster or slower than other children's pace.

The most frequently cited principle, auto-education, refers to self-directed exploration and learning. Respondents explained that they wanted their child to choose their own learning topics and become an independent learner, rather than follow a preselected course of study. One respondent explained,

> I wanted my children to be allowed to learn at the pace dictated by their own abilities and not by a preset curriculum…. Our younger child loves to push ahead to master concepts that are not taught in her grade at other local schools.

The second most-commonly cited principle was respect for the child, which refers to helping children do and learn things for themselves without unnecessary help or interruption and allowing children long blocks of time during the day to choose their own materials and become fully engaged in their work. Notably, 19 of the 35 respondents who mentioned respect for the child stressed their desire to let their child work at their own pace, whether faster or slower than that of peers. One respondent explained, "It gave him the extra time he needed to catch up on academics at his own pace," while another stated, "We thought our genius-IQ child could progress at his own rate."

Perceived Fit With Philosophy or School

Nearly half of respondents (*n* = 55, 44.3%) stated they chose their school because of their child's fit with Montessori philosophy or the school itself. More than half of this group (*n* = 35, 54.7%) reported that their positive perceptions and experiences of Montessori education prompted their enrollment decision (see Table 3). For this analysis, *experiences* refers to firsthand experiences or observations, others' experiences, or others' recommendations related to Montessori education in general, to other Montessori schools, or to the school the parents chose.

Table 3

*Perceptions of School Fit Prompting Parents' Choice of Montessori (*n = *64)*

Perception of fit	*n*	%
Positive perceptions and experiences of Montessori education[a]	35	54.7
Overall educational philosophy (12)		
With other Montessori schools (13)		
With the school chosen (12)		
School fit parents' and/or child's needs	22	34.4
Approach fit child's learning style (10)		
Wanted education-based rather than play-based preschool (7)		
Convenient location (6)		
Other options were believed to undermine child's learning or not fit needs	19	29.7
Deleterious instructional approaches (6)		
Poor classroom and social environment (6)		
Other unmet needs (5)		
Lower educational quality (4)		

Note. Parents' open-ended responses were analyzed, and some parents' responses corresponded to two or more principles.

[a]"Perceptions and experiences" refers to firsthand experience, others' experiences, or others' recommendations.

For example, 12 parents reported that the overall Montessori philosophy appealed to them. One respondent stated, "I believe it is a powerful way to approach education, and that its strategies mirror the latest brain-based research on how children (and people) learn." Other respondents were educators and had concluded that the Montessori approach was superior to traditional education. One participant said, "I am an educator who has worked in traditional public schools and progressive private schools. I also felt Montessori teachers are the most highly trained teachers in both skills and child development."

Nine respondents reported that they or their spouse had attended Montessori school as a child, their child had been enrolled in another Montessori school in the past, or they had friends at the school. One respondent said, "Both parents attended and we thought it would be a good fit for our son." Another respondent stated, "We had friends with other children at the school." School reputation also influenced parental choice. One respondent explained, "It was a high quality, small school with a great reputation. That it was Montessori was a bonus; it was after we discovered the school that we realized how ideal the Montessori philosophy is."

Perceived fit also included parents' perceptions that the school fit their child's or their own needs (34.4%). Ten respondents said the school's approach fit their child's learning style. One stated, "I felt that our daughter was well suited [to the approach], being a very free-spirited child who tended to enjoy independent thinking rather than a more structured atmosphere." Other aspects of fit concerned parents' desire for an education-based daycare or the school's convenient location.

Another 29.7% (*n* = 19) of these respondents indicated that other available options did not fit their child's needs or undermined their learning, for reasons such as instructional approaches used, the classroom or social environment, or lower quality of education. One respondent explained, "The behavior modification system in public education was discouraging and taught terrible lessons of shaming to young kindergarten aged children." Another wrote:

> My child was bored in public school with the worksheets, lectures, and writing assignments that had to be nonfiction. She began to stop really paying attention and fell behind. The interesting thing was that her teachers did not feel that she was not grasping important concepts and insisted that she was pulling average…. I just didn't understand why the children were not challenged more.

Anticipated Valuable Outcomes

Fifty of the 124 respondents (40.3%) reported choosing to send their child to Montessori school because of the outcomes the parents anticipated (and valued) from Montessori education (see Table 4). The leading anticipated outcome was academic self-efficacy (70.0%, *n* = 35), followed by valuable competencies (32.0%, *n* = 16), and self-actualization and enhanced general success (14.0%, *n* = 14).

Table 4

*Anticipated Outcomes From Montessori Education Influencing Choice of School (*n *= 50)*

Outcome	*n*	%
Academic self-efficacy	35	70
Intrinsic motivation to learn (15)		
Enjoyment of learning (10)		
Learning autonomy (9)		
Self-confidence and self-esteem (8)		
Natural curiosity (7)		
Self-discipline (5)		
Valuable competencies	16	32
Social skills (7)		
Progressive cognitive development (e.g., abstract thinking, computational ability) (4)		
Sense of context (4)		
Various knowledge areas (3)		
Self-actualization and enhanced general success	7	14

Note. Parents' open-ended responses were analyzed, and some parents' responses corresponded to two or more principles.

Regarding academic self-efficacy, respondents expressed the desire for their child to develop an intrinsic motivation to learn (*n* = 15), learning autonomy (*n* = 9), self-confidence and self-esteem (*n* = 8), natural curiosity (*n* = 7), and self-discipline (*n* = 5). One respondent noted, "I believe that a student-led environment in which a child can master a skill at their own pace will foster the child's innate love for learning, which will serve them well throughout life." Another elaborated, "I want my children to enjoy, understand, embrace, grow, learn about the world and to solve problems through the intrinsic motivation of the power of their own capacity to discover and understand." Yet another wrote, "[I] understood the value of self-reliance and independence from a friend that sent her daughter to our Montessori school."

Respondents identified several competencies that they wanted their child to develop and that they believed would be cultivated in Montessori schools. These include social skills (*n* = 7); cognitive

development, such as progressing from conceptual to abstract thinking (n = 4); sense of context, such as connections between history and science (n = 4); and a wide range of other skills and knowledge, such as public speaking, foreign language, or music (n = 3). One respondent said, "We wanted her to learn how to appropriately socialize with peers and make friends," while another commented, "I appreciate that the Montessori experience encourages critical thinking and problem-solving."

Finally, the seven respondents who asserted their belief that Montessori education would support their child's self-actualization and general success cited outcomes such as achieving full potential and becoming independent thinkers. One respondent explained, "I believe that this [focus on cultivating independent thinking], and the development and empowerment of intellect in this way, will most fully and powerfully help them to develop into the truest, best, and most productively impactful versions of themselves." Another respondent added, "I also heard that a Montessori education could really prepare my children to succeed in life and create a firm structure for their future education."

Attraction to Montessori Classroom

The final reason respondents reported choosing Montessori education was their attraction to the Montessori classroom (n = 40, 32.3%). Twenty-four (60%) respondents emphasized their appreciation for the positive, calm, and respectful classroom environment they witnessed in their schools (see Table 5). One respondent explained, "I felt that Montessori would provide a friendly and less distracting environment than our public school.… Our son suffered from anxiety and we wanted to put him in a setting where he…wouldn't be judged or poked fun at."

Table 5

*Classroom Features Prompting Parents to Choose Montessori (*n = *40)*

Feature	*n*	%
Positive, calm, and respectful classroom environment	24	60.0%
Mixed-age classrooms	10	25.0%
Peer learning and mentoring	10	25.0%
Focus on developing the whole child	5	12.5%
Freedom of movement and time outside	5	12.5%

Note. Parents' open-ended responses were analyzed, and some parents' responses corresponded to two or more principles.

Ten parents (25%) stated they liked mixed-age classrooms. One said, "Socially it makes sense. A child learns very quickly where they stand in any social situation having experienced being the younger, middle, and older child." Another 10 participants (25%) specified that they wanted their child to engage in peer learning and mentoring. One participant explained, "I appreciate that the Montessori experience encourages…collaboration and mentoring with peers." Another participant addressed how mixed grades and peer collaboration go together: "I also liked that the classroom has mixed grades, so the younger kids learn from the older ones and the older ones reinforce their learning by teaching others." Other attractive elements of the classroom include the focus on developing the whole child, freedom of movement, and time outside; each concept was cited by five (12.5%) respondents.

Discussion

Parents' reasons for choosing one educational option over another have been underexamined to date (Hiles, 2015). The present study produces insights that help fill this gap in research. Study findings indicate that parents chose Montessori education for a small set of reasons. It is notable that two of these reasons concern central aspects of Montessori education—Montessori principles and the Montessori classroom environment—constituting distinct competencies that set Montessori schools apart from other educational options. Administrators are advised to leverage these elements to help attract the families that will thrive in a Montessori setting.

Moreover, a few specific elements were cited by at least one of every four parents: (a) auto-education, with specific attention to self-directed and independent learning; (b) respect for the child, with specific attention to learning at their own pace; and (c) achieving academic self-efficacy, including the development of intrinsic motivation and joy in learning. These findings underscore a primary focus on the individual child and helping them become a self-motivated, self-managing learner. Study respondents explained that cultivating this approach to education would enhance their child's chances for success in school and in life.

At the same time, it is noteworthy that few of the 124 survey respondents cited the following elements as factors in their decision: focus on developing the whole child (five respondents), allowing freedom of movement and time outside (five respondents), the principles of sensitive periods (three respondents), and the absorbent mind (one respondent). These findings suggest that respondents may not understand the importance of these elements, which is reminiscent of Murray's (2008, 2010) conclusion that many adults do not understand the rationale behind the design and structure of Montessori classrooms. Although respondents in this study liked and were attracted to Montessori philosophy, principles, and classroom environments, it is possible they may not fully understand the Method. If parents substantially lack understanding of the Method, it is possible they do not understand the full value of the education or inadvertently encourage their child in ways that are counter to Montessori philosophies, such as using external rewards for good grades or test scores.

Implications for Montessori Administrators

Study findings indicate that parents' perceptions of fit with the Montessori philosophy or school are a significant factor in their decision to enroll their child. It follows, then, that exploration of fit should be a deliberate part of administrators' discussions with prospective families. This discussion could address topics such as: (a) parents' own experiences with Montessori education or the school, (b) what parents have heard or know about Montessori or the school, (c) their child's learning style and how it compares to the Montessori approach, and (d) their own or their child's perceptions of and experiences with other educational alternatives. Such a discussion could identify any existing sources of dissatisfaction with their child's education and identify how the school may address them. Moreover, study findings suggest that respondents' perceptions of Montessori education—even if not firsthand or about the school in question—played a key role in parents' enrollment decisions. Therefore, investing in parental and public awareness about Montessori education may lead to increases in enrollment.

Respondents in this study were attracted to the idea of their child developing as a self-motivated learner while being part of a positive and collaborative community. Montessori principles, methods, and environments support this aim. Thus, prospective parents should be allowed ample time to observe the classroom and school in action and to talk with current students or families to understand how the school fosters students' connection and independence within a caring environment.

Finally, respondents' emphasis on valued outcomes suggests that parents carefully consider the long-term returns on their investment in Montessori education. In addition to their child gaining a wide range of skills and competencies, respondents in this study expected their child to become avid, joyful, and

independent learners. Administrators should track students' long-term outcomes and make these data and other empirical research about anticipated results of Montessori education available to prospective parents.

Suggestions for Research

This study has uncovered several important insights about the reasons parents enroll their child in Montessori schools, despite a wide range of educational options. At the same time, study findings point to several areas for future exploration. First, although self-directed learning (auto-education) and working at a child's own pace (respect for the child) emerged as key reasons for choosing Montessori education, few parents cited other Montessori principles (e.g., sensitive periods, absorbent mind) as influences on their decisions. Therefore, the body of research on Montessori education would benefit from further exploration of parents' understanding and awareness of the principles and from examination of the extent to which these principles influence parents' decisions.

A primary reason parents in this study reported choosing Montessori education was the valued outcomes they believed their child would attain. It is important to note that the evidence base for efficacy and outcomes is still thin and continues to develop (Marshall, 2017). Available study findings indicated that Montessori students enjoy learning and working hard (A. Lillard et al., 2017; Rathunde, 2003); experience a more positive classroom community environment (A. Lillard & Else-Quest, 2006; Rathunde, 2003); exhibit greater academic achievement, social understanding, and mastery orientation (A. Lillard et al., 2017); and perform better in mathematics, language arts, and problem-solving (Dohrmann, 2003; Murray, 2010) than students in traditional school settings do. Other findings indicated mixed results when comparing students from Montessori schools with those in traditional environments (A. Lillard & Else-Quest, 2006; Lopata et al., 2005; Murray, 2010). Therefore, continued examination is needed to explore the outcomes of Montessori education. Ideally, such research also would examine whether outcomes vary by student characteristics such as learning styles and learning challenges.

A third suggestion for research is to examine why families decide against enrolling in Montessori schools, including both those families who considered Montessori but never enrolled and families who enrolled their child for a period of time (e.g., preschool or elementary school) before withdrawing them and enrolling them in a traditional setting. Parent exit interview data also may help provide insights into this outcome.

Limitations

This study was based on a small sample of 124 parents from only three schools. Although these data cannot be generalized to all Montessori schools in the United States, findings may transfer to similar Montessori schools.

Moreover, the only demographic information gathered in this survey was the year the respondent first enrolled a child in their Montessori school. Future research should gather the number of children enrolled; parents' age, ethnicity, and education level; and other relevant data. The absence of this information made it difficult to contextualize the current findings.

Additional research should be conducted to confirm the present results. Additionally, the present survey design inherently relied on parents' self-reporting and may not uncover the unconscious and complex motivations that are not easily expressed in this type of design.

