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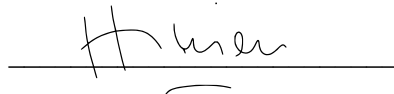
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**IMPLEMENTATION OF NATURALISTIC DEVELOPMENTAL
BEHAVIORAL INTERVENTION IN INCLUSIVE PRESCHOOL:
A CASE STUDY ON THE GROUP-BASED EARLY START DENVER MODEL
TEACHER PROFESSIONAL DEVELOPMENT**

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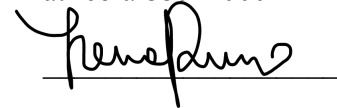
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Title

IMPLEMENTATION OF NATURALISTIC DEVELOPMENTAL
BEHAVIORAL INTERVENTION IN INCLUSIVE PRESCHOOL:
A CASE STUDY ON THE GROUP-BASED EARLY START DENVER MODEL
TEACHER PROFESSIONAL DEVELOPMENT

By Irene Russo

A dissertation submitted
in partial fulfillment of the requirement
for the degree of Doctor of Philosophy

Major Professor: Paola Aiello

*Dedication
To all Women*

*For the Women who have shown to be wise
And are proud of their intellect.*

*For the Women who have a career and family
And those who have a career or a family.*

*For the Women who have chosen to be mothers and partners
And for those who have chosen self-love.*

*For the Women who want to be feminine
And those who are fine the way they are.*

*For the Women who do not care about judgments
And those who fight rumors.*

*For the survivors and the victims
And for the compassionate.*

*Success is not an accident for us and never a coincidence.
It takes hard(er) work, dedication, perseverance.
It takes the love for what you do and your rise for equity.*

Acknowledgments

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Abstract

Naturalistic developmental behavioral interventions (NDBIs) are evidence-based approaches for children with a diagnosis of Autism Spectrum Disorder (ASD); they integrate applied behavior analysis and developmental sciences (Schreibman et al., 2015). NDBIs are well suited for inclusive early childhood education classrooms because they are designed for use in natural settings to teach developmentally appropriate skills with behavioral strategies (Schreibman et al., 2015). Although NDBI approaches are recommended for use in Early Childhood Education (ECE) and are considered evidence-based, several factors impact the implementation of NDBIs in inclusive classrooms. Professional development is one of the key elements to assure those competent teachers can implement NDBI for children with autism in a regular classroom.

In the past decade, great emphasis has been given to *implementation science* as a field of research that can promote the adoption of Evidence-Based Practices (EBPs) in Special Education. Comprehensive implementation frameworks and multilevel strategies are needed to sustain EBPs implementation and address a series of variables that might affect the success of the program in a school context (Cook & Odom, 2013). However, little is known about the processes to implement these practices within an inclusive framework.

The purpose of our mixed-methods concurrent study is twofold: 1) to document the application of the Active Implementation Frameworks (AIFs) strategies in the ECE system for teachers' professional development; 2) to provide data about the application of AIFs in promoting NDBIs implementation in inclusive early education classrooms.

Our implementation research study was developed and implemented in a community-based preschool program in Sacramento, California, over 30 months. We used the AIFs (Fixsen, Naoom, Blase, Friedman, & Wallace, 2005) to design the project and various multilevel strategies to implement the Group-based Early Start Denver Model (G-ESDM) by Vivanti et al. (2017). During the first Exploration Stage, a feasibility study was conducted to gather information about the context and build a G-ESDM training program. Between the Exploration and the Installation Stage, the school

leadership decided to fully adopt the G-ESDM in their early childhood program; moreover, to ensure the success of the program, an in-service training model based on AIFs, to follow implementation stages, create implementation teams, and sustain implementation drivers (Fixsen et al., 2005). During the course of the project, we conducted implementation-appropriate activities (monthly staff meetings, director meetings, weekly supervision meetings, etc.) and developed core implementation components to support a competent and sustainable service.

A single case pre-post test study design was piloted to test the effectiveness of in-service training on the G-ESDM and examine changes in teachers' competencies toward autism and inclusion across different variables (attitudes, knowledge). Participants were early childhood educators (N=17) organized in 4 cohorts: lead teachers (LT=5), assistant teachers (AT= 4), instructional assistants (IA=8), and the director of the early education program (DI=1). Data were collected at the beginning and the end of each school year. Training outcomes on teachers were evaluated with ESDM and G-ESDM fidelity tools (Dawson, Rogers, 2010; Vivanti et al., 2017). Teachers' knowledge and attitudes toward autism were assessed according to two measures: the Autism Attitude Scale for Teachers (AAST, Olley, 1981) and the Knowledge about Childhood Autism among Health Workers (KCAHW) questionnaire (Bakare, M.; Ebigbo, P.; Agomoh, A.; Menkiti, N.; 2008).

