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A Comparative Analysis of Applied Behavior Analysis and the Montessori Method

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A Comparative Analysis of Applied Behavior Analysis and the Montessori Method

THESIS

A thesis submitted in partial fulfillment of the
requirements for the degree of Master of Science in Education in the
College of Education
at the University of Kentucky

By
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Lexington, Kentucky
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2023

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ABSTRACT OF THESIS

A COMPARATIVE ANALYSIS OF APPLIED BEHAVIOR ANALYSIS AND THE MONTESSORI METHOD

The Montessori method is a multi-sensory curriculum design based on Dr. Maria Montessori's observations of the positive outcomes a multi-sensory educational approach had when working with children with disabilities; however, there is little empirical data to support the outcomes of using the Montessori method to teach children with disabilities. Despite the limited amount of quantitative research on the Montessori method and early childhood special education, studies suggest Montessori educators are open to professional development on working with children with disabilities and are willing to implement other methods to provide support for those children while still maintaining the integrity of the Montessori philosophy (Danner & Fowler, 2015; Long, Ferranti, & Westerman, 2022). Applied Behavior Analysis is a scientific approach to understanding behavior and serves as part of the foundation for developmentally appropriate practice in special education behavioral interventions; however, despite the evidence-based practices in ABA there are misconceptions about this approach among those in the Montessori community that impact its accessibility and use as an evidence-based practice to instruct children with disabilities in Montessori early childhood classrooms. This research examines the Behavior Analyst Certification Board's BCBA Task List, the Association of Montessori International's position statement on the Montessori method's core components, and the Montessori Accreditation Council for Teacher Education's position statement on core components of Montessori practice to identify similarities in practice between ABA and the Montessori method. Identifying similarities in practice could serve as a potential foundation for further investigation on (a.) the efficacy of implementing ABA interventions in a Montessori early childhood setting, and (b.) the efficacy of incorporating elements of a Montessori prepared environment into ABA clinical settings and self-contained special education classrooms.

KEYWORDS: Montessori method, Applied Behavior Analysis, Early Childhood Intervention, Inclusion

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CHAPTER 1. INTRODUCTION

Educational pedagogies are often reflections of contemporary culture. As such, these pedagogies are rooted in the values of the culture in which they emerge, as well as the practices that are considered by that culture to be of benefit for transferring knowledge. Within the field of early childhood education (ECE), there are numerous pedagogies that overlap and diverge with respect to the practices that are accepted and promoted (e.g., Waldorf, Reggio Emilia), as well as avoided. Some pedagogies may emphasize practices for promoting young children's creativity and exploration, whereas others may more heavily address practices for teaching academics. Given variations across these pedagogies, it is likely that the practices derived from each pedagogy may differ. It is in these areas of disagreement that pedagogies can be refined to ensure that resultant practices yield desired outcomes for young children and their families. As an example, the National Association for the Education of Young Children (NAEYC) published a position statement of developmentally appropriate practices in ECE that was viewed by the organization as encompassing all aspects of young children's educational needs, yet the statement presented limited considerations for children with disabilities (Shepley and Grisham-Brown, 2018). The field of early childhood special education (ECSE) responded with critiques of NAEYC's position statement (Carta et al., 1991), suggesting that a more robust set of practices should be considered to ensure that all children, regardless of ability or disability, will be successful in early childhood classrooms. Correspondence between representatives of the ECE and ECSE fields brought about a renewed effort within both fields to ascribe to more inclusive practices, which are now understood as *blended practice* (Grisham-Brown & Hemmeter, 2017).

Given the benefits derived from comparing educational pedagogies for supporting young children, I attempt to replicate such an analysis by examining the pedagogies and educational practices supporting two commonly utilized educational programs by families with young children: (a) Montessori-based education and (b) services based on the science of Applied Behavior Analysis (ABA). This is a timely comparison given (a) the rise in public Montessori schools and public Montessori charter schools since 2010 (Langhorne, 2019; National Center for Education Statistics, 2022; National Center for Montessori in the Public Sector, n.d.), (b) misconceptions of ABA practices among those outside the field of behavior science (Demchak et al., 2020), and (c) concerns about the historical application of ABA practices within therapy programs for individuals with disabilities (Anderson, 2022). It is my hope that a clear understanding of the ways in which the two pedagogies are aligned (and ways in which they are not aligned) can better support practitioners in both fields, as well as guide educational decisions for families with young children.

In the first section of this manuscript, I overview the history of each educational program and their relevance in contemporary society. Next, I present a rationale for why comparing these specific programs will benefit children, families, and practitioners. I then discuss the foundational philosophies and resultant practices that have emerged from each program, followed by the methods used to compare them. Finally, I present an analysis and discussion of findings, along with recommendations for how Montessori and ABA programs can simultaneously function and collaborate to support young children and their families.

CHAPTER 2. HISTORY

2.1 THE MONTESSORI METHOD

Dr. Maria Montessori was a 20th century Italian physician, psychologist, and anthropologist. Informed by her work with children living in institutionalized settings and the special education methods developed by Edouard Seguin, she developed an educational philosophy rooted in constructivist theory, multisensory learning, and experimental psychology commonly known as the Montessori method. For the purposes of this research, it is important to emphasize the influence Seguin's work had on Dr. Montessori's developing methodology. Based on his work with children living in institutions, Seguin theorized providing children with disabilities an education based in multisensory experiences would "improve the child's intellectual facility...therefore, educational practices [involving children with disabilities] were aimed at enhancing activity, intelligence and will" (van Drenth, 2015). Dr. Montessori observed the effectiveness this type of sensory education had on children with physical and intellectual disabilities, which then led her to theorize a system of sensorial learning for typically developing children (Nehring, 2014).