Conclusion

This study's results show that parents choose Montessori education for four primary reasons: attraction to Montessori principles, perceived fit with the Montessori philosophy or school, anticipated outcomes, and attraction to the Montessori classroom. These findings lead to key implications for Montessori schools and their administrators. Specifically, administrators should focus on increasing public

awareness of Montessori education to help attract prospective parents. Administrators also should thoroughly explore with prospective parents their educational goals for their child; their child's learning needs and preferences; and the nature, benefits, and outcomes of Montessori education to collaboratively examine and confirm school fit, allow parents to experience the unique Montessori environment through multiple contacts with the school, and communicate anticipated child outcomes.

AUTHOR INFORMATION

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References

American Montessori Society. (n.d.). *Frequently asked questions about Montessori*. Retrieved from http://amshq.org/Montessori-Education/FAQs

Anderson, K. M., & Resnick, M. A. (1997). *Careful comparisons: Public and private schools in America* (ED 411 611). National School Boards Association. Retrieved from https://files.eric.ed.gov/fulltext/ED411611.pdf

Chattin-McNichols, J. (1992). *The Montessori controversy.* Albany, NY: Delmar.

Chertoff, E. (2012, December). The great Montessori schism. *The Atlantic*. Retrieved from http://www.theatlantic.com/national/archive/2012/12/the-great-montessori-schism/266217/

Dohrmann, K. (2003). *Outcomes for students in a Montessori program: A longitudinal study of the experience in the Milwaukee Public Schools.* Association Montessori International / USA. Retrieved from https://www.ami-global.org/sites/default/files/Outcomes_1.pdf

Enright, M. (2010). Foundations study guide: Montessori education. *The Atlas Society*. Retrieved from http://www.atlassociety.org/guide-montessori

Hainstock, E. G. (1997). *The essential Montessori: An introduction to the woman, writings, the method, and the movement.* New York, NY: Penguin.

Hiles, E. (2015). *Measuring parent perception and understanding of Montessori education in three Massachusetts Montessori schools* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses Global. (UMI No. 3731884)

International Montessori Council. (n.d.) *Welcome to the International Montessori Council*. Retrieved from https://www.montessori.org/the-international-montessori-council-imc/

Koster-Hale, J., & Saxe, R. (2013). Functional neuroimaging of theory of mind. In S. Baron-Cohen, M. Lombardo, & H. Tager-Flusberg (Eds.) *Understanding other minds: Perspectives from developmental social neuroscience* (3rd ed.), pp. 132–163. New York, NY: Oxford University Press.

Laski, E. V., Vasilyeva, M., & Schiffman, J. (2016). Longitudinal comparison of place-value and arithmetic knowledge in Montessori and non-Montessori students. *Journal of Montessori Research, 2*(1), 1–15. https://doi.org/10.17161/jomr.v2i1.5677

Lillard, A. S. (2012). Preschool children's development in classic Montessori, supplemented Montessori, and conventional programs. *Journal of School Psychology, 50,* 379–401. doi:10.1016/j.jsp.2012.01.001

Lillard, A. S., & Else-Quest, N. (2006). Evaluating Montessori education. *Science, 313,* 1893–1894. doi:10.1126/science.1132362

Lillard, A. S., & Heise, M. J. (2016). Removing supplementary materials from Montessori classrooms changed child outcomes. *Journal of Montessori Research, 2*(1), 16–26. https://doi.org/10.17161/jomr.v2i1.5678

Lillard, A. S., Heise, M. J., Richey, E. M., Tong, X., Hart, A., & Bray, P. M. (2017). Montessori preschool elevates and equalizes child outcomes: A longitudinal study. *Frontiers in Psychology, 8,* 1–19. https://doi.org/10.3389/FPSYG.2017.01783

Lillard, P. P. (1997). *Montessori in the classroom.* New York, NY: Schocken.

Lopata, C., Wallace, N. V., & Finn, K. V. (2005). Comparison of academic achievement between Montessori and traditional education programs. *Journal of Research in Childhood Education, 20*(1), 5–13. https://doi.org/10.1080/02568540509594546

Marshall, C. (2017). Montessori education: A review of the evidence base. *npj Science of Learning, 2,* 1–9. doi:10.1038/s41539-017-0012-7

Miles, M. B., Huberman, A. M., & Saldaña, J. (2013). *Qualitative data analysis*. Thousand Oaks, CA: SAGE.

Montessori, M. (1995). *The absorbent mind.* New York, NY: Henry Holt.

Morrison, G. S. (2014). *Early childhood education today* (13th ed.). New York, NY: Pearson.

Murray, A. K. (2008). *Public perceptions of Montessori education* (Doctoral dissertation). Available from ProQuest Dissertations & Theses Global. (UMI No. 3297628).

Murray, A. K. (2010). *Overview of research on Montessori education: An evidence-based curriculum.* American Montessori Society. Retrieved from https://amshq.org/~/media/46C230AC87F8472E9FE2B46E555A9D28.ashx

Murray, A. K. (2012). Public knowledge of Montessori education. *Montessori Life*, *24*(1), 18–21.

National Center for Montessori in the Public Sector. (2014). *Growth of public Montessori in the United States: 1975–2014.* Retrieved from https://www.public-montessori.org/white-papers/growth-of-public-montessori-in-the-united-states-1975-2014/

North American Montessori Teachers' Association. (n.d.). *Frequently asked questions about Montessori education.* Retrieved from http://www.montessori-namta.org/FAQ/Montessori-Education

Perry, S. (2016, January 25). "Prince George effect" on Montessori schools: Interest among parents up a whopping 65 percent. *People*. Retrieved from http://www.people.com/people/package/article/0,,20395222_20982199,00.html

Povell, P. (2010). *Montessori comes to America: The leadership of Maria Montessori and Nancy McCormick Rambusch.* Lanham, MD: University Press of America.

Rathunde, K. (2003). A comparison of Montessori and traditional middle schools: Motivation, quality of experience, and social context. *The NAMTA Journal, 28*(3), 12–52. Retrieved from https://www.ami-global.org/sites/default/files/RathundeComparison.pdf

Schmidt, M., & Schmidt, D. (2009). *Understanding Montessori: A guide for parents*. Indianapolis, IN: Dog Ear Publishing.

Seldin, T., & Davies, V. (2006). *How to raise an amazing child the Montessori way.* New York, NY: DK Publishing.

U.S. Department of Education, National Center for Education Statistics. (2016a). Table 205.10. Private elementary and secondary school enrollment and private enrollment as a percentage of total enrollment in public and private schools, by region and grade level: Selected years, fall 1995 through fall 2015. In U.S. Department of Education, National Center for Education Statistics (Ed.), *Digest of Education Statistics* (2016 ed.). Retrieved from https://nces.ed.gov/programs/digest/d16/tables/dt16_205.10.asp

U.S. Department of Education, National Center for Education Statistics. (2016b). Table 214.10. Number of public school districts and public and private elementary and secondary schools: Selected years, 1869–70 through 2014–15. In U.S. Department of Education, National Center for Education Statistics (Ed.), *Digest of Education Statistics* (2016 ed.). Retrieved from https://nces.ed.gov/programs/digest/d16/tables/dt16_214.10.asp

U.S. Department of Education, National Center for Education Statistics. (2016c). Table 214.40. Public elementary and secondary school enrollment, number of schools, and other selected characteristics, by locale: Fall 2011 through fall 2014. In U.S. Department of Education, National Center for Education Statistics (Ed.), *Digest of Education Statistics* (2016 ed.). Retrieved from https://nces.ed.gov/programs/digest/d16/tables/dt16_214.40.asp

Whitescarver, K., & Cossentino, J. (2008). Montessori and the mainstream: A century of reform on the margins. *Teachers College Record, 110,* 2571–2600.

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To What Extent Do Parents of Montessori-Educated Children "Do Montessori" at Home? Preliminary Findings and Future Directions

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Keywords: *Montessori parenting, parenting practices, early childhood, home–school connections*

Abstract: Few if any empirical studies have explicitly examined the home environments of Montessori-educated children or, more specifically, the question of whether Montessori parents reinforce or undermine their child's Montessori education at home. With a convenience sample of 30 parents of toddlers and preschoolers attending a private Montessori school in the Midwest, this cross-sectional study examines parents' knowledge of Montessori principles and their parenting beliefs and behaviors at home. Results suggest that Montessori parents from the target school were knowledgeable about and valued Montessori principles, even though few had had a Montessori education themselves. Parents in this sample varied in their parenting behaviors and choices at home, with some parents who intentionally reinforced Montessori principles and others whose behaviors were inconsistent with a Montessori approach. Findings from this preliminary study provide a first glimpse into the beliefs and behaviors of Montessori parents upon which future studies can build. Montessori educators and administrators will benefit from future research involving Montessori parents, particularly those schools that offer Montessori-based parent-education sessions to the families they serve.

Although a number of studies have demonstrated the benefits of a Montessori education for young children, few if any have explicitly examined the home environments of Montessori-educated children. Prior research, including one recent longitudinal study of preschoolers, suggested that Montessori children tend to score higher on academic and behavioral skills compared to their non-Montessori peers (Lillard, 2012; Lillard & Else-Quest, 2006; Lillard et al., 2017). It is largely assumed that parents select a Montessori education for their child because it aligns with their educational values and goals for the child, but some authors have suggested that Montessori-educated children do not necessarily receive Montessori-based parenting at home (McFarland & McFarland, 2013). Also, Montessori principles are generally

misunderstood by the public and perhaps even by parents who select Montessori education for their child (Murray, 2012). The degree to which parents who select Montessori education for their child intentionally "do Montessori" at home has not been examined empirically. This gap in the literature is notable because children's educational outcomes are jointly shaped by home and school contexts (Bronfenbrenner & Morris, 1998). Understanding Montessori children's home environments can allow researchers and educators to identify key family and home factors that promote or hinder academic success within a Montessori setting. In the present study, *doing Montessori at home* is conceptualized as providing a physical environment that children can easily navigate and that offers opportunities for children to care for themselves and their environments (Woo, 2014). Doing Montessori at home is assessed according to the types of materials children have access to, how their materials are stored, their level of involvement in practical life activities, and parents' beliefs and behaviors in relation to their child's activities at home.

In a recent longitudinal study employing a nationally representative sample of young children in traditional public education settings, El Nokali, Bachman, and Votruba-Drzal (2010) examined the relationships between parental involvement and children's social and academic outcomes. They concluded that "further exploration of how parents and teachers may be jointly responding to children's social and behavioral skills could help to elucidate the potential benefits of parent involvement…" (El Nokali et al., 2010, p. 1003). Because so little is known about the home lives of Montessori-educated children, the current study provides a first glimpse into an understudied population of parents by examining the beliefs and behaviors of parents of Montessori-educated toddlers and preschoolers at a private Montessori school in the Midwest. This study's results can inform future research questions that use larger and more diverse samples of Montessori parents. Findings from this study and others like it may also reveal opportunities for Montessori educators to foster home–school relationships and enhance children's educational experiences at home.

Theoretical and Empirical Background

Ecological theory posits that children's development is shaped by their interactions and experiences within multiple interrelated contexts (Bronfenbrenner & Morris, 1998). Inspired by ecological theory, the overlapping spheres of influence model similarly emphasizes how aspects of home and school environments overlap in meaningful ways to produce different outcomes among children (Epstein, 2001). Establishing home–school partnerships is a priority for Montessori and non-Montessori schools alike. Stronger home–school partnerships and greater parental involvement in children's education are thought to positively affect children's learning and development (Bronfenbrenner & Ceci, 1994; Epstein, 2001; Galindo & Sheldon, 2012; Knoche & Witte, 2016). However, the benefits of parental involvement in children's schooling may depend in part on whether parents' involvement reinforces, or undermines, school curricula and culture. For some children, home and school are very different worlds that have different sets of expectations and resources. The extent to which children reap the benefits of a Montessori education is likely influenced by the degree of fit between Montessori principles and the parenting they receive at home (Ansari & Winsler, 2014; Havis, 2009).

The term *home–school dissonance* has been used to describe discrepancies between home and school in beliefs, values, and expectations (Phelan, Davidson, & Cao, 1991). Phelan et al. (1991) theorized that significant home–school dissonance, which is caused by the stress children experience when navigating inconsistencies between home and school, harms their development. Montessori-educated children whose home environments undermine or contradict Montessori principles—through differences in the physical setting, adults' expectations of them, or the nature of their interactions with adults—may experience greater cognitive dissonance and stress than children whose home environments are more similar to their school culture (Phelan et al., 1991). The absence of formal testing of those associations further underscores the importance of understanding variability in the parenting beliefs and behaviors of Montessori parents.

Montessori children may experience inconsistencies between their home and school environments in several ways, from the manner in which their materials are stored to the nature of their interactions with adults in both settings (McCarthey, 2000). Foundational to Montessori education is the assumption that

children are self-motivated learners who will thrive in an environment that offers them freedom of choice within a structured, developmentally appropriate setting. Similar to a Montessori classroom, Montessori-inspired homes may include prepared environments that provide children with access to developmentally appropriate materials on open shelving and at their eye level, for example. Adults in Montessori classrooms foster children's development by serving as gentle guides and role models, using careful observation and limited direction. Maria Montessori wrote, "When we give the child freedom and independence, we are giving freedom to the worker already braced for action, who cannot live without working and being active" (Montessori, 1995, p. 91). Applied to the home setting, parents who direct children's day-to-day activities, or who micromanage their actions, hinder children's natural desire for self-mastery.

Parenting styles (i.e., general attitudes toward parenting that differ based on levels of warmth and behavioral control) have long predicted a variety of child outcomes (Baumrind, 1967). *Authoritative* parents provide their child with affection and guidance to promote children's autonomy in a supportive and typically nonpunitive environment. *Authoritarian* parents value obedience and conformity and tend to be demanding, rigid, and restrictive. *Permissive* parents, while warm and loving, do not enforce rules or behavioral standards for children and are described in the parenting literature as lax or spoiling (Baumrind, 1991). Generally speaking, authoritative parenting and the democratic beliefs that underlie this approach to childrearing yield positive developmental outcomes among children (Darling & Steinberg, 1993; Steinberg, Lamborn, Dornbusch, & Darling, 1992; Schofield & Weaver, 2016). Authoritative parenting is aligned with a Montessori education, balancing children's needs for nurturance and guidance with opportunities for self-direction (American Montessori Society, n.d.). As such, it is plausible that authoritarian and permissive styles undermine a Montessori education.