During the three years of implementation, all the cohorts who have received training according to the different implementation stages suggested by Fixsen et al. (2005) have shown significant improvements across all the variables tested in the study. Preliminary results of the ongoing research demonstrate a significant increase in participants' knowledge of autism spectrum disorder and an improvement in attitudes toward autism inclusion. In addition, we found that participants' fidelity to the G-ESDM significantly improved as well.

Abstract

I Naturalistic developmental behavioral interventions (NDBIs) sono interventi basati sull'evidenza scientifica per i bambini con una diagnosi di disturbo dello spettro autistico (ASD); integrano l'analisi applicata del comportamento con la scienza dell'apprendimento e la psicologia dello sviluppo (Schreibman et al., 2015). Gli NDBI sono adatti per le scuole della prima infanzia inclusive perché sono stati pensati per essere utilizzati negli ambienti che il bambino vive tutti i giorni e per insegnare al bambino abilità adeguate allo sviluppo evolutivo in cui egli si trova (Schreibman et al., 2015). Sebbene gli approcci NDBI siano raccomandati per l'uso nell'educazione della prima infanzia (ECE) e siano supportati da evidenza scientifica, diversi fattori influiscono sull'implementazione degli NDBI nelle classi inclusive. Lo sviluppo professionale è uno degli elementi chiave per assicurare che gli insegnanti competenti possano implementare l'NDBI per i bambini con autismo in una classe normale.

Nell'ultimo decennio, è stata data grande enfasi alla scienza dell'implementazione come campo di ricerca che può promuovere l'adozione di pratiche basate sull'evidenza (EBP) nell'educazione speciale. La letteratura suggerisce che sono necessari quadri di attuazione completi e strategie multilivello per sostenere l'attuazione degli EBP, e per rispondere ad una serie di variabili che potrebbero influenzare il successo del programma in un contesto scolastico (Cook & Odom, 2013). Tuttavia, si sa poco sui processi per implementare queste pratiche all'interno di un quadro inclusivo.

Lo scopo del nostro studio quasi-sperimentale e quanti-qualitativo è duplice: 1) documentare l'applicazione delle strategie degli Active Implementation Frameworks (AIF) nel sistema delle scuole dell'infanzia americana per lo sviluppo professionale degli insegnanti; 2) fornire dati sull'applicazione degli AIFs nella promozione dell'attuazione degli NDBI nelle classi inclusive della prima infanzia.

Il nostro studio di ricerca sull'implementazione è stato sviluppato e implementato in una scuola dell'infanzia privata a Sacramento, in California, per oltre 30 mesi. Abbiamo utilizzato gli AIF (Fixsen, Naoom, Blase, Friedman e Wallace, 2005) per progettare la ricerca e varie strategie di formazione multilivello con lo scopo di

implementare il Group-based Early Start Denver Model (G-ESDM) di Vivanti et al. (2017). Durante la prima fase di esplorazione, è stato condotto uno studio di fattibilità per raccogliere informazioni sul contesto e costruire un programma di formazione G-ESDM. Tra l'esplorazione e la fase di installazione, il dirigente scolastico ha deciso di adottare completamente il G-ESDM nella scuola dell'infanzia; inoltre, per garantire il successo del programma, è stato utilizzato un modello di formazione in servizio basato sui AIF, che seguisse le fasi di implementazione, creasse dei team di implementazione e sostenesse le componenti principali per l'implementazione (Fixsen et al., 2005). Nel corso del progetto, abbiamo condotto attività di formazione periodiche (riunioni mensili del personale, riunioni del direttore, riunioni di supervisione settimanali, ecc.) e sviluppato componenti di implementazione fondamentali per supportare un servizio competente e sostenibile.