Ultanir (2012) explained constructivism in the context of Dr. Montessori's philosophy as a theory "constructed based on learners' previous experience and background knowledge" in which they "create or construct their own new understandings or knowledge through the interaction of what they already believe and the ideas, events, and activities with which they come into contact" (p. 195). Instead of rote learning and teacher-directed activity, the educational learning process in a Montessori classroom is often described as a self-guided exploration of materials and learning experiences (Ultanir, 2012; Lilliard, 2013). Dr. Montessori designed didactic (learning) materials for her classrooms based on her

observations and work with individuals with psychiatric disorders and developmental disabilities (Lilliard, 2013). She found the materials to be effective teaching tools when working with individuals with disabilities and reasoned typically developing children might also benefit. Dr. Montessori opened her first school, which she called a Children's House, in 1907 in a low-income area of Rome, Italy (Lilliard, 2013). Dr. Montessori (1949) described the school as follows:

“Our schools are like a furnished house, a ‘children’s house’. And what do the children do? It is what one does in one’s own house. They carry out work which has a practical aim, they sweep, dust, dress themselves, etc. In this house each one carries out his own work independently from the others; but if something occurs to one of them like knocking over a cup full of beads, or when there is any need for help in similar accidents, the other children are quick to assist.”

Her philosophies regarding child development and the child as a global citizen are too vast to cover in this paper, but two main components of her philosophy will be addressed as they pertain to early childhood education: (a) the teacher, and (b) the prepared environment.

2.1.1 The Teacher

In many ways, the teacher, and the prepared environment are one in the same. The teacher sets the culture and climate of the classroom through meticulous preparation of the environment (Lilliard, 1972; Montessori, 1964). In Montessori classrooms the teacher does not have a desk and does not direct children in their choices or movement; in fact, when the teacher has prepared the environment and the children are engaged in their work it should be as though the teacher does not exist except to assist the children as needed and give lessons

to individual children (Montessori, 1964). The expectation is for the teacher to speak in a quiet voice, spend much of her time observing, or be seated on the floor with a small group of children or at a table with one child giving lessons.

Dr. Montessori believed a child's self-regulation and discipline are attained through a process of *normalization* and an approach of *freedom within limits* that are maintained by the teacher's preparation of the classroom environment. Normalization occurs when a child can operate within the classroom without relying on the teacher to enforce rules or assist with activities (Montessori, 1967). Teachers observe to determine which behaviors are socially significant, acceptable, or destructive; this is a *freedom within limits* approach to classroom management. Dr. Montessori (1967) emphasized the teacher's ability to know when a child has achieved a level of self-discipline so they can be free to make choices with materials (i.e., carrying a tray with glass pitchers with care and coordination) is one of the most important roles of the teacher. For this reason, lessons in Practical Life (adaptive skills) are individualized based on a child's level of coordination, independence, and ability to concentrate.

Academic instruction is delivered to children on an individual basis using what Dr. Montessori refers to as the three period lesson, which is an instructional strategy of segmenting the teaching of a concept into three distinct parts. After instruction, the child is free to repeat the activity without interruption (Lillard, 1972). Dr. Montessori (1912) described the teacher's role as a guide who helps connect children with activities in which they have an interest and can do with some independence—that is, activities that are developmentally appropriate.

2.1.2 The Prepared Environment

Dr. Montessori (1967) believed a child's ability to concentrate lays the foundation for the development of other character virtues such as kindness, patience, and respect towards others. The child's interaction with the prepared environment is the path that leads to concentration, hence the importance of the teacher's role. The teacher is responsible for ensuring every learning material has its designated place on a shelf to create an atmosphere of order, beauty, and simplicity; the visual displays on the walls do not distract from the child's ability to choose work from the shelves; the shelves themselves have one of each material, complete with their pieces and parts, organized into the various areas of curriculum; containers that hold activities are made of natural materials with muted colors as to not overstimulate the child; items from nature, such as plants and classroom animals, are prominently and intentionally featured around the classroom; children's work is displayed at the child's eye level; the lighting in the room is natural or low; plates, glasses, and pitchers are made of glass and children use real utensils to prepare meals; child-size dish bins are prepared each morning for dishwashing after meals; cleaning supplies are available for children to clean spills; all supplies the child might need for academic work (e.g., cut paper, sharpened pencils, full glue bottles) are organized on the shelves so the child's concentration on a task is not interrupted because they cannot find the necessary supplies.

Classrooms are composed of mixed age groups, and the physical design consists of wooden furniture and materials made entirely for children to use so that nothing is off limits; the children can interact with their environment without interruption or the need for an adult (Montessori 1912). Each material has a built-in *control of error*, a self-correcting feature of the work that provides a visual prompt when the child using it has made a mistake. The

materials provide a scaffolding effect in that they progress from simple to complex, concrete to abstract, and are limited to one of each [material] per classroom (Lillard, 1972; Montessori, 1967). When there is only one of each activity, the children are taught to wait for their turn or how to ask to join a lesson with another child. When the children have undergone the process of normalization, they have developed the self-control needed to wait for their turn, make requests using appropriate language, and the ability to concentrate on a task. The children can assume responsibility for keeping the classroom beautiful and orderly (Lillard, 1972).

2.1.3 Adoption of the Montessori Method

Dr. Montessori's classrooms quickly spread across Europe in the early 1900s but did not fall into mainstream western systems of education until the 1950s and 60s. Even then, the specialized set of materials and teacher training required in Montessori classrooms did not align with current trends in developmental child psychology and education, and so Montessori classrooms in the United States became more common in peripheral private schools (University of Connecticut, n.d.).

Today, Montessori classrooms are increasing across the United States, with programs that provide public education services (i.e., programs that receive federal or state funding) having increased from 200 schools in the year 2000, to 500 schools in the year 2018 (U.S News and World Report, 2018). According to the National Center for Montessori in the Public Sector, over half of the Montessori schools operating in the United States opened within the last 10 years, indicating a growing interest in the Montessori method among families with young children (Begin, 2014). An article from Forbes magazine (2019)

reported that of the 168 “free-standing” (i.e., not housed in another school) public Montessori schools, 82% of those were public charter schools. Coincidentally, the National Center for Education Statistics (2022) shows the number of public charter schools rose 3% between 2010 and 2020, though more research is needed to explore any relationship between the rise in public Montessori schools and public charter schools. Furthermore, the American Montessori Society estimates that there are approximately 5,000 Montessori programs across the nation that include both publicly and privately funded classrooms (American Montessori Society, n.d.). It should be noted that there are challenges to identifying an exact number of Montessori programs in operation due to (a) differences across Montessori-accrediting organizations, (b) the housing of Montessori classrooms within schools that support various pedagogies, (c) and schools that may be ‘Montessori-inspired’ yet not officially accredited (Ackerman, 2019). Recent estimates from the National Center for Education Statistics (2017) suggest that there more than 127,000 children enrolled in Montessori classrooms across the United States.