Dr. Montessori made specific recommendations for the role of adults in children's lives: they should respect children and honor their innate drive toward exploration and self-mastery (e.g., Montessori, 1970). Accordingly, the instructions for teachers and for parents were very similar. Although Montessori teachers receive specialized training to effectively implement Montessori principles, the same is not true of parents. Thus, although Montessori schools generally work from a similar educational framework, we may expect greater variability in children's home experiences. Schools may foster home–school relationships by encouraging parents' involvement in school events or by offering opportunities for parents to better understand Montessori principles via parent-education workshops. The content, format, duration, and quality of these sessions vary, and no established standards or guidelines for Montessori-based parent education currently exist. As a precursor to developing meaningful and relevant parent-education workshops, Montessori teachers and administrators may benefit from understanding parents' beliefs, behaviors, and educational goals for their child. Because of socioeconomic, cultural, or other factors, Montessori parents likely vary in their beliefs about child development and parenting goals, which may be an important difference between home and school settings (McCarthey, 2000). Parent-education programs that successfully create positive connections between school and home may enhance the benefits children receive from a Montessori education.

The Current Study

Consistent with ecological theory and the concept of home–school dissonance, it is theorized that children may benefit from receiving parallel messages at school and home about their capabilities, the expectations for their behavior, and the manner in which adults interact with them (Phelan et al., 1991). Few if any studies have examined the home lives of Montessori-educated children, leaving a gap in our understanding of parenting variations within this population. In the current study, doing Montessori at home is conceptualized in terms of the physical environment at home, the degree to which children have freedom within that environment, and how parents interact with their child. Specifically, authoritative parenting, a value for children's autonomous work, and nonpunitive discipline strategies are consistent with Montessori principles. In response to the notable lack of information on Montessori parents, the following exploratory research questions were investigated:

- Do parents of Montessori-educated children understand basic Montessori principles?
- To what degree are parents intentional about doing Montessori at home?
- What are the parenting beliefs, styles, and discipline strategies of parents who select a Montessori education for their child?
- Is knowledge of Montessori principles associated with parenting beliefs and behaviors?
- Are parents' discipline strategies associated with other parenting behaviors and specifically those thought to reflect doing Montessori at home?

Method

Participant Recruitment

The target group for this study was parents of children ages 18 months to 6 years attending a private Montessori school in the Midwest. Families with at least one child in the Toddler or Primary room were recruited through flyers, emails, and word of mouth. The author also announced the study at a parent-education event hosted by the school. Of the 48 eligible families, 30 consented to participate in the study. Participating families received a $10 incentive and one hour of credit toward their volunteer obligations at the school. This study received approval to conduct research with human subjects from the institutional review board of the author's research institution.

Sample

The final sample consisted of 30 participants (25 biological mothers and five biological fathers). Parents' ages ranged from 22 to 49 years (M = 35.47, SD = 6.10). Eighty-four percent of parents self-identified as White, 13% as Asian, and 3% as other. The vast majority of the sample (90%) was married and college educated, with 76% holding at least a 4-year degree. Average family household income was approximately $226,000 per year (range = $35,000–$900,000, SD = $188,000). Nineteen (63%) of the children of participating parents were enrolled full-time, and 11 (37%) were enrolled part-time (i.e., half day). At the time of the survey, children had been attending the target school, on average, slightly longer than one year (M = 14.60 months, SD = 11.14 months). Parents' choice of school was driven by two main factors: a value of Montessori education and the specializations of the teachers and learning environment, and convenience or location. Cost, hours of operation, and reputation of the school ranked lower in influence on parents' school selection (Table 1).

Data Collection

One parent from each family completed an anonymous online survey, prepared using Qualtrics software (Qualtrics, 2018), which included both fixed-response and open-ended questions. In addition to standard demographic information (e.g., race, marital status, income), parents responded to questions about their reasons for selecting a Montessori school, their general understanding and endorsement of Montessori principles, the manner in which children's materials were stored in their home, opportunities for children's autonomy at home, discipline strategies, and parenting style and beliefs about child development. To gather more detailed information, open-ended questions followed some of the fixed-response questions, allowing parents to elaborate on their responses. All participants completed 100% of the survey, and there were very few missing data on individual items.

Table 1

Parents' Top-Ranked Reasons for Selecting the Target Montessori School

Reason	*n*[*]	%
Montessori philosophy	24	80
Location	16	53
Qualifications of teachers/staff	14	47
Classroom environment	10	33
Teacher-child ratio	8	27
Cost	6	20
Reputation of the school	5	17
Recommendation from someone	5	17
Hours of operation	4	13
Other	1	3

[*]Number of parents who ranked that option as one of their top three reasons for choosing the target Montessori school.

Measures

Demographic variables. All parents, when offered a choice of four genders (i.e., male, female, transgender, nonbinary), self-identified as either male or female. Ethnicity categories included Black, Asian, American Indian or Alaska Native, Native Hawaiian or Pacific Islander, White, or other. Parents also reported their age, highest level of education completed, annual household income, marital status, and relationship to the target child. (Biological parents comprised 100% of the sample.)

Montessori knowledge. Parents' understanding of Montessori principles was assessed with several fixed-response questions. It was not the intent to test parents on Montessori principles or their knowledge of specific activities or works, but rather to get a general sense of how their perspectives aligned with a Montessori approach. Parents indicated the degree to which they (a) were comfortable educating friends and colleagues about Montessori principles, (b) were knowledgeable about the target school's behavioral and academic expectations for their child, (c) attended parent-education events at the target school, (d) researched information about Montessori principles, (e) experienced Montessori education as a child, and (f) had formal training in Montessori principles. Responses ranged from 1 (*disagree*) to 4 (*agree*), with higher scores indicating greater Montessori knowledge.

Montessori application at home. The degree to which parents do Montessori at home was measured directly by asking parents to indicate the degree to which they agreed with the statements "I run my home in a way that is consistent with Montessori principles" and "My child has similar expectations at school and at home," on a scale from 1 (*disagree*) to 4 (*agree*). Parents also were asked to explain, in their own words, the location and manner in which their child's materials were stored at home, as well as how decisions about storing those materials were made. Parenting behaviors and styles were also considered as evidence of doing Montessori at home.

Parenting beliefs and behaviors. Parents' beliefs about young children's development were measured with four items: "Children learn best from hands-on activities," "Children should respect adults," "Younger children can learn a good deal by interacting with older children," and "It is possible for young children to engage in uninterrupted work for 2–3 hours at a time." (Children of parents who participated in this study regularly engaged in 2- to 3-hour work cycles at school.) Parents responded to 11 items that reflected the degree to which they promoted their child's autonomy and self-directed play at home and their patience with and respect for their child. Response options to the parenting beliefs and behaviors questions ranged from 1 (*disagree*) to 4 (*agree*). Agreement with items such as "I encourage my child to take

responsibility for his/her belongings" and "I encourage my child to do things for himself/herself, such as putting on shoes" reflected doing Montessori at home because those parental behaviors encourage children's independence and self-mastery, a recognized feature of the Montessori Method. Due to the exploratory and descriptive nature of this study, questions that reflected doing Montessori at home were analyzed separately and were not combined to form a scale.

Parenting style. Using a scale ranging from 1 (*never*) to 6 (*always*), parents indicated how often they engaged in parenting practices that were later grouped into subscales for authoritative, authoritarian, and permissive parenting styles (Robinson, Mandleco, Olsen, & Hart, 1995). Sample items included "I am responsive to my child's feelings and needs" (i.e., authoritative), "I use threats as a form of punishment with little or no justification" (i.e., authoritarian), and "I give into my child when he/she causes a commotion about something" (i.e., permissive). Mean scores were computed for each parenting style.

Discipline strategies. Given a list of discipline strategies supplied by the researcher, parents were first asked to indicate whether they had ever used the strategies with their child. The list included a variety of strategies for active discipline (e.g., time-out, open discussions), passive discipline (e.g., ignoring the behavior), and harsh discipline (e.g., spanking, threatening). Parents received one point for each strategy they reported having used. Points were added together to form subscale scores for active, passive, and harsh discipline, with higher scores indicating greater use of each type of discipline strategy. Parents also explained in their own words which strategies they used most often and why. Active and positive discipline strategies were considered to be consistent with Montessori principles; harsh and passive discipline strategies were considered to be inconsistent with Montessori principles (Pottish-Lewis, 2011).

Results

Parents' Knowledge of Montessori

Descriptive statistics were analyzed for several questions thought to reflect parents' general understanding of Montessori principles. On a scale from 1 (*disagree*) to 4 (*agree*), most parents said they felt comfortable describing Montessori philosophy to a friend or colleague ($M = 3.50$, $SD = 0.68$), viewed Montessori education as different from traditional public education ($M = 3.83$, $SD = 0.46$), and preferred Montessori education to traditional public education ($M = 3.57$, $SD = 0.73$). Similarly, parents highly rated their knowledge of their school's academic and behavioral expectations of their child highly ($M = 3.57$, $SD = 0.63$; $M = 3.90$, $SD = 0.31$, for academic and behavioral expectations, respectively). Very few respondents (or their partners, when applicable) had first-hand experience with Montessori education as a child ($n = 1$, 3%) or formal training in Montessori principles ($n = 1$, 3%).

Are Montessori Parents Doing Montessori at Home?

Descriptive statistics were analyzed for questions designed to reflect explicit and implicit application of Montessori principles at home. On average, parents indicated they ran their home "in a way that is consistent with Montessori principles" ($M = 2.83$, $SD = 0.69$) and that their child had similar behavioral expectations at home and school ($M = 3.23$, $SD = 0.73$). Parents generally agreed with the statement "I intentionally store my child's belongings in a location where he/she can reach them" ($M = 3.37$, $SD = 0.72$). Open-ended questions allowed parents to describe how and where children's materials were stored. All parents indicated one or more of the following storage or display methods: open shelving, bins or tubs (open or clear plastic), or baskets. Half of the sample reported storing or displaying children's materials in a designated space such as a playroom or toy room, and others reported storing items in the bedroom (33.3%), living room (26.6%), or basement (10%). Half of parents (50%) said they intentionally stored or displayed their child's materials in this way, based on their understanding of Montessori principles, because they perceived it to be age appropriate or because they wanted items to be accessible. Some parents organized their child's materials because of physical space limitations (26.6%) or for convenience or easy

cleanup (26.6%). Only two parents said their method of storing or displaying children's materials was arbitrary. As one parent wrote, "It just happened."

A second set of questions reflected parenting behaviors related to children's development of autonomy, an important developmental goal of Montessori education (see Table 2). Pearson correlations (see Table 3) suggest that parents who scored themselves higher on patience were more likely to say they respected their child (r = .53, p = .00); offered their child choices (r = .45, p = .01); encouraged their child to do things for themselves, such as putting on shoes (r = .36, p = .05); and encouraged their child to choose their own clothing (r = .43, p = .02). Although too few fathers responded to make a statistically meaningful comparison to mothers, fathers' average scores for "I offer my child choices" were somewhat higher than for mothers (M = 4.00, SD = 0.00 for fathers; M = 3.40, SD = 0.50 for mothers).

Table 2

Descriptive Statistics for Parenting Variables That Reflect Doing Montessori at Home

Statement	Range	M^*	SD
I offer my child choices.	1–4	3.50	0.51
My child chooses what he/she wears.	1–4	3.17	0.65
I encourage my child to do things for him/herself.	1–4	3.73	0.45
My child is free to choose his/her own activities at home.	1–4	3.40	0.56
I give my child opportunities to be independent at home.	1–4	3.50	0.51
I respect my child.	1–4	3.57	0.50
I encourage my child to take responsibility for his/her belongings.	1–5	4.23	0.68

*Higher means indicate greater agreement with the statements.

Parents also reported how often their child participated in food preparation at home, an activity that is encouraged within a Montessori school environment. One parent reported their child never participated in food preparation at home. Other parents' responses were as follows: six parents (20%) selected "rarely" (i.e., less than once per week), 18 parents (60%) selected "sometimes" (i.e., 1–3 times per week), and five parents (17%) selected "often" (i.e., 4 or more times per week).

Montessori Parents' Beliefs, Parenting Styles, and Discipline Strategies

Consistent with the Montessori approach of multiage classrooms, most parents agreed with the statement "Younger children can learn a good deal by interacting with older children" (M = 3.63, SD = 0.49). Parents also agreed, albeit to a lesser degree, with the statement "It is possible for young children to engage in uninterrupted work for 2–3 hours at a time" (M = 2.87, SD = 0.82). A one-way repeated measures analysis of variance was conducted to compare parents' scores on the three parenting-style variables. Results suggest significant mean differences in parenting styles (F(2, 28) = 176.55, p = .00). Pairwise comparisons suggest that parents scored significantly higher on authoritative parenting (M = 4.97, SD = 0.49) than on permissive parenting (M = 2.47, SD = 0.73) or authoritarian parenting (M = 2.06, SD = 0.64).

When respondents were asked about discipline strategies used at home, 52% indicated they used open discussions, reasoning, or problem-solving with their child because "children understand" or are "very smart," and many perceived that open discussions yielded more positive responses. Fewer parents reported using time-out (17%), redirection (7%), or looks of disapproval or a serious tone of voice (14%); one parent reported that time-out was recommended by the family's pediatrician. Only two parents indicated frequent use of harsher discipline strategies (e.g., yelling), and one justified this choice by indicating that yelling had been used by respondent's own parents. No parents reported using spanking as a frequent discipline strategy.