Uno studio di caso pilota con analisi pre-post è stato necessario per testare l'efficacia della formazione in servizio sul G-ESDM ed esaminare i cambiamenti nelle competenze degli insegnanti verso l'autismo e l'inclusione attraverso diverse variabili (atteggiamenti, conoscenza). I partecipanti erano educatori della prima infanzia (N=17) organizzati in 4 coorti: insegnanti curricolari (LT=5), assistenti (AT=4), assistenti alla didattica speciale (IA=8) e il dirigente scolastico (DI= 1). I dati sono stati raccolti all'inizio e alla fine di ogni anno scolastico. I risultati della formazione sugli insegnanti sono stati valutati con strumenti di fedeltà ESDM e G-ESDM (Dawson, Rogers, 2010; Vivanti et al., 2017). La conoscenza e l'atteggiamento degli insegnanti nei confronti dell'autismo sono stati valutati secondo due misure: l'Autism Attitude Scale for Teachers (AAS, Olley, 1981) e il questionario Knowledge about Childhood Autism between Health Workers (KCAHW) (Bakare, M.; Ebigbo, P. ; Agomoh, A.; Menkiti, N.; 2008).

Durante i tre anni di implementazione, tutte le coorti che hanno ricevuto formazione secondo le diverse fasi suggerite da Fixsen et al. (2005) hanno mostrato miglioramenti significativi in tutte le variabili testate nello studio. I risultati preliminari della ricerca in corso dimostrano un significativo aumento della conoscenza dei partecipanti sul disturbo dello spettro autistico e un miglioramento degli atteggiamenti

verso l'inclusione dell'autismo. Inoltre, abbiamo scoperto che anche la fedeltà dei partecipanti al G-ESDM è notevolmente migliorata.

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CHAPTER 1: INTRODUCTION

1.1 Background

The prevalence rates of children on the autism spectrum have been increasing rapidly in the past decade. Only six years ago, the Center for Disease Control and Prevention (CDC) estimated that in multiple communities in the United States, 1 in 68 children received a diagnosis of autism spectrum disorder ([ASD]; CDC, 2014). In the years after, the CDC recorded the increase of prevalence at a rate of 1:59 among 8-year old children (Baio et al., 2018), and in the last records from 2020, the rate was 1:54 (Maenner et al. 2020). These data make autism one of the fastest-growing developmental disabilities (CDC, 2014).

The significant increase in the prevalence of ASD diagnoses among children has raised the number of students on the autism spectrum enrolled in American schools (U.S. Department of Education, 2016). In the public school system, data from the US Department of Education shows that 10% of the students in the 2015- 2016 school year were eligible for special education services under the category of autism (U.S. Department of Ed., 2018). As the number of students with special education needs increases in both public and private school systems, the awareness of the necessity of inclusion, accomplished with the creation of educational programs to meet these students' unique and individual needs, is on the rise as well (National Autism Center, 2015; U.S. Department of Ed., 2018).

Over two decades of research in clinical and educational fields have provided evidence for several practices designed for pupils with ASD. These interventions, called evidence-based practices (EBPs), have been developed to improve ASD children's educational outcomes, which lag behind students' programs or other special needs (Cook & Odom, 2013; National Autism Center, 2015). Simultaneously, the clinical field has anticipated identification and diagnostic practices of autism very early in children's development, allowing the implementation of intervention much earlier in life

(Schreibman et al., 2015). Research has identified Naturalistic Developmental Behavioral Interventions (NDBIs), a new category of evidence-based intervention specifically designed to meet the developmental needs of toddlers with ASD (Schreibman et al., 2015).

The advanced ability to identify children with ASD at very young ages and the consequent increase of its prevalence have provided new opportunities and challenges in Early Childhood Education (ECE). In ECE, indeed, there is a growing expectation that educators provide education to children with special needs in natural environments (U.S. Department of Health and Human Services [U.S. DHHS] & U.S. Department of Education [U.S. DOE], 2015). According to the National Association for the Education of Young Children (NAEYC), primary teachers are responsible for providing high quality early learning environments for young children with a variety of diverse needs (2009), including young children with diagnoses of autism (Vakil, Welton, O'Connor, & Kline, 2009). Therefore, U.S DHHS and U.S. DOE issued in 2015 a national policy statement addressing general education objectives for the inclusion of young children with disabilities in regular classrooms, including those with ASD (Lawrence, Smith & Banerjee, 2016).

Both clinical and special education scientists have presented a plethora of reasons concerning ECE teachers' importance in pupils' interventions. Specifically, the need is to make ECE teachers aware and capable of possible didactic strategies based on evidence-based interventions that help children reach developmental milestones and develop new skills while monitoring progress to achieve educational outcomes.