2.2 APPLIED BEHAVIOR ANALYSIS

Applied behavior analysis is a scientific process that suggests understanding and predicting human behavior can be done in a scientific and systematic process (Baer, 1968). McNiven and Blevin (2016) describe ABA as “the science of learning and behavior and utilizes general ‘laws’ pertaining to how behavior works and how learning takes place in an environment” (p. 3). The advocacy group Autism Speaks describes ABA as a treatment to help decrease interfering behaviors and increase “useful or desired” behavior (Autism Speaks, n.d., McNiven & Blevin, 2016, p. 3). Within ABA, *behavior* can be defined as the “portion of an organism’s interactions with its environment that involves movement of some

part of the organism” (Johnston & Pennypacker, 2009, p. 31 as quoted in Cooper, 2020). Practitioners in ABA approach modifying behavior based on an understanding of operant (behavior strengthened or weakened by consequences) and respondent (adaptive, physiological behavior in response to a stimulus) behaviors interacting with the environment (Sturmev, Ward-Horner, & Marroquin, 2007). The *environment* according to Johnston and Pennypacker (2009) refers to “the full set of physical circumstances in which the organism exists” and it is “comprehensive in that any facets of the physical world may be considered for their contribution to behavior.” A key characteristic of ABA is a focus on discovering environmental variables that lead to improvements in socially significant behaviors for an individual (Cooper, 2020). Therefore, ABA seeks to improve meaningful behaviors for an individual by changing how that individual interacts with their environment or by changing the environment to better support the individual’s behavior.

Fuller (1949) published the transitional piece of research on human operant behavior that served as the springboard for ABA becoming a legitimate practice to guide behavior intervention. In his research, Fuller (1949) used operant conditioning to successfully teach arm movements to an individual with profound physical disabilities. Morris et al. (2013) documents a series of studies that followed Fuller’s research which utilized operant conditioning interventions to increase a variety of skills ranging from improving children’s cooperation (Azrin & Linsley, 1956), reducing bedtime temper tantrums (Williams, 1959), and improving an adult’s stutter (Flanagan, 1958). In the initial years of experimental behavior analysis, researchers did not always identify socially significant behaviors to study; however, as the practice continued to be refined in the coming decades, researchers would come to understand the ethical importance of targeting behaviors that would improve the

lives of individuals (Morris et al., 2013). The evolution of ABA in practice today is a result of the acknowledgement of human behavior as a complex system that requires a holistic approach to understanding an individual's experience in the world before attempting to change their behavior (Heward et al., 2022). For example, Rohrer and Weiss (2022) studied the impact of "soft skills" training for students of ABA which taught "compassionate skills" that promoted empathy from students when working with families.

2.2.1 Early Childhood Education and ABA

Contemporary ABA methods are documented in a wide variety of disciplines and are considered an evidence-based practice that are effective in classroom behavior management and instructional interventions (Twyman, 2013). The prevalence of ABA practices used in ECSE can be traced back to the seminal piece of research by Hart and Risley (1968) that studied the impact of incidental teaching strategies (an ABA practice that expands on a child's existing language ability) on children's communication acquisition (Shepley & Grisham-Brown, 2018). In response to the Hart and Risley (1968), the field of ECSE saw tremendous growth in the 1980s, with renewed attention to assessment and intervention (Shepley & Grisham-Brown, 2019). The alignment between ECSE and ABA methods lay in each field's focus on (a.) individualized, single-case research design methods, (b.) intervention implementation fidelity to ensure the intervention is responsible for any change in behavior, (c.) research and data-based decision making when selecting interventions for individual children, and (d.) relationships with families and children (Strain et al., 1992, as cited in Shepley & Grisham-Brown, 2018). Chandler et al. (2012) document the changes in

ECE and ECSE teacher preparation standards beginning in 1983 (p. 52) that reflect this alignment, citing the focus on teacher competency in evidence-based intervention implementation and assessment.

CHAPTER 3. STUDY RATIONALE

Comparing the pedagogies of Montessori education and ABA has practical implications for teachers and providers who work with young children with disabilities and their families who are making decisions about their child's education. Educational services derived from the pedagogies of ABA and Montessori encompass well-established practices that, despite their age (1968 and 1907, respectively), remain relevant in contemporary educational environments. For that reason, the scope and sequence of each method must be understood to honor the integrity of those practicing in the field of ECE. In addition, changes in federal laws and movements from professional organizations have resulted in an educational landscape that is much different than when ABA and Montessori programs were initially developed. For this reason, the onus falls to practitioners from each field to explore ways to broaden the scope of practice in order to meet the needs of families and satisfy requirements from federal agencies.

The Least Restrictive Environment clause of the Individuals with Disabilities Education Act requires public schools to provide learning environments that allow students with disabilities to learn alongside peers without disabilities (U.S. Department of Education, n.d.). A study by Long et al. (2022) surveyed 80 accredited Montessori programs to determine the representation of children with disabilities enrolled. The survey reported that 3.75% of children with disabilities who received Montessori education were infant and toddler age and 8.49% of children with disabilities enrolled in Montessori programs were preschool and Kindergarten age. These results align¹ with the Office of Special Education Program 2019-20 report on the number of children with disabilities served under Part B and

C of IDEA (OSEP, n.d.). The authors report that despite Montessori programs not having the funding stream or legal requirement to identify and enroll children with disabilities (c.f., *child find*), Montessori administrators and teachers felt “somewhat confident” or “confident” when working with this population and are committed to inclusive education (Long et al., 2022).

However, oftentimes a child’s challenging behavior creates a stressful learning environment and renders the teacher’s instruction ineffective, regardless of the type of classroom where learning occurs. It is at this point the practitioner benefits from an understanding or proficiency in implementing strategies that address challenging behavior. Regarding children with ASD in public school systems, Barnett et al., (2021) report public school administrators are knowledgeable of the research base of ABA practices that address challenging behaviors and instructional strategies but lack the financial and personnel resources to provide sufficient professional development in ABA strategies or to hire qualified ABA professionals.