Table 3

*Intercorrelations Among Parent Reports of Their Patience With Child, Parenting Behaviors, and Children's Options at Home (*N = *30)*

Variables	1	2	3	4	5	6	7	8	9	10	11	12
1. Patient with child	—											
2. Home–school similarities	.12	—										
3. Montessori home	.26	.62*	—									
4. Encourage responsibility	-.24	-.31	-.23	—								
5. Food preparation at home	.09	.05	.31	.02	—							
6. Offer choices	.45*	.23	.24	-.45*	.05	—						
7. Encourages independence	.36*	-.12	.07	.02	.24	.30	—					
8. Plan activities for child	.14	.26	.31	-.20	.38*	.10	.19	—				
9. Speak to child as adult	.15	.06	.02	.15	-.01	.21	.32	-.19	—			
10. Child chooses activities	.38*	.02	.09	-.11	.36*	.24	.30	.22	.17	—		
11. Respect for child	.53**	.19	.08	-.21	.07	.47**	.08	.01	.03	.27	—	
12. Child chooses clothing	.43*	-.08	-.17	.01	.04	.26	.16	-.18	.31	.10	-.09	—

*$p < .05$. **$p < .01$.

Associations Between Parents' Knowledge of Montessori Principles and Parenting

Pearson correlations revealed that the more parents understood the school's behavioral expectations for their child, the more likely they were to say that they had similar expectations for their child at home (r = .42, p = .02) and that they ran their home in a manner consistent with Montessori principles (r = .57, p = .00). However, knowledge of the school's behavioral expectations was not correlated with specific behaviors thought to reflect doing Montessori at home, such as intentionally storing children's belongings where they can reach them, allowing children freedom to choose their own activities, and engaging children in food preparation (see Table 4).

No significant associations were found between parents' knowledge of the school's behavioral and academic expectations of their child and the three parenting-style variables. Online research of Montessori principles was negatively associated with authoritarian parenting (r = -.56, p = .00). Endorsement of the belief that Montessori education is not different from public education was positively associated with permissive parenting (r = .48, p = .01).

Associations Between Discipline Strategies and Doing Montessori at Home

Parents were asked to report if they had ever used a number of discipline strategies with their child. Parents' reports were grouped into three sets of scores to reflect harsh (e.g., yelling, spanking), passive (e.g., ignoring, distracting), and active (e.g., discussing or problem-solving, time-out) discipline. Composite scores for harsh (4 items; M = 1.53, SD = 1.17, Min. = 0, Max. = 4), passive (2 items; M = .5, SD = 0.63, Min. = 0, Max. = 2) and active (6 items; M = 4.53, SD = 1.01, Min. = 2, Max. = 6) discipline were computed as sum scores based on whether parents had ever used those specific discipline strategies. Several significant Pearson correlations were found between discipline strategies and other parenting behaviors. Parents who reported using harsh discipline strategies more often were less likely to offer their child the freedom to choose activities at home (r = -.51, p = .01). Parents who reported greater use of passive discipline strategies were less likely to speak to their child as an adult (i.e., pronounce words correctly; r = .64, p = .02), and more likely to use baby talk with their child (r = .84, p = .00).

Discussion

Taken together, results suggested that this sample of Montessori parents made an informed decision to select a Montessori education for their child. Even so, there was variability in parenting beliefs and behaviors within this sample; in some cases parenting was inconsistent with Montessori principles. For example, although most families recognized the value of having children's materials accessible to them (i.e., at their eye level and on open shelving), a small subset of parents reported using baby talk and harsh discipline (e.g., spanking, yelling) with their child. Havis (2009) suggested that parents may engage in parenting practices that undermine their child's Montessori education because of their own unresolved childhood issues. Parents may have unknowingly responded to their child's behavior in a harsh manner because of how their parents responded to them when they were children, for example. Havis further suggested that parents need to resolve lingering childhood issues to engage with their child in a more positive manner. Dr. Montessori echoed,

> Until the adults consciously face their errors and correct them they will find themselves in a forest of insoluble problems. And children, becoming in turn adults, will be the victims of this same error, which they will transmit from generation to generation. (Montessori, 1970, as cited in Nunn, n.d.)

In the present study, greater (self-reported) patience was associated with providing children with choices, encouraging autonomy, and other behaviors that reflected doing Montessori at home. It is possible that parents who had more peaceful or positive childhoods were better able to remain emotionally calm to encourage children's independence. It is also possible, as Woo (2014) pointed out, that children's behavior

Table 4

*Correlations Between Parents' Understanding of Their School's Behavioral Expectations and Parenting Behaviors (*N= *30)*

Variables	1	2	3	4	5	6	7	8	9	10
1. Understands school's behavioral expectations	—									
2. Home–school similarities	.42*	—								
3. Home life consistent with Montessori principles	.57**	.62*	—							
4. Encourages responsibility	.05	-.31	-.23	—						
5. Food preparation at home	.11	.05	.31	.02	—					
6. Child chooses activities	.04	.02	.09	-.11	.36*	—				
7. Encourages independence	.11	.23	.05	.05	.24	.24	—			
8. Plans activities for child	-.10	.26	.31	-.20	.38*	.22	.10	—		
9. Uses baby talk with child	-.56**	-.24	-.31	.15	-.14	.08	.00	.13	—	
10. Speaks to child as adult	.21	.06	.02	.01	-.01	.18	.21	-.19	-.55**	—

*$p < .05$. **$p < .01$

problems can stem from issues within the home environment. If children are frustrated because their home environment is overly restrictive or chaotic, for example, parents may notice more tantrums at home, which can tax parents' ability to be patient.

To address home–school inconsistencies, Havis (2009) proposed that "schools must, therefore, deal with these undermining attitudes by removing the uncooperative families, if necessary, until the issue is finally resolved at home" (p. 3). This type of response from schools may be impractical and disruptive to the child, family, and school. In contrast, Epstein (2015) suggested a greater need for open communication between Montessori teachers and parents as a mechanism for fostering collaborative partnerships and "understanding family priorities" (p. 11). This approach requires teachers to be diligent about providing opportunities for families to share their perspectives about their child's education and development. In addition to parents having regular conversations with teachers, results from the present study suggest that parents may benefit from opportunities to learn about the guiding logic of Montessori principles, to explore their own parenting beliefs and practices, and to learn ways of doing Montessori in the home that do not require abandonment of their current parenting practices and routines. Specifically, parent-education programs geared toward Montessori parents could encourage positive parent–child interactions at home; developmentally appropriate language; and active, but not punitive, discipline strategies. Montessori-inspired parent-education programs also could provide parents with information about how to structure the physical environment at home to be more consistent with children's experience in their Montessori classrooms. Teachers should anticipate that parents may find it easier to alter the physical environment at home (e.g., by placing limited items on open shelving) than to alter their deeply rooted beliefs about child development and discipline. The challenge of working with parents whose beliefs about child development may not align with a Montessori perspective further underscores the importance of parent–teacher communication that honors the perspectives of both parties, while also prioritizing the needs of the child.

Parenting is deeply embedded in one's culture. For example, ethnicity and culture shape parents' values concerning their child's traits and behaviors, and variations in parents' values predict different outcomes in children's academic achievement (Okagaki & Sternberg, 1993). Prior to drawing premature conclusions about apparent mismatches between home and school contexts, Montessori educators would benefit from understanding how families' cultural beliefs inform their parenting choices (Epstein, 2015). A potentially beneficial, albeit time-intensive, strategy is to conduct home visits with families to better understand parents' perspectives and build home–school connections (Patton, 2015). Community organizations can be valuable resources in assisting schools to develop parent-education workshops that are culturally sensitive, while gently encouraging parents to reinforce the central goals of a Montessori education at home.

The subjects in this study tended to be authoritative in their parenting style, scored relatively highly on responsiveness and reasoning, and overrepresented the higher end of the socioeconomic distribution. The site for data collection was a private Montessori school, which tends to draw families who can afford private-school tuition. Future studies that include a larger and more diverse sample of parents would be in a better position to examine how parents' gender, socioeconomic status, and culture influence their parenting beliefs and practices at home. Larger and more diverse samples from both private and public Montessori schools would also allow more rigorous statistical analyses of associations between parent and child factors associated with Montessori (or non-Montessori) practices at home (Debs, 2016).

The questions used in this study to measure doing Montessori at home asked parents to indicate if their home environment and parenting were consistent with Montessori principles. However, the fixed-response questions provided limited information, and parents' self-reports may be biased. For example, some parents may have misperceived that their expectations of their child were similar to those of the child's school, particularly if their understanding of Montessori principles was limited. In-depth interviews with parents may uncover unrevealed influences and processes at home that facilitate or inhibit Montessori parenting. Future studies would benefit from using a mixed-method research design to better understand Montessori parents' perspectives.

Given the noted limitations of the present sample and research design, results from this study should be considered preliminary and thus should be interpreted with caution. Nonetheless, these results are intriguing and provide a first glimpse into the home lives of Montessori-educated toddlers and preschoolers. As researchers continue to explore this topic of inquiry, they should establish reliable, validated, and theoretically grounded survey instruments to measure parents' understanding of Montessori principles and doing Montessori in the home.

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References

American Montessori Society. (n.d.). *Montessori at home*. Retrieved from http://amshq.org/Family-Resources/Montessori-at-Home

Ansari, A., & Winsler, A. (2014). Montessori public school pre-K programs and the school readiness of low-income Black and Latino children. *Journal of Educational Psychology, 106,* 1066–1079. http://dx.doi.org/10.1037/a0036799

Baumrind, D. (1967). Child care practices anteceding three patterns of preschool behavior. *Genetic Psychology Monographs, 75*(1), 43–88. Retrieved from http://homepages.utoledo.edu/mcaruso/honors-lifespan/baumrind.PDF

Baumrind, D. (1991). The influence of parenting styles on adolescent competence and substance use. *The Journal of Early Adolescence, 11,* 56–95. https://doi.org/10.1177/0272431691111004

Bronfenbrenner, U., & Morris, P. A. (1998). The ecology of developmental processes. In W. Damon & R. M. Lerner (Eds.), *Handbook of child psychology: Theoretical models of human development, Vol. 1* (pp. 993–1028). Hoboken, NJ: Wiley.

Bronfenbrenner, U., & Ceci, S. J. (1994). Nature-nurture reconceptualized in developmental perspective: A bioecological model. *Psychological Review, 101,* 568–586. http://dx.doi.org/10.1037/0033-295X.101.4.568

Darling, N., & Steinberg, L. (1993). Parenting style as context: An integrative model. *Psychological Bulletin, 113,* 487–496. http://dx.doi.org/10.1037/0033-2909.113.3.487

Debs, M. C. (2016). Racial and economic diversity in U.S. public Montessori schools. *Journal of Montessori Research, 2*(2), 15–34. https://doi.org/10.17161/jomr.v2i2.5848

El Nokali, N. E., Bachman, H. J., & Votruba-Drzal, E. (2010). Parent involvement and children's academic development in elementary school. *Child Development, 81,* 988–1005. doi:10.1111/j.1467-8624.2010.01447.x

Epstein, A. (2015). Montessori early childhood teacher perceptions of family priorities and stressors. *Journal of Montessori Research, 1*(1), 1–13. https://doi.org/10.17161/jomr.v1i1.4939

Epstein, J. L. (2001). *School and family partnerships: Preparing educators and improving schools*. Boulder, CO: Westview Press.

Galindo, C., & Sheldon, S. B. (2012). School and home connection and children's kindergarten achievement gains: The mediating role of family involvement. *Early Childhood Research Quarterly, 27,* 90–103. https://doi.org/10.1016/j.ecresq.2011.05.004

Havis, L. (2009). Home-school relations. *The Montessori Observer, 30*(1), 2–4. Retrieved from https://ia800201.us.archive.org/26/items/ERIC_ED520736/ERIC_ED520736.pdf

Knoche, L. L., & Witte, A. L. (2016). Strengths-based educational interventions in rural settings: Promoting child development through home-school partnerships. In L. J. Crockett & C. Gustavo (Eds.), *Rural ethnic minority youth and families in the United States* (pp. 227–246). Available from https://link.springer.com/book/10.1007%2F978-3-319-20976-0

Lillard, A. S. (2012). Preschool children's development in a classic Montessori, supplemented Montessori, and conventional programs. *Journal of School Psychology, 50*, 379–401. doi:10.1016/j.jsp.2012.01.001

Lillard, A. S., & Else-Quest, N. (2006). The early years: Evaluating Montessori education. *Science, 313*, 1893–1894. doi:10.1126/science.1132362

Lillard, A. S., Heise, M. J., Richey, E. M., Tong, X., Hart, A., & Bray, P. M. (2017). Montessori preschool elevates and equalizes child outcomes: A longitudinal study. *Frontiers in Psychology, 8*, 1783. https://doi.org/10.3389/fpsyg.2017.01783

McCarthey, S. J. (2000). Home–school connections: A review of the literature. *The Journal of Educational Research, 93*, 145–153. http://dx.doi.org/10.1080/00220670009598703

McFarland, S., & McFarland, J. (2013). Montessori parenting: An idea whose time has come. *Montessori Life*, *25*(1), 30–39.

Montessori, M. (1970). *The child in the family*. New York, NY: Avon Books.

Montessori, M. (1995). *The absorbent mind*. New York, NY: Holt.