1.2 American Inclusion Framework

Since inclusion has become an essential piece of the educational goal for young children with disabilities, it seems relevant to define its key concepts in the American context.

In the US, early childhood inclusion was established over 30 years ago with the reauthorization of the Education for the Handicapped Act of 1986, renamed Public Law

99- 457, which required services for young children with disabilities to be delivered in the least restrictive or in the most natural environments by familiar adults, such as parents, relatives, caregivers, teachers. After that first step, the definition of early childhood inclusion has evolved to comprise concepts such as accessibility, participation, and support in order to assure the right of every child to receive proper early education; to promote a sense of belonging and membership; and to help children reach their full potential (Division for Early Childhood/National Association for the Education of Young Children, 2009).

New regulations and position statements, such as the one signed by the Division for Early Childhood (DEC) and NAEYC, have contributed to change the perspective on inclusion in American society. Consequently, this new awareness of inclusion promoted an increase in the prevalence of children with disabilities in ECE. According to our estimates, today,, two-thirds of all the children with disabilities, ages three through five, are educated in an inclusive setting (U.S. Department of Education, 2018), making inclusion a decisive topic for the American Special Education research.

However, scientific evidence about the effectiveness of inclusive placements for children with autism is still unclear, primarily if specific programming and didactics for the child in need are not provided and implemented (Odom & Woolery, 2003). Following the principles of inclusive early education, teachers, specialists, and administrators should have access to in-service professional development resources and a system of support to acquire the knowledge, skills, and dispositions required to implement effective inclusive strategies. Moreover, recommendations in the field focus on professional development that supports the implementation of evidence-based practices (Division for Early Childhood, 2014; Odom et al., 2009). Indeed, for many researchers, an inclusive model can be impactful if educators are appropriately trained and proficient in evidence-based practices to support the development and learning of children with special needs (Odom, Buyesse, & Soukakou, 2011). Among all the EBPs, NDBI strategies appear to be consistent with inclusive early education settings (Wolery, 2000) because they are

grounded on developmentally appropriate strategies considering children in their entirety and their relationship within the natural context (Wolery & Odom, 2000).

The following paragraph will address the rationale behind the implementation of NDBIs as evidence-based practices for children with autism who are suited for inclusive early childhood settings.

1.3 Naturalistic Developmental Behavioural Interventions: A Path to Inclusion

Historically, in the US, the theoretical pathways behind the implementation of special education programs for children with autism in inclusive settings have followed two distinct philosophical approaches: a behavioral approach and a developmental approach (Jennett, Harris, & Mesibov, 2003; Quill, 1997).

The behavioral approach finds its roots in Behaviorism, a theory grounded on the basic scientific principle that the environment influences an individual's behavior. As the science of behavior evolved, applied behavior analysis has emerged (ABA; Baer, Wolf, & Risley, 1968) to understand how modifications in the environment produce changes in human behavior (Baer et al., 1968). In particular, applied behavior analysis (ABA) focuses on the manipulation of one or more parts of the three-term contingency (Cooper, Heron, Heward, 2007): the antecedent (i.e., what happens before the behavior occurs), the behavior (the action displayed by the individual), and the consequence (i.e., what happens directly after the behavior). Based on these principles, intervention research has developed various methods to treat young children with ASD, such as the Discrete Trial Training (DTT), Pivotal Response Training (PRT), and Pictures Exchange Communication System (PECS).

Developmentally Appropriate Practices (DAP; Copple & Bredekamp, 2009) are, instead, those educational methods in early childhood education that emphasize teaching techniques that nurture a child's socio-emotional, physical and cognitive development. They are based on research, standards, and recognized theories such as cognitive learning theories, especially those formulated in the work of Piaget, Bruner, and Vygotsky, from which the concepts of constructivism and sociocultural theory originate. Development is

a process through which humans grow and develop from infancy to adulthood (Berk, and Winsler, 1995; Berk, 2013); child development depends on the context, experiences, and interactions she/he learns from birth. Three are the main components of the DAPs: knowledge about development and learning; knowledge about individual children; and knowledge about the social and cultural contexts where children grow and learn.

As the autism interventions field began to look at research advantages both in behavioral science and in developmental science, new models and methods have started to carve comprehensive strategies and treatment targets to support children's specific needs in early development. NDBIs combine the strengths of DAPs, and ABA approaches into their intervention practices to sustain children's emergent skills through developmentally appropriate milestones and support children's natural environments, such as home, early childhood education settings, and familiar relationships (Schreibman et al., 2015).