A 2015 study by Danner and Fowler that compared Montessori and non-Montessori teacher experience working with children with disabilities found that of the 82 Montessori teacher participants, 82% of those had experience teaching children with disabilities as compared to 99% of the 168 non-Montessori teachers. The Montessori teacher participants rated themselves “less knowledgeable about inclusion” than the non-Montessori teachers (Danny & Fowler, 2015). Most non-Montessori teachers have college-level special education course work as part of their teaching certification program, whereas accrediting organizations like the Montessori Accreditation Council for Teacher Education (MACTE) do not require teacher preparation programs to include special education courses in their teacher

certification curriculum (MACTE, 2018)². This has implications for families deciding where to send their young child particularly if the child is at risk for, or diagnosed with, a disability. Regarding implications for public Montessori programs, Block (2015) argues the importance for teachers to have certifications in the Montessori method and state teaching credentials to implement Montessori [and state testing standard] methods with fidelity. Despite the small body of literature on Montessori methods for serving children with disabilities, studies suggest Montessori educators are open to professional development on working with children with disabilities and are willing to implement other methods to provide support for those children while still maintaining the integrity of the Montessori philosophy (Danner & Fowler, 2015; Long et al., 2022).

In a similar vein, although there is a lack of quantitative research to demonstrate the extent to which the Montessori method is effective when working with children with disabilities, there is literature which describes Montessori practices that align with the evidence-based practices used in ECSE, ABA, and inclusive settings (Long et al., 2022; Pickering, 2019; McKenzie et al., 2021; Dattke, 2014). Pickering and Lane-Barmapov (2019) describe specific practices of ABA that are effective when working with children with ASD in a Montessori classroom and Montessori practices that can be modified when working with these children. For example, the Montessori practice of allowing the child to repeat an activity as many times as they choose may not be appropriate for a child who fixates on certain aspects of the activity at the expense of participating with other materials and activities to learn new skills (Pickering & Lane-Barmapov, 2019). Ender and Ozcan (2019) surveyed 134 special education teachers to identify aspects of the Montessori method the teachers believed they could effectively implement in their classrooms. Teachers felt the

most unsure of how much independence to allow children, in that many activities in a Montessori classroom require a level of independence children with severe disabilities do not have the capacity to successfully achieve; very little exists in the literature on procedures for implementing the Montessori method in these circumstances. It should be noted that there have been some suggestions for an inclusive Montessori model (Datkke, 2014), but much work remains. Ender and Ozcan (2019) suggest there is value in implementing the Montessori method when working with children with disabilities but note the lack of training as an obstacle for teachers not trained in the Montessori method. The 2015 adoption of Every Student Succeeds Act (ESSA) incentivized public and private early childhood programs, including Montessori AMS and AMI teacher preparation programs, to address ways in which teachers can create inclusive learning environments and contributed to the growing momentum in the Montessori community to facilitate full inclusion in Montessori programs (McKenzie et al., 2021).

Given the (a) rise in public and private Montessori schools since the year 2000, (b) initiatives in the Montessori community to create more inclusive classrooms, (c) evidence to support positive outcomes for children with ASD and other disabilities who receive ABA services, and (d) the growing demand for ABA services in the United States, I will examine the congruence between ABA and Montessori practices that, when clearly defined, will support the ABA therapist and the Montessori classroom teacher in identifying areas for growth and areas of shared competency.

CHAPTER 4. METHOD

4.1 IDENTIFICATION OF PRACTICES FOR COMPARISON

My research compares selected practices of the Montessori method of education and ABA services. The practices of each field are not limited to those discussed in this paper; instead, I chose to compare those practices that pertain to educational services provided in an early childhood classroom. My analysis will look at the practices of ABA and Montessori to identify areas where the two methods do, and do not, align. Identifying areas where both fields can borrow from each other can potentially strengthen practitioners' instruction when working with young children and their families. Chandler et al. (2012) provides guidance for addressing the value of comparing different educational standards and the areas where they do not align. For example, Chandler et al. (2012) explicitly states the purpose of their comparison of standards from multiple early childhood organizations is to serve as a guide for professional development programs. In other words, identifying commonality demonstrates how standards from different organizations can complement each other and strengthen educational practices.

4.1.1 ABA Practices

Selected ABA practices come from the 5th edition Task List (Behavior Analyst Certification Board [BACB], 2017) for Board Certified Behavior Analysts (BCBAs). Based on principles of scientific inquiry as it pertains to understanding behavior, the BACB provides pre-service BCBAs with a task list to guide the scope of their professional practice; therefore, given its prominent role in setting guidelines for best practices in the field, the BACB task list was chosen as a seminal publication from which to select ABA

practices. The BCBA task list conveys foundational knowledge that a BCBA should hold, as well as practice-based knowledge to support the implementation of ethical assessment and intervention procedures in clinic, classroom, or home settings. BCBAs can help convey this knowledge to classroom teachers by providing training and consultation when creating classroom learning goals for a child. Given the focus of this study on comparing practices specific to ECE and classroom application, selected practices were from the BCBA task list sections of *Behavior Assessment*, *Behavior-Change Procedures*, and *Selecting and Implementing Interventions* (see Table 1).

4.1.2 Montessori practices

Lillard and McHugh (2019) define authentic Montessori practices as those described in Dr. Montessori's lectures and writings that she continued to espouse until the end of her life. It is in these lectures and writings that practitioners find specific instructions on how to prepare the environment, make observations of the child, and how to use the materials (Montessori, 1949, 2004, 1973). Authentic Montessori practice follows a "trinity" of core components: the child, the prepared environment, and the teacher (Lillard & McHugh, 2019, p. 3). The American Montessori Society (AMS) identifies five core components of the Montessori method that global accrediting organizations such as MACTE use to ensure quality and consistency in their accreditation process (Lillard & McHugh, 2019): (a) trained teachers, (b) multi-age classrooms, (c) Montessori materials, (d) child-directed work, and (e) uninterrupted work time (see Table 2), (AMS, n.d.; Long et al., 2022). Specific practices within each tenet (see Table 1) were taken from the MACTE (2018) accreditation guide which contains recommended Montessori practices teachers must demonstrate before

receiving their Montessori certification. These components of the Montessori method connect practitioners to Dr. Montessori's publications and lectures, in which she describes these tenets in detail and specifically defines how to apply them when working with children.