Murray, A. (2012). Public knowledge of Montessori education. *Montessori Life, 24*(1), 18–21. Retrieved from https://t.amshq.org/Publications-and-Research/Montessori-Life/~/media/0834C9E4F0A04D928FEA5E81F28D04F9.ashx

Nunn, P. (n.d.). *The prepared adult as the key to the Montessori approach for indigenous communities of Australia*. Montessori Australia Foundation. Retrieved from https://montessoridigital.org/file/1995/download?token=tcpyIsuH

Okagaki, L., & Sternberg, R. J. (1993). Parental beliefs and children's school performance. *Child Development, 64*, 36–56. http://www.jstor.org/stable/1131436

Patton, M. (2015). The home visit: Creating connections and building relationships with parents. *Montessori Life, 27*(1), 42–44. Retrieved from https://amshq.org/Publications-and-Research/Montessori-Life/~/media/A0B9070BDC22479F84C3BF6C31A70D92.ashx

Phelan, P., Davidson, A. L., & Cao, H. T. (1991). Students' multiple worlds: Negotiating the boundaries of family, peer, and school cultures. *Anthropology & Education Quarterly, 22*, 223–249. doi:10.1525/aeq.1991.22.3.05x1051k

Pottish-Lewis, P. (2011). *Elementary classroom management: How to implement cosmic education* [Booklet]. American Montessori International/USA. Retrieved from https://assets1.casaschool.nl/uploads/document/file/70/Elementary_Classroom_Management_Cosmic_Education.pdf

Qualtrics [Computer software]. (2018). Retrieved from https://www.qualtrics.com

Robinson, C., Mandleco, B., Olsen, S. F., & Hart, C. H. (1995). Authoritative, authoritarian, and permissive parenting practices: Development of a new measure. *Psychological Reports, 77*, 819–830. https://doi.org/10.2466/pr0.1995.77.3.819

Schofield, T. J., & Weaver, J. M. (2016). Democratic parenting beliefs and observed parental sensitivity: Reciprocal influences between coparents. *Journal of Family Psychology, 30*, 509–515. http://dx.doi.org/10.1037/fam0000166

Steinberg, L., Lamborn, S. D., Dornbusch, S. M., & Darling, N. (1992). Impact of parenting practices on adolescent achievement: Authoritative parenting, school involvement, and encouragement to succeed. *Child Development, 63*, 1266–1281. http://www.jstor.org/stable/1131532

Woo, S. (2014). Creating an amazing Montessori toddler home environment. *Montessori Life*, *26*(2), 54–59.

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Using Social Network Analysis to Evaluate Academic Assistance Networks in a Holistic Education Secondary School

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Keywords*: social network analysis, Montessori, Erdkinder, evaluation, holistic education*

Abstract. One goal of Erdkinder schools is for students and teachers to provide academic assistance to their peers, particularly to less-knowledgeable ones. However, traditional educational evaluations do not provide a means to investigate the exchange of academic help. This study piloted the use of social network analysis to describe academic assistance relationships within a Montessori secondary school. Using a network survey, social network data concerning the exchange of academic help were collected from 23 students and 8 teachers. The results show that while students provide help to both fellow students and teachers, teachers are the main source of assistance for students. In some subjects, a few students and teachers neither provided nor received assistance, indicating another area for improvement. The results of a multiple regression quadratic assignment procedure (multiple regression-QAP) show that for most subjects, their willingness to help others was not significantly influenced by their own personal level of knowledge. Thus, more-knowledgeable individuals do not provide more assistance to less-knowledgeable peers. To adhere to Erdkinder principles, this school should encourage more-knowledgeable students to recognize their responsibility to help others and to actually help those who need support. This pilot yielded valuable information, and social network analysis warrants further study within holistic education.

Montessori high schools, known as Erdkinders, are a form of holistic education that has experienced a recent resurgence in the number of active schools (Barker, 2011; Kahn, 2011; R. Miller, 1990). One goal of Erdkinders is to promote the development of adolescents beyond cognitive development. Similar to many other forms of holistic education, the Erdkinder system is designed to provide students with an educational experience that fosters independence in an environment where they can develop their talents, support each other, and work as equals with their teachers and peers (Montessori, 1973). These schools educate students in cognitive, social, emotional, and moral development, toward the development of the whole child (R. Miller, 1990; J. P. Miller, 2010). Such intentions have allowed these and other types of holistic schooling to become more popular in the United States, as more parents seek these environments for their children (Forbes & Martin, 2004). However, Erdkinders, and other holistic education schools attempting to build similar environments, have few options for evaluating whether they are actually developing the supportive and egalitarian environment they seek to implement.

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A Review of the Literature

Adolescents and Montessori Schooling

Although Maria Montessori's work is primarily associated with early childhood education, she also included adolescent education in her conceptualization of human development (Grazzini, 2004; Gutek, 2004; Standing, 1998). Dr. Montessori asserted that adolescents experience the same level of physical and emotional turmoil they experienced as infants and that they need particular support as they engage with society and one another (Montessori, 2011c). She had two primary concerns for the adolescent years: to protect children during this sensitive time in life and to support them in developing the skills to understand their role in society (Barker, 2011). The eventual goal of adolescence was a healthy transition to young adulthood and support of the adolescent's *valorization*, which Donahoe (2010) described as "the adolescent's process of becoming a strong and worthy person" (p. 1).

Dr. Montessori wanted adolescents' educational experience to take place at an Erdkinder, a boarding school in a farm setting, allowing students to specialize in tasks and trade services (Montessori, 1973). Students learn through their experiences on the farm—for example, learning biology through agricultural food production—and do not attend classes in a traditional format. When students live and work on an Erdkinder, Dr. Montessori believed they develop the skills that assure they are independent and productive contributors to a peaceful society (Montessori, 1973; Montessori, 2011a; Montessori, 2011b; Tornar, 2011).

Academic Assistance in Erdkinder

Dr. Montessori considered work important in personality development in adolescents and in children of other ages. Schoolwork needs to provide students with the opportunity to learn self-sufficiency, as well as the experience of identifying challenges to their community and of working to address those challenges as a positive force (Montessori, 1973; Montessori, 2011a; Tornar, 2011). By working together and helping others at Erdkinders, students gain not only the benefit of the knowledge imparted from completing a task, but also learn how they can help others through their work and appreciate the value of their own ability to reach a goal or complete a task (Kahn, 2011; Kahn & Pendleton, 2007). In time, a student should come to offer assistance to others in need of a skill that the student possesses, regardless of whether it is part of an assigned task (Kahn, 2011; Montessori, 1973). This helpfulness—the ability to identify problems and the willingness to offer assistance—is an action that specifically supports students' valorization process (Donahoe, 2010). Thus, a goal of Erdkinder schooling is to cultivate helpfulness in adolescents as one way to support the valorization process.

It is important to note that although highly skilled and knowledgeable students within a school should provide a great deal of help to others, specifically to those lacking these skills and knowledge, these students should not be seen by others within the school as a knowledgeable elite. Instead, individuals should share the responsibility of supporting the community, regardless of any perception that they are highly skilled or knowledgeable; everyone should assist others because everyone has unique abilities that can be used to support others (Kahn, 2011; Montessori, 1973). Thus, Erdkinder leaders and teachers should encourage all students to help one another, reinforcing to students the idea that they are skilled, knowledgeable, and able to serve as a valuable source of help to others in the school.

Role of Teachers

The guidance provided by teachers and the relationships teachers form with students are critical to the success of Erdkinder students (Rathunde & Csikszentmihalyi, 2005; Wentzel, 1998). In traditional schooling, students rarely receive help outside of formal lessons (Guthrie & Davis, 2003), and teachers are often viewed as distant and judgmental (Rathunde & Csikszentmihalyi, 2005; Wentzel, 1998). Instead of

using lectures, teachers in modern Erdkinders facilitate self-directed projects in which pupils learn from one another throughout school hours and teachers are available for questions throughout the day and involved in a multitude of subjects (Montessori, 1973; Rathunde & Csikszentmihalyi, 2005). Ideally, students will not feel self-conscious about asking any teacher for help in any subject, and this help will be readily available to them (Montessori, 1973). Teachers should engage with their students as equals and act as guides for learning, not as sovereigns.

Need for Evaluation

One issue facing Montessori secondary education is that no official governing body certifies or oversees Erdkinders. Commonly, the schools themselves shoulder the responsibility of proving to parents that they adhere to Erdkinder principles (North American Montessori Teachers' Association, 2015). Evidence suggests that Erdkinders are building positive work communities (Casquejo Johnston, 2016); however, there is a pervasive lack of evaluation in these schools due to a lack of tools capable of accurately evaluating the outcomes of this unique learning environment. Also, the Montessori community is resistant to traditional educational assessment methods, which it views as overly reliant on cognitive instruments (Pottish-Lewis, 2013). To gain the necessary insight for improvement, Montessori schools need evaluation methods and tools that can capture the social environment within their schools (Pottish-Lewis, 2013; Tornar, 2011).

Social Network Research in Education

This study used social network analysis (SNA) as the primary method of analysis to answer research questions because SNA provides a way to understand the patterns of academic assistance occurring within a school. Although the education field continues to recognize the value of using SNA to answer research questions, these techniques remain underutilized in K–12 education research, particularly for the evaluation of programs and interventions with social goals (Akers, 2011; Daly, 2010; Scott, 2000). Generally, schools rely on traditional social science analyses to evaluate programs and plan interventions (de Laat, Lally, Lipponen, & Simons, 2007). However, holistically oriented schools have difficulty using standard methods because these tools are not suited to examine social relationships. Further, inferential statistics do not describe students' social context well (de Laat et al., 2007; Thomas, 2000).

The past two decades have provided a steady influx of research exploring the potential for SNA to innovate educational evaluation and classroom studies. For example, Martinez, Sher, Krull, and Wood (2009) integrated SNA with qualitative methods and inferential statistics to develop a nuanced interpretation of collaborative learning. Coburn and Russell (2008) found social network theory apt for determining how new district policies change teacher relationships. The benefits to using SNA in K–12 education settings are great, as SNA methodologies provide a clearer picture of the formal and informal workings of a school. These tools could also be key to determining if schools affect not only the cognitive outcomes of students but also the social outcomes. Thus, we intended to test the use of SNA to identify, describe, and evaluate the academic assistance networks within a Montessori school.

Purpose

The purpose of this study was to pilot a social network–based evaluation method to determine if a school committed to providing a whole-child approach to education was developing the supportive and egalitarian system it intended to build. By examining the academic assistance networks within a school, the study addresses the following research questions:

1. How cohesive are the academic assistance networks for English, math, social studies, science, and foreign language?
2. Who are the main sources of academic assistance in these networks?

3. Does difference in self-perceived knowledge level predict assistance ties for each subject?

These research questions reflect the evaluative purpose of the study and demonstrate what a school adopting this methodology for evaluation purposes would examine as part of its evaluation. As the principles of inclusion and community responsibility are a key focus for the target school, we anticipated that the students would have very dense networks for each subject (i.e., English, math, social studies, science, and foreign language) and that difference in knowledge levels would predict the variance in assistance ties for all subjects. We also anticipated upperclassmen to be the most important sources of assistance because their higher level of education and extended experience in the Erdkinder setting may make them more inclined to help others.

Methods

To address the research questions of this study, we collected social network data from an Erdkinder that was interested in exploring new evaluation tools. The school is a small, private setting composed of 23 students and eight teachers. The students span four grade levels (i.e., grades 9, 10, 11, and 12) but learn in combined classrooms. The eight teachers are responsible for their own specialty subjects but share responsibility in teaching the school's five main courses (English, math, social studies, science, and foreign language). Preliminary interviews with school administrators indicated that students interact openly with peers and teachers. In other words, students talk to each other freely and work collaboratively on multiple projects throughout the school day. Students also address teachers spontaneously rather than awaiting direct instruction. However, administrators were concerned that only a few students provide academic assistance. Further, administrators were curious whether teachers provide help outside of their designated subjects. Administrators encourage teachers to assist with subjects outside of their specialty; however, observations of daily teaching caused administrators to wonder if this cross-subject help takes place.

Network Survey and Data

Working with the school's administration and board of directors, we designed the School Academic Assistance Survey (SAAS), a social network survey. This instrument asked students and teachers to name the individuals to whom they had provided help in five subjects: English, math, social studies, science, and foreign language. Thus, the instrument collected relationship data for five assistance relationships. A multigrid roster displayed the survey items, with one column for each subject. This style of network survey prevents cognitive overload and lessens the time needed to complete the survey when compared to open-response questionnaires. The survey asked students and teachers to mark the name of (or *endorse*) anyone whom they helped at any time during the school day. However, the survey did not ask respondents to specify when or how often they helped because recalling these details is difficult for adolescents, and evidence suggests that respondents cannot recall patterns with a high degree of accuracy (Bernard, Killworth, & Sailer, 1982; Borgers, Hox, & Sikkel, 2003). This set of relational data will be referred to as the *I-Help* data.

The SAAS collected a second set of relationship data to increase the validity of the responses. Research indicates that some groups of students (particularly girls) will not be forthcoming about whom they help because of cultural expectations of modesty (Lent, Brown, & Larkin, 1984; Pajares & Schunk, 2001; Raby & Pomerantz, 2015). To improve accuracy, therefore, the survey used a second multigrid roster to capture who provided help to the participants. The SAAS asked students and teachers to endorse the names of everyone who had helped them in each of the five subjects, identifying additional ties that respondents may have overlooked. This second roster also addressed missing data when participants did not complete the survey. This set of relational data will be referred to as the *Helps-Me* data. The I-Help data and the Helps-Me data collected from the survey captured the complete academic assistance network within the school and account for potential underreporting of ties.

To acquire the independent variables, the SAAS asked respondents to rate their perceived knowledge of a subject. The item "How would you rate your knowledge level in the following subjects?" collected responses using a Likert-type rating scale ranging from *very low* to *very high*, and determined the

students and teachers who self-identified as the most and least knowledgeable. The descriptive data produced by this item determined whether perceived knowledgeableness predicts academic assistance ties. Similarly, at the request of the school and to address students' emotional well-being, the SAAS asked participants "How would you rate your comfort level with each of the following subjects?" The data from this item are included in the analyses discussed below but are not the focus of this study's research objectives.

The SAAS also used multiple-choice items to collect demographic data related to status and sex. Status indicated respondents' status as teacher or student, as well as students' grade level. This item yielded data needed to determine whether students and teachers assist others without regard to status, as Dr. Montessori intended (Kahn, 2011). Respondents' self-reported sex was a control variable in the analyses described below.