For these reasons, the development of NDBIs can contribute to close the gap between evidence-based findings and their implementation in inclusive preschool classrooms, merging the strengths of DAPs and ABA approaches to improve child outcomes, making them an excellent match for inclusive preschool classroom didactics intervention (Odom & Wolery, 2003; Schreibman et al., 2015).

1.4 Training on EBPs: Bridging the Research-to-Practice Gap

Traditionally, early investigations on EBPs derived from case studies in the field of psychology and behavioral sciences. In the last decades, however, as the field of general education and special education in the US progressed with more elaborate research designs, including experimentally valid research (Mayton, Wheeler, Menendez, & Zhang, 2010), studies have begun focusing on developing evidence-based practices (EBPs) specifically intended to improve the educational outcomes of students, especially those with special needs (Fixsen, Blase, Metz, & Van Dyke, 2013).

Despite its rich history, the field of the American general and special education has been characterized by a significant gap between research on EBPs and their actual

implementation and accessibility (Mayton et al., 2010). The initial difficulty was identifying appropriate EBPs based on studies that were valid in terms of research and methodology, outcomes, and quality assurance. Afterward, EBPs implementation, the processes to promote the adoption of these practices into routines, has become more a central topic in the Education and Special Education field (Cook, Odom, 2013). Nevertheless, research demonstrates that there is still a significant gap - about 20 years - between the practices being developed and proved to be effective and the implementation in the everyday world (Melgarejo, Lind, Stadnick, Helm, & Locke, 2020).

This so-called research-to-practice gap has been a central topic for researchers, who have been trying to address the issue of widespread accessibility to different models and to achieve broad, sustained, and high-quality implementation of EBPs. Fixsen and colleagues (2005) suggested that introducing practices through typical professional development such as workshops and classes does not necessarily lead to the use and adoption of such practices. Instead, a system of professional development should consider the principles of *Implementation Science* to guide the process for the adoption and use of innovations necessary for quality improvement and effective use of EBPs for students with ASD (Odom, 2013). Implementation science has been defined as a scientific discipline that studies a range of methods and models to promote the systematic uptake of research findings and EBPs into routine practice (Eccles & Mittman, 2006), promoting and scaling up EBPs dissemination into community-based educational programs, and identifying teachers' EBPs adoption and adaptation (Cook & Odom, 2013).

1.5 Bridging the Research-to-Practice Gap in Inclusive Early Education: Opportunities and Challenges

In Early Child Education, bridging the gap between research on evidence-based practices and their implementation has presented both opportunities and challenges.

Many scholars suggest that childcares¹ and preschools are ideal settings for identifying children with developmental delays, such as ASD, and early childhood educators are ideal candidates for providing students and parents with access to early intervention and special education services (Branson et al., 2008; NAEYC, 2009), and for implementing evidence-based practices (Odom, Buysse, & Soukakou, 2011). However, the increasing numbers of children with autism in ECE classrooms, with or without a formal diagnosis, require a new set of knowledge and skills and a change in the roles and responsibilities of early childhood educators (Vakil et al., 2009), who must receive appropriate training on EBPs (Odom, Cox, Brock, 2013) and inclusive strategies and procedures (Bredekamp & Copple 1997).

Regarding early identification, preschool teachers have extensive knowledge of early development and should be able to identify those children who are not meeting the developmental milestones at a young age. Indeed, following the Individuals With Disabilities Education Act (IDEA; 2006) - which regulates how states and public agencies provide services in early intervention, special education, and inclusive settings for infants and toddlers - early childhood educators are trained in the identification of the core characteristics of ASD defined as: “a developmental disability significantly affecting verbal and nonverbal communication and social interaction, . . . engagement in repetitive activities and stereotyped movements, resistance to environmental change in daily routines, and unusual responses to sensory experiences” (IDEA Regulations, 34 C.F.R. § 300.8[c][1][i]).

Moreover, recent research has shown that teachers can be a great resource during the diagnostic process. One study by Johnson, Porter, & McPherson (2012) found that preschool teachers are more knowledgeable about ASD than they believe they are. Still, they lack knowledge and experience working directly with children who have such a diagnosis. Other studies found that preschool teachers can be an effective and reliable source of information during the assessment (Dereu, Warreyn, Raymaekers, Meirsschaut,

¹ The term “childcares” indicates schools for children 0 to 2 years old.