CHAPTER 5. ANALYSIS

There are several frameworks in the literature to conduct a comparative analysis of educational pedagogies, practices, and standards (Cattaneo, 2017; Chandler et al., 2012; ECPC, 2010; Long et al., 2021; McLean & Odom, 1993; Slayton et al., 2012) which helped create the criteria I used to determine if practices were aligned. For example, unlike Slayton et al. (2012), two practices being compared did not have to contain identical wording for there to be alignment. Adopting a framework used by Long et al. (2022) to match core tenets of the Montessori method with best practices recommended by the DEC's Council for Exceptional Children (Long et al., 2022), my analysis embeds practices in ABA alongside the core components of Montessori and vice versa in order to conduct a comparison of the individual practices within each discipline. Practices were found to be aligned when they were perceived to be based on the same theoretical or philosophical concept behind the practice.

To account for the lack of literature comparing ABA and the Montessori method, I identified professionals in the fields of behavior analysis and Montessori education to provide additional perspective and feedback on the analysis (See Tables 1 and 2). Those invited to participate included a private consultant to Montessori schools; a Montessori teacher educator and contributing author to literature on Montessori education and inclusive classrooms; a former school director, Montessori certified teacher, and BCBA; and Long (2022), a professor in the field of Early Childhood Development who also co-authored research cited throughout this paper. The initial email sent to these professional reviewers outlined the nature of my research, the specific section they were being asked to review, and a sample of the analysis tables (See Tables 5.3 and 5.4). Each reviewer gave their permission

for the comments to be used in the final manuscript; because this research did not involve human subjects for analysis, approval from the Internal Review Board was not required. Each reviewer received a document containing my initial analysis and an area to provide written feedback about the extent to which they agreed or disagreed with my perceptions of each practice's alignment. Once the feedback was returned, the data was de-identified by my advisor and then shared with me. Based on the extent to which I agreed with the comments, I revised my analysis. For example, in the analysis I suggested there was no alignment between the Montessori practice of *Uninterrupted Work Time* and any ABA practice. The professional reviewers also saw no alignment; thus, that portion of the analysis was not revised. Alternatively, I suggested there was alignment between the ABA practice of discrete trial training and the Montessori practice of adapting lessons to isolate a specific skill; however, there was no consensus among the professional reviewers to the extent these aligned. In instances where no consensus was reached between the professional reviewers regarding a particular practice, I revised that section based on my interpretation of the feedback received (e.g., regarding the previous discrete trial training example, I did not revise the initial analysis but instead used the conflicting feedback to inform points raised in the discussion section). Similarly, for practices where I perceived no alignment between ABA and Montessori practice, but the feedback from the professional reviewers did, I revised that section based on my interpretation of the feedback received. The issues raised through this method of analysis will be addressed in the Limitations section of this paper.

5.1 POSITIONALITY STATEMENT

I hold an early childhood teaching certificate from AMS and work with a child diagnosed with autism spectrum disorder who attends a Montessori school. These factors influence the credibility and trustworthiness of this research; however, they play a significant role in my interpretation of ways in which the Montessori method and ABA align. In addition, I am presently completing coursework to obtain a Master's in Education degree with a focus in Interdisciplinary Early Childhood Education. As a predominant part of my coursework, I have completed multiple classes in ABA. These courses are part of a verified course sequence that is approved by the Association for Behavior Analysis International, which is a requirement for ABA programs that are preparing graduates to sit for board certification as a behavior analyst.

5.2 PERCENTAGE CALCULATIONS

Percentages of alignment were calculated to indicate the extent to which the Montessori method and ABA were aligned. For the Montessori method, the percentage was calculated by (a) identifying the total number of Montessori practices as the denominator, (b) identifying the number of Montessori practices for which at least one ABA was aligned as the numerator, (c) dividing these numbers, and (d) multiplying by 100. For example, and as a preview of the results, of the 22 Montessori practices that were identified (denominator), there were at least 15 practices (numerator) with which at least one ABA practice was aligned. Therefore, the percentage of alignment was 68%; which indicates that 68% of ABA practices were aligned with at least one Montessori practice. This same formula was used to calculate the alignment of ABA practices. Future research could validate these percentage calculations by conducting a similar comparative analysis between ABA and the Montessori

method and analyzing those results; the calculations in this research were not validated against any known alignment studies.

Table 5.3 Montessori Practices and their Alignment with ABA

Tenets of Montessori Method	Montessori Practices ^a	ABA Practices
Montessori Materials	Presentation of a material is designed to isolate a specific skill	Use discrete-trial, free-operant, and naturalistic teaching arrangements; Use stimulus and response prompts and fading (e.g., errorless, most-to-least, least-to-most, prompt delay, stimulus fading) Use modeling and imitation training; Use instructions and rules; Use shaping; Use chaining;
	The materials are arranged in the classroom and sequenced from simple to more complex, concrete to more abstract.	Use procedures to promote stimulus and response generalization; Interpret functional assessment data
	The materials are designed with “control of error” so the child can self-correct his work	Use shaping; Use chaining; Use positive and negative reinforcement procedures to strengthen behavior
	Materials are hands-on and open-ended to allow variations of use and accommodations for different children	Use chaining
	Materials make up the curriculum for language, math, science, geography, sensorial, art, music, and practical life	No alignment
	Any supplemental materials adhere to Montessori standards of simplicity, beauty, and order ^a	Use procedures to promote stimulus and response generalization; Use discrete-trial, free-operant, and naturalistic teaching arrangements; Use stimulus and response prompts and fading (e.g., errorless, most-to-least, least-to-most, prompt delay, stimulus fading)
	The Montessori materials make up curriculum that aligns with	No alignment