Coding. For the relational data collected from the I-Help portion of the SAAS, five adjacency matrices exist, one for each subject. As the survey asked respondents to indicate only whether or not a relationship existed, binary coding was used. For example, a value of 1 in the cell *i, j* indicated that actor *i* provided help to actor *j*. A value of 0 in cell *i, j* indicated that actor *i* did not provide help to actor *j*. We used the same procedures to code adjacency matrices for the Helps-Me portion of the SAAS. A value of 1 in cell *i, j* indicated that actor *i* was helped by actor *j*. A value of 0 in cell *i, j* indicated that actor *i* was not helped by actor *j*.

After coding, we compared the rows in the transpose of the Helps-Me matrices to the corresponding rows of the I-Help matrices. Any additional ties identified by the transpose of Helps-Me matrices were added to the actors' vector in the I-Help matrices. This step created the five network matrices this study used for data analyses (i.e., the *academic assistance network matrices*), in which a value of 1 in cell *i, j* indicated that actor *i* provided help to actor *j*, as endorsed by *i, j*, or both. Again, to acknowledge the well-documented phenomenon of female students downplaying their importance in school, this study used both sets of relational data to create the assistance network. For participants who consented to be in the study but who did not complete the I-Help network items, the transpose of their column in the Helps-Me matrices filled their row in the I-Help matrices. Following the coding of the relational data, the analyses also included each respondent's responses to the knowledge and comfort scales, as well as their self-reported sex.

Procedures and Analyses

The study received approval from our institutional review board in April 2016. The process of gaining consent began 1 week before data collection, and students and teachers completed the pen-and-paper surveys during school hours. Usable network-survey data were acquired from 20 students and seven teachers, roughly 87% of the school population. The survey responses were then coded and entered into a spreadsheet, and respondents' names were recoded as pseudonyms. As detailed in the previous section, responses to the network questions were used to create the academic assistance network matrices used in the analyses.

Each academic assistance network matrix was input into UCINET 6.596 (Borgatti, Everett, & Freeman, 2002), analytical software that specializes in SNA and that uses network matrices to calculate network measures and the strength of relationships. The program created one-mode network datasets for assistance in English, math, social studies, science, and foreign language. The respondents' descriptive variables were also input into UCINET to create a dataset of respondents' individual characteristics.

Network Measures

To answer the first research question (i.e., How cohesive are the academic assistance networks for English, math, social studies, science, and foreign language?), multiple measures assessed the degree to which the school was cohesive. For each subject's academic assistance network, we calculated *network density*. Network density is a measure of a network's interconnectedness and is determined by the

proportion of relationships that do exist to the number that could possibly exist. Because Erdkinders stress open interaction and group work, the network ideally is markedly interconnected. The density measures determine which of the five subjects are most and least dense so that the school can target its efforts to the appropriate subjects when trying to increase student interaction. Given that this study was the pilot for future studies, this density measure acted as a baseline measure for future network analyses.

Reciprocity, which was acquired using the reciprocity procedure in UCINET, also shows the school's cohesion, indicating how often students and teachers reciprocate the assistance given to them by others in the network. Students who rated themselves on the survey as having a lower level of knowledge of a subject expectedly may be less able to reciprocate the help they receive, specifically from the students who rated themselves as having a higher level of knowledge. Although this outcome is likely, understanding the reciprocity in the networks is important, as the connections between students may decay over time if help is not reciprocated.

To address the second research question (i.e., Who are the main sources of academic assistance in these networks?), *outdegree centrality* determined which participants provided the most assistance to others for the various subjects. Outdegree centrality measures the number of outgoing ties in a person's network; in other words, how many other people to whom a student or teacher provided assistance. Outdegree centralization was also calculated for each subject's network because of the school administration's concerns that students may depend too much on assistance from a single person. Outdegree centrality assessed the degree to which each subject's network revolved around one person, indicating whether those concerns were justified.

Multiple Regression Quadratic Assignment Procedures

A series of multiple regression quadratic assignment procedures (multiple regression-QAPs) answered the third research question, (i.e., Does difference in self-perceived knowledge level predict assistance ties for each subject?). Multiple regression-QAPs are commonly used in social network studies; they provide a means of running multiple regressions using dyadic rather than individual data. Multiple regression-QAPs involve conducting permutations of potential dyadic pairs to determine if a variable has a significant effect on whether a relationship would be observed. As Montessori principles assert that more-knowledgeable students should provide more help than less-knowledgeable students (Kahn, 2011), this analysis was chosen to determine if knowledge level is, in fact, predictive of the variance in the school's assistance ties. The results of the multiple regression-QAPs were presented to the school as an indicator of whether highly knowledgeable students provide help to less-knowledgeable students. A multiple regression-QAP was performed using all five academic assistance networks as dependent variables. Thus, five procedures created models in which assistance in English, math, social studies, science, and foreign language were the dependent variables.

The independent variables for the multiple regression-QAPs comprised participants' self-reported knowledge level and comfort level in each of the five subjects. In each model, sex was a control variable for the likelihood that people would assist others of the same sex. Status (i.e., participant's grade level or standing as a teacher or student) also was an independent variable in all regression models to test whether sharing the same grade level or position as student or teacher affected assistance ties. As the analyses used in this study were a series of multiple regressions of dyadic data, these individual-level variables had to be transformed into dyadic variables that define a relationship. Thus, the sex of a participant became a dyadic variable that was defined by whether participants were of the same sex. School status was defined by the difference between a participant's grade level and the grade level of every other person in the network, as well as the difference between being a student and being a teacher. Comfort and knowledge levels became dyadic for the analyses by expressing each participant's knowledge- and comfort-level rating as the quantitative difference between the knowledge- and comfort-level ratings of every other person in the network. Transformations of variables were conducted for all participants' ratings of their knowledge and

comfort levels for each subject, and the new dyadic variables were included in the regression model for each subject in addition to the dyadic variables for sex and status.

Results

English Assistance Network Measures

The English assistance network, as shown in Figure 1, had a density of .141, meaning that students and teachers reported participating in 14.1% of the assistance relationships that could exist in the network.

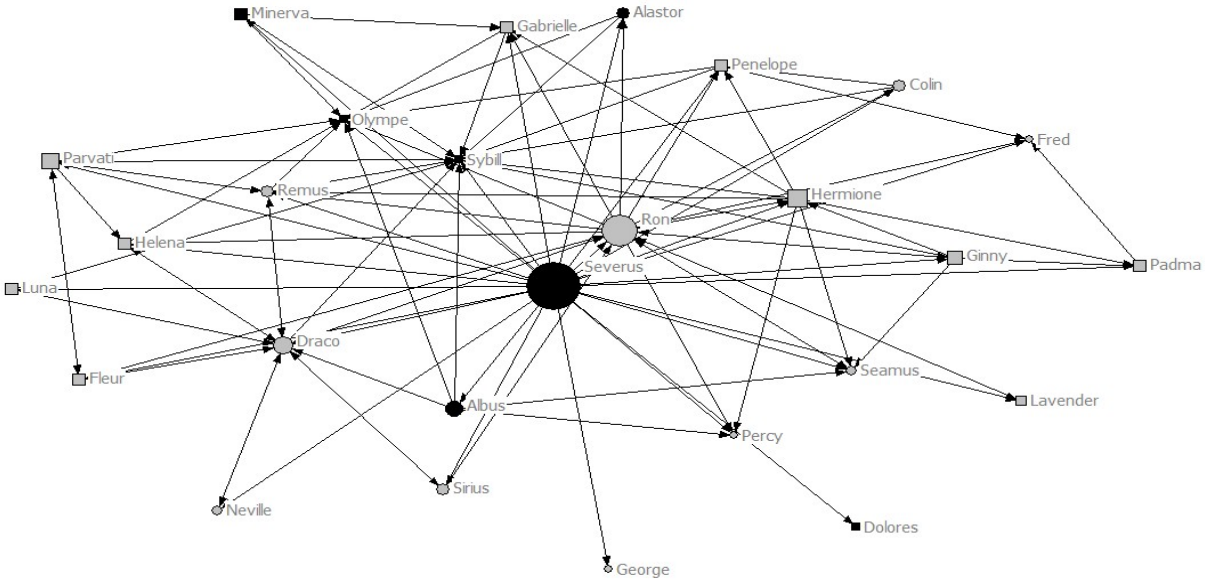

Figure 1. English academic assistance network. Teachers' names appear in black, and students' names appear in gray. Female subjects are represented as squares, and male subjects are represented as circles.

This percentage can be interpreted as low, as the subject school is a small school focused on collaborative work, and collaborative environments typically realize 30% of the network ties possible (Borgatti, Everett, & Johnson, 2013). However, it was not the lowest of the school's network densities, as Table 1 shows.

Table 1

Network Measures for the Five Academic Assistance Networks

Measure	English	Math	Social studies	Science	Foreign language
Density	.141	.120	.080	.171	.071
Reciprocity	.242	.333	.250	.387	.240
Average degree	3.667	3.111	2.074	4.407	1.852
Outcentralization	.892	.675	.436	.862	.325

The measure for reciprocity in the network was .242, meaning that just over 24% of the assistance ties for English were reciprocated. The average degree for participants was 3.667, meaning students gave or

received help from more than three others on average. Outdegree centralization was .892, meaning that the English network was highly oriented around one actor. These measures were unexpected, given that the school strives to be highly collaborative and encourages free interaction. Highly collaborative environments are expected to have more instances of reciprocity, a greater number of ties, and lower centralization (Borgatti et al., 2013). However, it is worth noting that these procedures are largely untested in secondary schools, particularly Montessori schools. Therefore, such networks have no established norms.

Table 2 displays the degree measures for each of the actors. The degree measure indicates that Severus, the English teacher, helped the greatest number of people in this network, with outgoing ties to 26 students and teachers. Student Ron followed, helping 16 other people. Science teacher Sybill received the most help from other teachers and students, getting help from 13 others. Foreign language teacher Olympe received help from 10 others. No graduating senior was among the most helpful actors for English.

Table 2

Actors' Outdegrees for the Five Academic Assistance Networks

	Network outdegree				
Actor	English	Math	Social studies	Science	Foreign language
Sirius	2.0	4.0	2.0	5.0	1.0
Luna	2.0	3.0	0.0	1.0	1.0
Ron	16.0	1.0	1.0	3.0	0.0
Parvati	5.0	4.0	0.0	4.0	1.0
Draco	7.0	2.0	8.0	26.0	4.0
Colin	2.0	2.0	0.0	0.0	1.0
Penelope	3.0	2.0	2.0	2.0	4.0
George	0.0	4.0	1.0	4.0	2.0
Lavender	1.0	2.0	2.0	3.0	1.0
Fleur	3.0	5.0	2.0	6.0	2.0
Padma	2.0	2.0	1.0	3.0	1.0
Seamus	1.0	3.0	0.0	1.0	0.0
Fred	0.0	4.0	0.0	1.0	0.0
Hermione	7.0	4.0	5.0	2.0	2.0
Percy	0.0	0.0	0.0	0.0	0.0
Remus	3.0	4.0	0.0	1.0	2.0
Neville	1.0	1.0	0.0	1.0	0.0
Ginny	4.0	0.0	3.0	5.0	0.0
Helena	2.0	3.0	2.0	3.0	1.0
Gabrielle	2.0	2.0	1.0	1.0	1.0
Olympe	0.0	0.0	0.0	0.0	8.0
Sybill	0.0	11.0	1.0	25.0	1.0
Alastor	2.0	20.0	2.0	17.0	3.0
Minerva	3.0	1.0	1.0	3.0	2.0
Albus	5.0	0.0	8.0	2.0	2.0
Severus	26.0	0.0	13.0	0.0	0.0
Dolores	0.0	0.0	1.0	0.0	10.0

Note. The names in the shaded rows are teachers' names.

Math Assistance Network Measures

Figure 2 displays the math assistance network. This network had a density of .120, as shown in Table 1. The reciprocity for the network was .333, meaning that a third of the assistance ties for math were reciprocated. The average degree for actors was 3.111: the actors sought or provided math help to an average of about three people. Outdegree centralization was .675, meaning that math was not as oriented around one actor as English was.

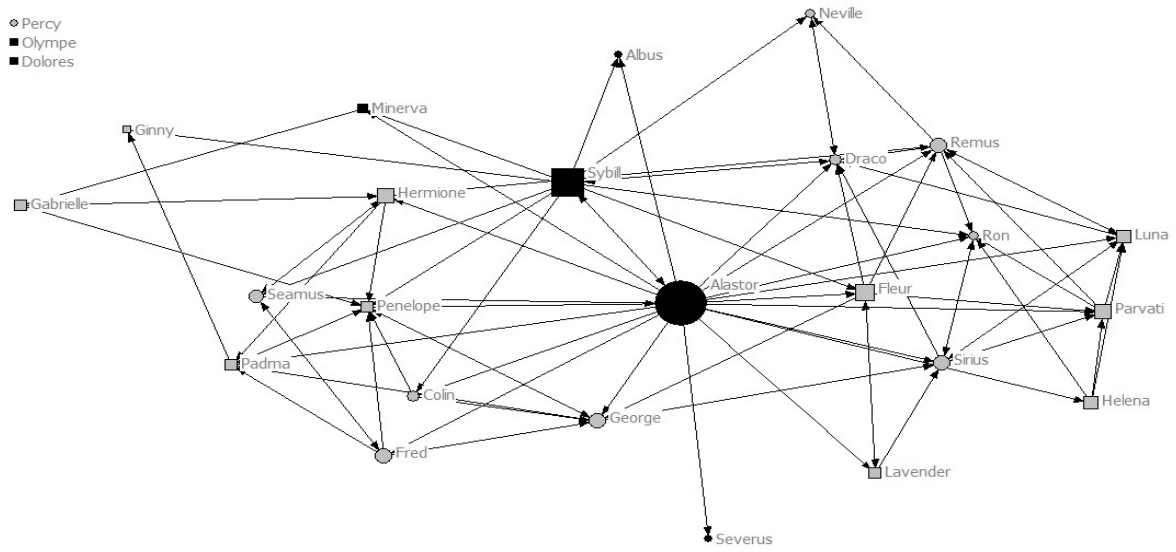

Figure 2. Math academic assistance network. Teachers' names appear in black, and students' names appear in gray. Female subjects are represented as squares, and male subjects are represented as circles.