² The development of program champions is a key part of the initial implementation stages because it assure the diffusion and continuity of training after the implementation and training is completed (Metz & Bartley, 2012)

Pattyn, Schietecatte, & Roeyers, 2010; Kantzer, Fernell, Gillberg, & Miniscalco, 2013). In particular, a study by Kantzer et al. (2013) found that 75% of children whom preschool educators referred for an ASD screening at a young age met the diagnostic criteria for ASD, whilst the remaining children were found to have other developmental disorders.

Implementing EBPs in inclusive early education settings presents both challenges and opportunities. Meeting individual children's needs is a longstanding principle of developmentally appropriate practices (DAP, Bredkamp & Copple, 1997; NAEYC, 2009). Teachers are responsible for adjusting and developing new programs and accommodating the changing needs in their classrooms regardless of the abilities and disabilities of the pupils. Moreover, the structure of the preschool classroom and peers exposure appear to create an optimal context. Educators are the ideal implementers of educational interventions that can target early in the development core deficits of ASD, such as social communication and play, laying the basis to improve language skills and academic performances later in life (Estes et al., 2015).

As mentioned earlier, one specialized category of intervention practices designed for preschoolers and delivered in a young child's natural context are NDBIs (e.g., Early Start Denver Model [ESDM], Learning Experiences and Alternative Program for Preschoolers and their Parents [LEAP], Treatment and Education of Autistic and related Communication Handicapped Children [TEACCH]). Although scientists describe NDBIs as a resource for the educational needs of young children with autism, and well-documented studies support their implementation in the community (Wong et al., 2015; Reszka, Belardi, Amsbary, Boyd, & Watson, 2019), research on efficacious teachers-implemented and school-based NDBIs is still lacking (Kasari & Smith, 2013). Our study took a first step in addressing this need by utilizing an implementation framework to introduce a classroom-based, teacher-implemented intervention for preschoolers with ASD in a community-based program.

1.3 Problem Statement

The past decade has seen a controversial debate about bringing together educators and clinical professionals in educational settings (Odom & Wolery, 2003). At the core of the controversy, there are the difficulties of aligning: 1) pedagogical and clinical competencies; 2) inclusive principles and early intervention principles; 3) educational standards and intervention outcomes (Zappala, 2021).

First, for many scientists, the increased prevalence of students with autism makes it imperative that the fields of Education and Early Intervention integrate their competencies in the mission to promote the development and learning of pupils. For example, results from various studies suggest the potential benefit of combining the contribution of early childhood educators in the early identification of and early intervention on autism (Dereu et al. 2010; Larsen, Aasland, Disethl. 2018; Zhang et al., 2019). Despite the effort for early identification, most children receive a diagnosis of autism after the age of 4 (CDC, 2016) during the years they spend in ECE programs. Moreover, they do not receive the proper educational intervention due to delayed diagnoses and various other systemic factors that affect the accessibility of services in the US (Stahmer, Debabnah, Rieth, 2019). Early childhood educators are in an ideal position to remedy this delay by noticing potential developmental deviations and providing the first opportunities to address the autistic core characteristics in American educational programs.

Second, designing an inclusive educational environment appears to be an intricate task considering the variety of individual special educational needs preschoolers with ASD present (Handleman & Harris, 2001). However, 40% of preschoolers with developmental disabilities already attend American preschool mainstream classrooms for some portion of their school day, according to the U.S. Department of Education (2018). Among those, the number of children with autism in inclusive settings is also on the rise (Allen & Cowdery 2005), benefitting from both special and general education. For many interventionists, NDBIs offer an opportunity to provide a better inclusive and

individualized education environment. Indeed, NDBIs focus on the principle that children with ASD potentially learn and develop in the same way children with typical development do. Autism symptomatology affects the typical developmental trajectories because it places a barrier to the process of learning from the proximal environment (Vivanti et al., 2017). Therefore, NDBIs may allow teachers to address the needs of children with ASD by introducing strategies to modify and individualize the educational learning environment. This strategy is in line with the pedagogical principle of designing individualized and inclusive programs for children with ASD (Odom & Wolery, 2003; Odom et al., 2011).