	early childhood state standards ^a	
Child-Directed Work	Children choose work activities based on their interests and abilities	Use discrete-trial, free-operant, and naturalistic teaching arrangements; Conduct preference assessments Conduct assessments of relevant skill strengths and deficits
	Children are free to repeat a work as many times as they choose	Use discrete-trial, free-operant, and naturalistic teaching arrangements; Conduct preference assessments; Conduct assessments of relevant skill strengths and deficits
	A child may explore different aspects of the materials to satisfy their interests and needs	Conduct preference assessments; Conduct assessments of relevant skill strengths and deficits
Multi-Age Classrooms	Multi-age classrooms allow peer-to-peer teaching and learning opportunities.	Use positive and negative reinforcement procedures to strengthen behavior; Use interventions based on motivating operations and discriminative stimuli
	Classrooms are equipped with materials to support inclusion of all abilities and developmental needs.	No alignment
Uninterrupted Work Time	Enrichment subjects such as art, music, and recess are integrated into classroom work choices so there is no transitioning to special classes	No alignment
	Children may repeat the use of a material as many times as they choose during the work time	Use positive and negative reinforcement procedures to strengthen behavior; Use interventions based on motivating operations and discriminative stimuli
	Children may initiate new activities independently and/or request lessons with a teacher	Use positive and negative reinforcement procedures to strengthen behavior; Use interventions based on motivating operations and discriminative stimuli

	Children work uninterrupted to grow concentration skills, order, and independence in their activities	No alignment
Trained Teachers	Teachers are trained to observe children during uninterrupted work time to develop individualized learning plans based on a child's interests	Conduct assessments of relevant skill strengths and deficits Conduct preference assessments; Recommend intervention goals and strategies based on such factors as client preferences, supporting environments, risks, constraints, and social validity
	Teachers are responsible for preparing the environment by providing children with a complete set of Montessori materials and ensuring children have access to supplemental materials (pencils, scissors, paper, etc.)	Use discrete-trial, free-operant, and naturalistic teaching arrangements; Establish and use conditioned reinforcers; Use chaining; Use instructions and rules
	Teachers are trained to assess the child's interests and developmental readiness in order to give presentations of each material to individuals or small groups of children	Conduct assessments of relevant skill strengths and deficits
	Teachers are trained to give presentations of the Montessori materials based on the child's interest, needs, and writings of Dr. Montessori.	No alignment
	Teachers are trained to work collaboratively with family or caregivers to support the child's development	Recommend intervention goals and strategies based on such factors as client preferences, supporting environments, risks, constraints, and social validity; Collaborate with others who support and/or provide services to clients
	Teachers are trained to do qualitative assessments based on observation and documentation to inform instruction	Recommend intervention goals and strategies based on such factors as client preferences, supporting environments, risks, constraints, and social validity; When a target behavior is to be decreased, select an acceptable

		alternative behavior to be established or increased; Plan for possible unwanted effects when using reinforcement, extinction, and punishment procedures
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Note. ^arefers to practices specified by Montessori in the Public Sector (2019) (Lillard & McHugh, 2019; Long et al., 2022; American Montessori Society, n.d.; Montessori Accreditation Council for Teacher Education, n.d.)

Table 5.4 ABA Practices and their Alignment with Montessori

BCBA Task List Sections	ABA Practices	Montessori Practices
Behavior Assessment	Review records and available data (e.g., educational, medical, historical) at the outset of the case	No alignment
	Determine the need for behavior-analytic services	No alignment
	Identify and prioritize socially significant behavior-change goals	No alignment
	Conduct assessments of relevant skill strengths and deficits	Teachers are trained to observe children during uninterrupted work time to develop individualized learning plans based on a child's interests
	Conduct preference assessments	Teachers are trained to observe children during uninterrupted work time to develop individualized learning plans based on a child's interests
	Describe the common functions of problem behavior	No alignment
	Conduct a descriptive assessment of problem behavior	Teachers are trained to work collaboratively with family or caregivers to support the child's development; Teachers are trained to do qualitative assessments based on observation and documentation to inform instruction
	Conduct a functional analysis of problem behavior	No alignment
Behavior Change Procedures	Interpret functional assessment data	Teachers are trained to do qualitative assessments based on observation and documentation to inform instruction
	Use positive and negative reinforcement procedures to strengthen behavior	The materials are designed with "control of error" so the child can self-correct his work; Teachers are trained to assess the child's interests and developmental readiness in order to give presentations of each material to

		individuals or small groups of children;
	Use interventions based on motivating operations and discriminative stimuli	Teachers are trained to do qualitative assessments based on observation and documentation to inform instruction; Teachers are trained to assess the child's interests and developmental readiness in order to give presentations of each material to individuals or small groups of children
	Establish and use conditioned reinforcers	Teachers are trained to assess the child's interests and developmental readiness in order to give presentations of each material to individuals or small groups of children; Teachers are responsible for preparing the environment by providing children with a complete set of Montessori materials and ensuring children have access to supplemental materials (pencils, scissors, paper, etc.); Teachers are trained to do qualitative assessments based on observation and documentation to inform instruction
	Use stimulus and response prompts and fading (e.g., errorless, most-to-least, least-to-most, prompt delay, stimulus fading)	Teachers are responsible for preparing the environment by providing children with a complete set of Montessori materials and ensuring children have access to supplemental materials (pencils, scissors, paper, etc.); Teachers are trained to assess the child's interests and developmental readiness in order to give presentations of each material to individuals or small groups of children
	Use modeling and imitation training	Teachers are trained to assess the child's interests and developmental readiness in order to give presentations of each material to

		individuals or small groups of children
	Use instructions and rules	Presentation of a material is designed to isolate a specific skill Teachers are trained to assess the child's interests and developmental readiness in order to give presentations of each material to individuals or small groups of children
	Use shaping	Teachers are trained to assess the child's interests and developmental readiness in order to give presentations of each material to individuals or small groups of children
	Use chaining	The materials are designed with "control of error" so the child can self-correct his work; Presentation of a material is designed to isolate a specific skill
	Use discrete-trial, free-operant, and naturalistic teaching arrangements	Presentation of a material is designed to isolate a specific skill; Teachers are responsible for preparing the environment by providing children with a complete set of Montessori materials and ensuring children have access to supplemental materials (pencils, scissors, paper, etc.)
	Teach simple and conditional discriminations	Teachers are trained to observe children during uninterrupted work time to develop individualized learning plans based on a child's interests; Teachers are responsible for preparing the environment by providing children with a complete set of Montessori materials and ensuring children have access to supplemental materials (pencils, scissors, paper, etc.)
	Use Skinner's analysis to teach verbal behavior	Teachers are responsible for preparing the environment by providing children with a complete set of Montessori materials and ensuring