Table 2 displays the degree measures for each of the participants. Alastor, the math teacher, and Sybill, the science teacher, assisted the greatest number of people in this network, at 20 and 11 peers respectively. Student Penelope assisted eight peers. No senior student was highly central in this network. Three participants (i.e., student Percy and foreign language teachers Olympe and Dolores) were isolates in this network and had no outgoing or incoming ties.

Social Studies Assistance Network Measures

Figure 3 displays the social studies assistance network, which had a particularly low density of .080. The reciprocity for the network was .250, meaning that just over 25% of the assistance ties for social studies were reciprocated. The average degree for actors was 2.074: students and teachers gave or received help from about two people. Outdegree centralization was .436, showing that the social studies network was not notably oriented around one person. As shown in Table 2, English teacher Severus (who often doubles as the social studies teacher) had the greatest number of outgoing ties, having helped 13 people. Teacher Albus and student Draco helped eight others. The individual with the greatest number of incoming ties was Draco, who received help from six others. Again, senior students were not central, neither giving help to nor receiving help from a large number of peers. The network had two isolates: student Fred and foreign language teacher Olympe.

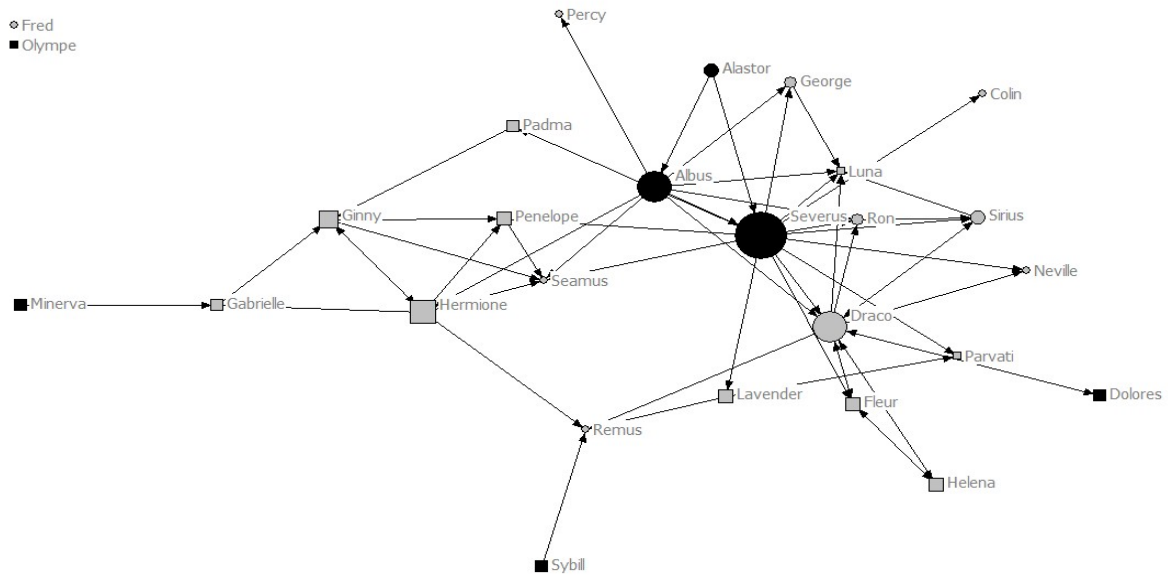

Figure 3. Social studies academic assistance network. Teachers' names appear in black, and students' names appear in gray. Female subjects are represented as squares, and male subjects are represented as circles.

Science Assistance Network Measures

Figure 4 displays the science assistance network which had the greatest network density of .171. The reciprocity for the network was .387, meaning that nearly 39% of the assistance ties for social studies were reciprocated. The average degree for actors was 4.407: students and teachers gave or received help to about four people. Outdegree centralization was .862, showing that the social studies network was more highly oriented around a single actor. As shown in Table 2, student Draco provided the most assistance, having helped 26 people. Science teacher Sybill helped 25 people. The participant who received the most assistance was also Draco, who was helped by 13 others. Again, senior students were not very central.

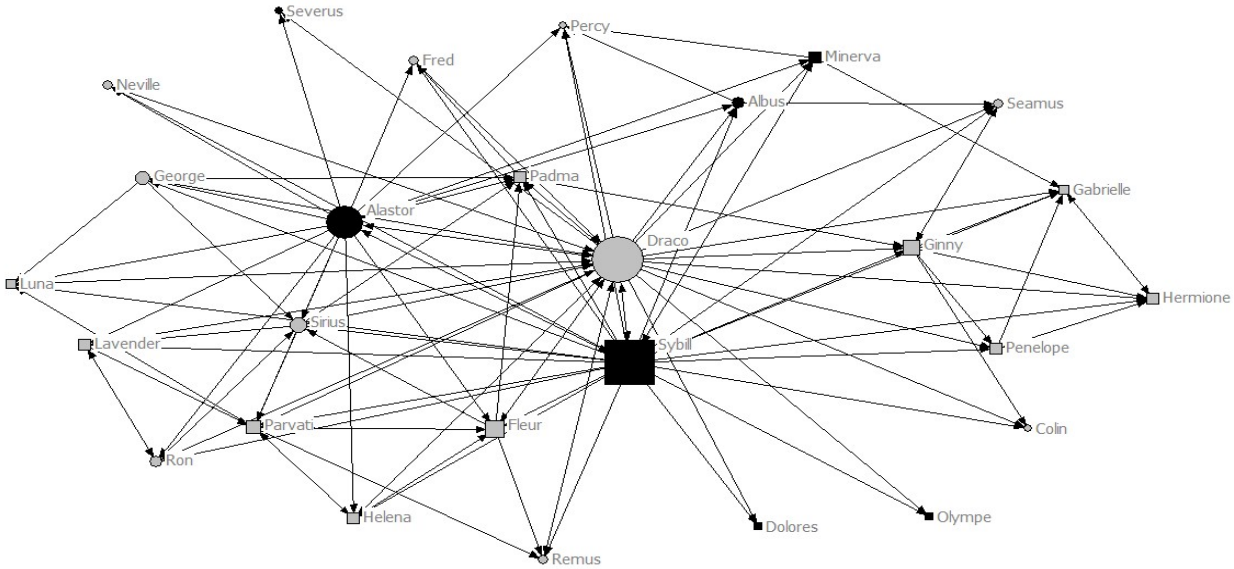

Figure 4. Science academic assistance network. Teachers' names appear in black, and students' names appear in gray. Female subjects are represented as squares, and male subjects are represented as circles.

Foreign Language Assistance Network Measures

Figure 5 displays the foreign language assistance network. This network had the lowest network density of .071. The reciprocity for the network was .240, meaning that 24% of the assistance ties for foreign language were reciprocated. The average degree for actors was 1.852: students and teachers gave or received help to fewer than two people on average. Outdegree centralization was the lowest of all networks at .352, showing the foreign language network was not particularly oriented around a single actor. As shown in Table 2, foreign language teacher Dolores provided the most assistance, having helped 10 people. Olympe, the other foreign language teacher, helped eight others. The actor with the greatest indegree centrality was Draco at 13.0. Again, senior students were not very central. This network had four isolates who neither provided nor received help in this subject.

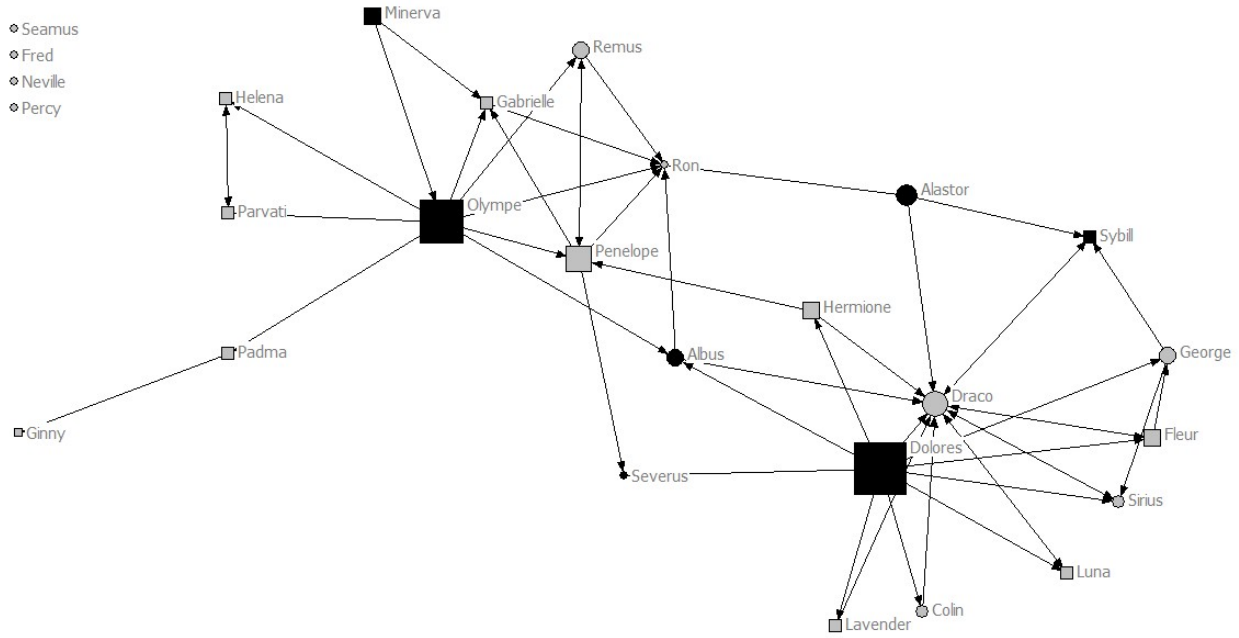

Figure 5. Foreign language academic assistance network. Teachers' names appear in black, and students' names appear in gray. Female subjects are represented as squares, and male subjects are represented as circles.

Multiple Regression-QAP Results

Multiple regression-QAPs included each of the academic assistance matrices as the dependent variable; thus, a model tested all five subjects. Each model included four independent variables: the same sex as matrix, the same status as matrix, the simple difference matrix for knowledge level in the respective subject, and the simple difference matrix for comfort level in the respective subject. Table 3 summarizes the results.

Table 3

Multiple Regression-QAP Results

Variable	English	Math	Social studies	Science	Foreign language
sameSEX	.038	.012*	.035	.047*	.013
sameSTATUS	.124***	.075	.006	.074*	.044
diffEng know	.034				
diffEng comf	.024				
diffMath know		.004			
diffMath comf		.013			
diffSoc know			.003		
diffSoc comf			.008		
diffSci know				.051	
diffSci comf				.012	
diffLang know					.025*
diffLang comf					-.008
R-squared	.057***	.015*	.008*	.057***	.016**

*p ≤ .05. **p ≤ .01. ***p ≤ .001.

English Results

The model had a significant R^2 of .057 ($p < .001$), explaining only 5.7% of the variance among the English academic assistance dyads. Differences in English knowledge did not have a significant effect on the expected number of cases of English assistance seen in 1,000 observations of individual *i* helping individual *j*. The variable for participants' school status had a significant coefficient of .124. Thus, sharing the same grade level or position in the school means 124 more instances of *i* helping *j* in English are expected in 1,000 observations, compared to when the individuals do not share the same school status. Differences in English comfort level and sharing the same sex were not significant.

Math Results

The model had a significant R^2 of .015 ($p = .01$), explaining only 1.5% of the variance among the math academic assistance dyads. Differences in math knowledge did not significantly influence the math assistance observed in the network. Sharing the same sex did have a significant coefficient of .012. When individuals are of the same sex, 12 more instances of *i* helping *j* in math are expected in 1,000 observations, compared to when the individuals are not of the same sex. Sharing the same school status and differences in math comfort level were not significant.

Social Studies Results

The model had a significant R^2 of .008 ($p = .05$), explaining only 0.8% of the variance among the social studies academic assistance dyads. Differences in social studies knowledge did not significantly affect the social studies assistance network. Sharing the same school status, sharing the same sex, and differences in social studies comfort level were not significant.

Science Results

The model had a significant R^2 of .057 ($p < .001$), explaining only 5.7% of the variance among the science academic assistance dyads. Science knowledge did not significantly influence the assistance ties observed, indicating that differences in science knowledge did not predict the number of science assistance cases observed in the network. Being of the same sex was significant in the model. Sharing the same sex means that 47 more cases of *i* helping *j* in science are expected in 1,000 observations. The coefficient for school status also was significant. Sharing the same school status means that 74 more cases of *i* helping *j* in science are expected in 1,000 observations. Differences in levels of science knowledge level and science comfort were not significant.

Foreign Language Results

The model had a significant R^2 of .016 ($p = .005$), explaining only 1.6% of the variance among the foreign language academic assistance dyads. The coefficient for difference in foreign language knowledge was significant, indicating that foreign language knowledge predicted the number of foreign language assistance cases observed. Therefore, with every one-unit increase in difference between two individuals' foreign language knowledge, 25 more cases of *i* helping *j* in foreign language are expected in 1,000 observations. The coefficient of .025 means that for every one-unit increase in difference in foreign language knowledge, the dependent variable will be .025 unit higher on average. Differences in foreign language comfort level, sharing the same sex, and sharing the same school status were not significant.

Discussion

The purpose of this study was to pilot a social network–based evaluation method to determine if an Erdkinder school was developing the supportive and egalitarian system it intended to build. To answer the first research question (i.e., How cohesive are the academic assistance networks for English, math, social studies, science, and foreign language?), we collected network data and acquired various network measures. The densities for all five academic assistance networks were lower than school administrators expected, given the school's small size and focus on collaboration. The science assistance network had the highest density measure at .171, while the foreign language network had the lowest at .071. Although no standard exists for the appropriate density for a Montessori school, administrators had hoped to see a density measure of at least .3, which is a more common value for collaborative organizations (Borgatti et al., 2013). The reciprocity measures indicate that most assistance ties were not reciprocated. Again, science had the highest measure at .387. Although Montessori principles explain why some students are less able to reciprocate the help they receive (Kahn, 2011; Montessori, 1973), the target school prefers students and teachers to be more involved with one another. These results show that the school is not as cohesive as administrators would like it to be, especially considering that some networks revealed isolated individuals who neither provided nor received help. We recommend that administrators encourage students to help each other more to achieve the desired close-knit, supportive environment. Foreign language has the most pressing need for intervention, as it had the lowest cohesion measures. The school may want to consider having these classes follow the example of the science classes by assigning foreign language group projects similar to ongoing science projects. These projects may give peers more opportunities to collaborate and to assist each another.

Regarding the second research question (i.e., Who are the main sources of academic assistance in the networks?), outdegree centralization and actors' outdegree centrality were calculated for each academic assistance network. For all subjects, designated subject teachers had the highest outdegree centrality and thus were the most important source of academic assistance in the networks. While this is expected in a traditional high school, students are expected to take the lead in Montessori schools, with teachers acting as supports (Rathunde & Csikszentmihalyi, 2005). Therefore, we recommend that the school have teachers relinquish some control over the assistance they provide and remind students of the value of their help to others. The school may also benefit from asking students about the challenges of giving and receiving help;

such an investigation may yield additional solutions. Among students, none of those with the highest outdegree centrality was a senior. Therefore, the school does not lose its most prolific sources of help to graduation. The outdegree centralizations for English and science were high, meaning that these networks depend heavily on one actor, likely because a single teacher or student provided most of the assistance. Encouraging students to help each other through peer mentoring or study groups may alleviate this issue.

Regarding the third research question (i.e., Does difference in self-perceived knowledge level predict assistance ties for each subject?), results for the series of multiple regression-QAPs showed that differences in perceived knowledge level were significant only for the foreign language network. However, even in this model, the explained variance was very low. The results of these analyses suggest that individuals do not display the assistance patterns expected under Montessori guidelines (Kahn, 2011), as perceived knowledge does not predict providing assistance to others. This may be because students relied heavily on subject teachers for help, students and teachers helped each other with little regard for their own talents, or students and teachers over- or underrated their own knowledge. We also recommend that school administrators work with students and teachers to recognize the unique talents and specific needs of both cohorts, as well as reinforce the responsibility members of each group have to share their talents with others. This goal could be reached via mentoring or other projects specifically oriented to students' talents and interests.

The multiple regression-QAPs also uncovered in English and science that being of the same role in the school—and for students, the same grade-level—was predictive of providing more assistance. Because the school aspires to be egalitarian and students should be helping one another regardless of their grade level, this preference for helping peers should not be present. In addition, the school should consider setting up multigrade peer partnerships and encouraging teachers to seek help from students. These strategies will encourage students to work more with students of other grade levels and will foster student independence.

Conclusions

This study was a pilot for using SNA to evaluate an Erdkinder; it provides a framework for other Montessori schools to evaluate the academic assistance networks in their schools. The techniques used in this study yielded valuable information for the target school's administration, showing that these concepts are applicable and appropriate for assessing this type of educational environment. The analyses described here show that the school successfully adheres to Montessori principles in some respects, such as with students helping teachers. However, there are also areas that may require attention. For example, school administrators could encourage students to rely less on subject teachers for assistance, and more-knowledgeable students should take on the responsibility of helping less-knowledgeable students. In identifying this result, we quantitatively confirmed school administrators' concerns about students' helping behaviors and provided evidence that the lack of help being provided is an issue that needs to be addressed.

One of the most positive aspects of this study is that it demonstrates how Montessori school leaders can identify the academic assistance networks already present in their schools, enabling schools to determine areas of strength and needs for improvement. Further, this method allows schools to identify individuals who are not very connected to the academic assistance networks and who may benefit, academically and socially, from becoming more closely connected to the school community. The possible implications for student academic success and possible reductions in negative social behaviors such as bullying and negative personal behaviors such as self-harm are worth examining at some point in the future (Bond et al., 2007; Langille, Asbridge, Cragg, & Rasic, 2015; O'Brennan & Furlong, 2010). Erdkinder administrators who are interested in the academic assistance networks present in their schools can implement a survey similar to this one and can conduct a similar analysis. The research questions in this study demonstrate how administrators can determine closeness in their school.

The implications for a school implementing the method described in this study go beyond identifying strengths and weaknesses in a school. Schools could use the data collected and the analysis

results to market themselves to prospective students and families. Schools could also use the data and outcomes in accreditation reporting and in grant applications.

Furthermore, implementing this method demonstrates how helpfulness, an aspect of the Montessori valorization process (Donahoe, 2010), can be quantitatively measured and evaluated within a school setting. For this analysis, helpfulness is the action of providing academic assistance, although the concept of helpfulness in an Erdkinder likely goes far beyond this one strategy. For example, helpfulness could refer to a student assisting another student with cleaning a classroom space or practicing for an extracurricular, such as theater or baseball. While the reduction of this concept to academic assistance omits these other forms of helpfulness and the strategy captures only a small component of the larger valorization process, the analysis begins to provide a means of measuring and quantitatively evaluating the valorization process. Additional work with the Erdkinder community and the inclusion of additional evaluation tools may lead to the development of a full Erdkinder evaluation system.

Although we worked to reduce the study's limitations, a few are worth noting. One limitation of this study is that a combination of two sets of network data was used to create the academic assistance networks. While using these two sets of data mitigated issues of students underrating their help to others for sociocultural reasons, the networks likely include multiple interpretations of help rather than a single idea. Future work will include investigating ways to gain an accurate network with the use of valued networks that indicate how often students and teachers provide help to one another.

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References

Akers, K. S. (2011). *Connections, paths, and explanations: A social network approach to investigating experiences of experiences of early childhood special education with the ECLS-K* (Doctoral dissertation). University of Kentucky, Lexington. Available from https://uknowledge.uky.edu/gradschool_diss/165/

Barker, D. (2011). A historical look at Montessori's Erdkinder. *Communications: Journal of the Association Montessori Internationale,* 1-2, 96–112.

Bernard, H. R., Killworth, P., & Sailer, L. (1982). Informant accuracy in social network data V: An experimental attempt to predict actual communication from recall data. *Social Science Research, 11,* 30–66. https://doi.org/10.1016/0049-089X(82)90006-0

Bond, L., Butler, H., Thomas, L., Carlin, J., Glover, S., Bowes, G., & Patton, G. (2007). Social and school connectedness in early secondary school as predictors of late teenage substance use, mental health, and academic outcomes. *Journal of Adolescent Health, 40,* 357.e9–357.e18. https://doi.org/10.1016/j.jadohealth.2006.10.013

Borgatti, S. P., Everett, M. G., & Freeman, L. C. (2002). *UCINET 6 for Windows: Software for social network analysis* (Version 6.96) [Computer software]. Lexington, KY: Analytic Technologies.

Borgatti, S. P., Everett, M. G., & Johnson, J. C. (2013). *Analyzing social networks*. Thousand Oaks, CA: SAGE.

Borgers, N., Hox, J., & Sikkel, D. (2003). Response quality in survey research with children and adolescents: the effect of labeled response options and vague quantifiers. *International Journal of Public Opinion Research, 15*(1), 83–94. https://doi.org/10.1093/ijpor/15.1.83

Casquejo Johnston, L. M. (2016). Examining Montessori middle school through a self-determination theory lens: A mixed methods study of the lived experiences of adolescents. *Journal of Montessori Research, 2*(1), 27–42. Retrieved from https://journals.ku.edu/jmr/article/view/4994

Coburn, C. E., & Russell, J. L. (2008). District policy and teachers' social networks. *Educational Evaluation and Policy Analysis, 30*(3), 203–235. https://doi.org/10.3102/0162373708321829

Daly, A. J. (2010). *Social network theory and educational change*. Cambridge, MA: Harvard Education Press.

de Laat, M., Lally, V., Lipponen, L., & Simons, R.-J. (2007). Investigating patterns of interaction in networked learning and computer-supported collaborative learning: A role for social network analysis. *International Journal of Computer-Supported Collaborative Learning, 2,* 87–103. https://doi.org/10.1007/s11412-007-9006-4

Donahoe, M. (2010). *Liberty and hope for the adolescent: Valorization of the personality.* Retrieved from the Cincinnati Montessori Secondary Teacher Education Program website: http://cmstep.com/wp-content/uploads/Valorization_of_the_Personality1.pdf

Forbes, S. H., & Martin, R. A. (2004, April). *What holistic education claims about itself: An analysis of holistic schools' literature*. Paper presented at the annual conference of the American Educational Research Association, San Diego, CA. Retrieved from http://www.holistic-education.net/articles/research04.pdf

Grazzini, C. (2004). The four planes of development. *The NAMTA Journal, 29,* 27–61. Retrieved from http://www.montessori-namta.org/PDF/4planesofdevelopment.pdf

Gutek, G. L. (2004). Introduction: A biography of Montessori and an analysis of the Montessori Method. In G. K. Gutek (Ed.), *The Montessori method: The origins of an educational innovation, including an abridged and annotated edition of Maria Montessori's The Montessori method* (pp. 1–66). Lanham, MD: Rowman & Littlefield.

Guthrie, J. T., & Davis, M. H. (2003). Motivating struggling readers in middle school through an engagement model of classroom practice. *Reading & Writing Quarterly, 19*(1), 59–85. https://doi.org/10.1080/10573560308203

Kahn, D. (2011). Eight pictures at an exhibition: A Montessori retrospective on the discovery of the adolescent. *Communications, 1-2,* 15–41.

Kahn, D., & Pendleton, D. R. (2007). *The whole-school Montessori handbook*. Burton, OH: North American Montessori Teachers' Association.

Langille, D. B., Asbridge, M., Cragg, A., & Rasic, D. (2015). Associations of school connectedness with adolescent suicidality: Gender differences and the role of risk of depression. *Canadian Journal of Psychiatry, 60,* 258–267. doi:10.1177/070674371506000604

Lent, R. W., Brown, S. D., & Larkin, K. C. (1984). Relation of self-efficacy expectations to academic achievement and persistence. *Journal of Counseling Psychology, 31,* 356–361. http://dx.doi.org/10.1037/0022-0167.31.3.356

Martinez, J. A., Sher, K. J., Krull, J. L., & Wood, P. K. (2009). Blue-collar scholars?: Mediators and moderators of university attrition in first-generation college students. *Journal of College Student Development, 50,* 87–107. doi:10.1353/csd.0.0053

Miller, J. P. (2010). *Whole child education*. Toronto, Canada: University of Toronto Press.

Miller, R. (1990). *What are schools for? Holistic education in American culture.* Brandon, VT: Holistic Education Press.

Montessori, M. (1973). *From childhood to adolescence: Including Erdkinder and the function of the university.* New York, NY: Schocken.

Montessori, M. (2011a). Principles and practice in education. *Communications: Journal of the Association Montessori Internationale, 11-12,* 50–60. (Reprinted from First Lecture, Institute of Medical Psychology, London, November 10, 1936.)

Montessori, M. (2011b). The physical and psychological development of the adolescent. *Communications: Journal of the Association Montessori Internationale, 1-2,* 67–72. (Reprinted from the 34th Lecture given at the 23rd International Course, Amsterdam, 1938.)

Montessori, M. (2011c). The adolescent: A social newborn. *Communications: Journal of the Association Montessori Internationale, 1-2,* 73–78. (Reprinted from the 37th Lecture given at the 23rd International Course, Amsterdam, 1938.)

North American Montessori Teachers' Association (2015). *Curriculum downloads*. Retrieved from http://www.montessori-namta.org/Curriculum-Downloads

O'Brennan, L. M., & Furlong, M. J. (2010). Relations between students' perceptions of school connectedness and victimization. *Journal of School Violence, 9,* 375–391. https://doi.org/10.1080/15388220.2010.509009

Pajares, F., & Schunk, D. H. (2001). Self-beliefs and school success: Self-efficacy, self-concept, and school achievement. *Perception, 11,* 239–266.

Pottish-Lewis, P. (2013). Standardized tests: Help or hindrance. *AMI/USA Journal, Winter,* 3–8.

Raby, R., & Pomerantz, S. (2015). Playing it down/playing it up: girls' strategic negotiations of academic success. *British Journal of Sociology of Education, 36,* 507–525. https://doi.org/10.1080/01425692.2013.836056

Rathunde, K., & Csikszentmihalyi, M. (2005). Middle school students' motivation and quality of experience: A comparison of Montessori and traditional school environments. *American Journal of Education, 111,* 341–371. http://www.jstor.org/stable/10.1086/428885

Scott, J. (2000). *Social network analysis*. Los Angeles, CA: SAGE.

Standing, E. M., & Havis, L. (1998). *Maria Montessori: Her life and work*. New York, NY: Plume.

Thomas, S. L. (2000). Ties that bind: A social network approach to understanding student integration and persistence. *Journal of Higher Education, 71,* 591–615. http://www.jstor.org/stable/2649261

Tornar, C. (2011). The secret of adolescence. *Communications: Journal of the Association Montessori Internationale, 1-2,* 113–120.

Wentzel, K. R. (1998). Social relationships and motivation in middle school: The role of parents, teachers, and peers. *Journal of Educational Psychology, 90,* 202–209. http://dx.doi.org/10.1037/0022-0663.90.2.202