		children have access to supplemental materials (pencils, scissors, paper, etc.)
	Use equivalence-based instruction	No alignment
	Use the high-probability instructional sequence	No alignment
	Use reinforcement procedures to weaken behavior (e.g., DRA, FCT, DRO, DRL, NCR)	No alignment
	Use extinction	Teachers are trained to do qualitative assessments based on observation and documentation to inform instruction
	Use positive and negative punishment (e.g., time-out, response cost, overcorrection)	Teachers are trained to do qualitative assessments based on observation and documentation to inform instruction
	Use token economies	No alignment
	Use group contingencies	Teachers are trained to do qualitative assessments based on observation and documentation to inform instruction
	Use contingency contracting	No alignment
	Use self-management strategies	Teachers are trained to do qualitative assessments based on observation and documentation to inform instruction; Children may repeat the use of a material as many times as they choose during the work time; Teachers are trained to observe children during uninterrupted work time to develop individualized learning plans based on a child's interests
	Use procedures to promote stimulus and response generalization	Children may repeat the use of a material as many times as they choose during the work time; Teachers are trained to do qualitative assessments based on observation and documentation to inform instruction
	Use procedures to promote maintenance	Teachers are trained to do qualitative assessments based on observation

		<p>and documentation to inform instruction;</p> <p>Children may repeat the use of a material as many times as they choose during the work time;</p> <p>Teachers are responsible for preparing the environment by providing children with a complete set of Montessori materials and ensuring children have access to supplemental materials (pencils, scissors, paper, etc.)</p>
Selecting and Implementing Interventions	State intervention goals in observable and measurable terms	No alignment
	Identify potential interventions based on assessment results and the best available scientific evidence	No alignment
	Recommend intervention goals and strategies based on such factors as client preferences, supporting environments, risks, constraints, and social validity	<p>Teachers are trained to do qualitative assessments based on observation and documentation to inform instruction;</p> <p>Teachers are trained to work collaboratively with family or caregivers to support the child's development</p>
	When a target behavior is to be decreased, select an acceptable alternative behavior to be established or increased	<p>Teachers are trained to do qualitative assessments based on observation and documentation to inform instruction;</p> <p>Teachers are trained to work collaboratively with family or caregivers to support the child's development</p>
	Plan for possible unwanted effects when using reinforcement, extinction, and punishment procedures	<p>Teachers are trained to do qualitative assessments based on observation and documentation to inform instruction;</p> <p>Teachers are trained to work collaboratively with family or caregivers to support the child's development</p>
	Monitor client progress and treatment integrity	No alignment

	Make data-based decisions about the effectiveness of the intervention and the need for treatment revision	No alignment
	Make data-based decisions about the need for ongoing services	No alignment
	Collaborate with others who support and/or provide services to clients	Teachers are trained to do qualitative assessments based on observation and documentation to inform instruction; Teachers are trained to work collaboratively with family or caregivers to support the child's development

CHAPTER 6. RESULTS

Table 5.3 presents the identified practices for the Montessori method and the ABA practices that align with each Montessori practice. Table 5.4 presents the identified practices for ABA and the Montessori practices that align with each ABA practice.

6.1 MONTESSORI PRACTICES

Of the 22 Montessori practices included in the analysis (see Table 1), 15 practices (68%) aligned with at least one ABA practice. Of the 7 Montessori practices identified under the *Montessori Materials* tenet, 4 practices (57%) aligned with at least one ABA practice. Of the 3 practices identified under the *Child Directed Work* tenet, each (100%) aligned with at least one ABA practice. Of the 2 practices identified under the *Multiage Classroom* tenet, 1 practice (50%) aligned with at least one ABA practice. Of the 4 practices identified under the *Uninterrupted Work Time* tenet, 2 practices (50%) aligned with at least one ABA practice. Finally, of the 6 practices identified under the *Trained Teachers* tenet, 5 practices (83%) aligned with at least one ABA practice.

6.2 ABA PRACTICES

Of the 40 ABA practices included in the analysis, 26 of the ABA practices aligned with Montessori practices (65%). Of the 9 ABA practices identified under the *Behavior Assessment* tenet, 4 (44%) aligned with at least one Montessori practice. Of the 22 practices identified under the *Behavior Change Procedures* tenet, 17 (77%) aligned with at least one Montessori practice. Of the 9 practices identified under *Selecting and Implementing Interventions*, 4 (44%) aligned with at least one Montessori practice.

CHAPTER 7. DISCUSSION

The data results indicate only one component of the Montessori method had 100% alignment with ABA practices, but no tenet of ABA aligned 100% with a core component of the Montessori method; therefore, I suggest a partial alignment between the Montessori method and ABA. The areas of most alignment were in the tenets of Montessori *Trained Teachers* (83%) and ABA's *Behavior Change Procedures* (77%), suggesting the overlap in these two areas could result in Montessori teachers implementing specific ABA practices when working with children with disabilities; ABA practitioners could incorporate elements of the Montessori method into their behavior or learning interventions. This finding was not surprising given the emphasis the Montessori method and ABA put on observation, structure, and explicit instruction based on child preference; however, the application of these findings will likely require effective professional development, updated Montessori teacher preparation program standards that reflect teacher competency in ECSE, and ABA student practicum experience in Montessori learning environments. There was 100% alignment in the Montessori tenet of *Child Directed Work*, implying a shared goal for the child to be independent in their daily activity.

Regarding areas that did not align between ABA and Montessori, Chandler et al. (2012) suggests those practices represent "specialized knowledge and skill" which are unique to their respective field. Areas of least alignment were found in ABA's tenets of *Conducting Assessments* and *Selecting and Implementing Interventions*, which was not surprising given the Montessori method does not have universal systems for data collection or assessment, nor are teachers trained in specific learning and behavior interventions.

7.1 IMPLICATIONS FOR PRACTITIONERS

As the Montessori method continues to expand its programs to embrace the public school system, Montessori practitioners will be increasingly required to adopt evidence-based practices as mandated by the Individuals with Disabilities Education Act (2004). These findings suggest the potential for the use of some ABA practices in combination with the Montessori method to deliver child-centered, holistic, and evidence-based instruction in both privately and publicly funded classrooms. However, as the analysis showed, there are areas of nonalignment that could make full implementation of ABA strategies incompatible with the Montessori method. For example, the Montessori practice of uninterrupted work time and freedom to repeat activities multiple times is sometimes not practical in an ABA clinical setting in which the efficient acquisition of skills is a paramount consideration. Alternatively, a token economy, an intervention commonly used in ABA practice to encourage skill acquisition, would clash with ways in which Montessori teachers are trained to encourage intrinsic motivation. Perhaps most salient for those working with children with disabilities is the rigorous training practitioners receive in ABA practices for methods of assessment and selecting instructional interventions based on data and progress monitoring versus the training Montessori teachers receive for working with children with disabilities during their teacher preparation programs.

While there are certainly specific practices that are unique to ABA and the Montessori method, the idea of blending practices between two fields is supported by research. Grisham-Brown & Hemmeter (2017) describe how the practices in early childhood education (ECE) and the contributions of ABA practices to ECSE combine to inform the idea of *blended practice*. Blended ECE programs are those in which children with and without

disabilities “receive individualized instruction aligned with each child’s needs, preferences, and learning histories” and relies on the teacher’s implementation of embedded learning opportunities within the child’s natural learning environment (Grisham-Brown & Hemmeter, 2017; Shepley & Grisham-Brown, 2019). For example, Shepley and Grisham-Brown (2019) describe snack time as part of a child’s daily routine where ABA and ECSE practices can be used in embedded learning opportunities to instruct a child needing targeted practice with a particular skill. Note the symmetry between the relationship between the implementor (teacher), variables in the learning environment, and the child, and the “trinity” that make up the Montessori philosophy:

“To the fullest extent possible embedded instruction takes advantage of naturally occurring (a) discriminative stimuli, (b) motivating operations, (c) prompts, and (d) contingencies present throughout early childhood activities and environments. For example, a child working on using a pincer grasp to open food items may receive targeted instruction during mealtimes. The presence of an unopened bag of food (i.e., discriminative stimulus) signals the availability of food (i.e., reinforcement), and the deprivation of food that builds between snacks and meals functions as an establishing operation increasing the value of food as a reinforcer. Upon presentation of the unopened bag, a practitioner can engage in a response prompting strategy, such as graduated guidance or most to least prompting (Wolery, Ault, & Doyle, 1992), to help the child perform the target behavior” (Shepley & Grisham-Brown, 2019 p. 237).

7.2 IMPLICATIONS FOR FAMILIES

What is the best learning environment for a child with special needs? The answer is overwhelmingly unique for each individual child and their family. Qualitative reports describe Montessori classrooms as effective learning environments for children with learning differences (AMS, n.d.; Pickering, 2019). Garcia and Coneway (2019) conducted a qualitative study on the value of appropriate processing time in early childhood environments, particularly for children with disabilities. The authors cite the Montessori practice of allowing extended periods of time to concentrate as an example of providing the appropriate amount of time to process new information (2019). However, when a child has a more severe disability or learning need it is essential that the instructional strategies employed in that learning environment are selected based on data and evidence-based practices. The lack of alignment between Montessori practices and ABA practices of behavior assessment and intervention could be useful information for families who need to make decisions on the best learning environment for their child.

7.3 CONSIDERATIONS FOR FUTURE RESEARCH

The feedback from external reviewers indicated the primary obstacle that future research in this area will face is a better understanding of contemporary practices in both ABA and the Montessori method. For example, a common theme between the Montessori professionals who contributed feedback was the impression that ABA practices were both too rigid and adult-directed to align with the Montessori method. How can ABA practitioners better communicate the “soft skills” (Rohrer & Reiss, 2022) that are now understood as best practices towards a more compassionate approach? Furthermore, the Montessori

professionals expressed concern about how to align the Montessori philosophy of intrinsic motivation with the scientific understanding of reinforcement underscored in ABA practices. For Montessori classrooms to become more inclusive learning environments, however, teachers must embrace a combination of behaviorist *and* constructivist strategies. The Montessori method lacks empirical evidence on its effectiveness as a teaching method when working with children with disabilities. Further exploration of the alignment between ABA and the Montessori method should use more rigorous systems to conduct an analysis that can strengthen its internal and external validity. Finally, due to the lack of fidelity with which the Montessori method is implemented among various programs depending on their accreditation status, future research must consider how to clearly define the specific type of Montessori programs used in future studies.

7.4 LIMITATIONS

Several limitations challenge the internal validity of this research. My personal bias is comprised of my professional experience in the Montessori field which functioned as the impetus for my interest in this topic. In addition, I acknowledge that my limited knowledge of ABA threatens the trustworthiness of my analysis. Regarding the practices selected for analysis, the Montessori practices may be considered by some to be insufficient in that there are other practices that should be included. As final limitation, there are various methods and techniques that are available for conducting a comparative analysis which require different analytical methods. As such, these differing methods could result in different findings.

CHAPTER 8. CONCLUSION

This study explored the alignment between the practices of the Montessori method and ABA. These practices serve as a proxy to the broader educational pedagogies of these methods. Findings suggest there is a partial alignment between these two practices, with the most alignment falling under areas of Montessori teaching practices and ABA behavioral change procedures; however, there are few Montessori practices that align with ABA practices to conduct behavior assessments and implementing intervention strategies. There are several limitations to this work, including personal bias and questions of external validity that must be addressed in future research. However, I hope that practitioners from both ABA and Montessori programs can use this analysis as a starting point to broaden their scope of instructional practice. Perhaps more than anyone, though, families with young children with or at-risk for disability can have a better understanding of both methods to determine what is the best path for their child.

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VITA

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