Third, ECE inclusive practices often involve strategies for adaptations and modification of time and space in order to promote the full participation of children with autism (Buysse, & Hollingsworth, 2009). Although participation is an essential educational standard to achieve learning outcomes, educators may face difficulties identifying specific learning objectives only from these pedagogical principles, especially if they do not have ASD-specific training (Zappala', 2021). Therefore, it is essential to identify comprehensive models that clarify children's educational goals in early life stages. For this reason, early intervention curricula, educational strategies, and teaching techniques may guide educators in making individualized educational programs for children with ASD.

Although there has been a long debate about the affinity between evidence-based methods and educational strategies, in the last decade, American scientists in the field of Education and Special Education have been focusing research on understanding how to successfully train teachers to implement effective educational strategies to support pupils with ASD (Odom, Cox, & Brock, 2013). While numerous studies have provided empirical support for the effectiveness of NDBIs (Schreibman et al., 2015), there is a concerning gap between research and practice and a continuous need for understanding the systematic process to introduce such practices into early childhood inclusive education and program routines. This research-to-practice gap may be addressed by following the principles of implementation science, which requires that methods such as

NDBIs get implemented through strategies (e.g., professional development, training, coaching) that promote acceptance, adaptation, and adoption (Dunst, Trivette, & Raab, 2013).

1.4 Purpose of the Study

Following the problem statement discussed above, the present research intends to take a first step in addressing: 1) the implementation of NDBIs into inclusive programs; 2) the need to develop alignment between inclusive pedagogical principles and autism-specific educational intervention for preschoolers with ASD; 3) the application of science-based implementation frameworks, suggested specifically for program success in childcare settings (Metz & Bartley, 2012).

NDBIs have emerged as critical early interventions that can offer an opportunity to change developmental trajectories for children with autism. Although many scholars suggest that NDBIs are - in theory and practice - evidence-based interventions suited for inclusive early childhood settings, there is a paucity of research focused on training educators to implement any of them in ECE. Thus, the present research aims at implementing an NDBI, the G-ESDM, in an inclusive community-based program by training educators who serve children with autism together with their peers.

The G-ESDM, chosen for its demonstrated effectiveness in inclusive and special education settings, is in line with pedagogical principles and evidence-based methods. Indeed, the G-ESDM curriculum, which stems from the Early Start Denver Model (ESDM, Rogers, Dawson, 2010), integrates developmentally appropriate skills with autism-specific behaviors, providing educators with a tool to create individualized plans following developmental sequences. Moreover, the G-ESDM, as a relationship-based and child-centered intervention, focuses on child-specific interests and motivation, offering educators scientific information and pedagogical insights to set learning opportunities through the design of educational environments. Finally, the G-ESDM strategies integrate evidence-based teaching techniques in activities with peers, promoting social inclusion.

However, scientists have found limited evidence that teachers in mainstream schools have the required background knowledge of autism and of EBPs, and enough experience with EBPs to provide programming in inclusive classrooms (Austin et al., 2013; Buysse et al., 1996; Chang, Early, & Winton, 2005; Dunst & Bruder, 2013). For this reason, the present study intends to deploy implementation science and specific implementation strategies from the Active Implementation Frameworks (AIFs) by Fixsen et al. (2005) to train educators on the implementation of the G-ESDM while improving inner context variables such as the attitudes of educators and their knowledge of autism, and engagement in training. According to Fixsen and his colleagues, effective implementation requires top-down changes (at the state and federal levels) and purposeful support systems to create the needed change in knowledge, behavior, and attitude (2005).

1.5 Definition of Terms

The following terms were relevant to and used extensively in this study and are explicitly defined with respect to this research.

Childcare or Daycare: a school for children from 6 weeks to 6 years old or younger than those attending elementary school or kindergarten.

Early Childhood Education (ECE): any type of public or private program whose focus is on educating young children in the years prior to entering kindergarten (Bowman, 1993).

Preschool: a type of early childhood education program designed for learning through play for children ages 3 to 5, prior to kindergarten (Encyclopedia of Children's Health, n.d.).

Evidence-Based Practices: instructional practices that have been proven effective for students with ASD and have been rigorously evaluated using a systematic literature review process (National Autism Center, 2015; Reichow & Volkmar, 2010; Wong et al., 2015).

Naturalistic Developmental Behavioral Interventions: evidence- and research-based intervention practices based firmly on methods from both developmental and behavioral science (Schreibman et al., 2015).

Preschoolers: means any child who has not entered kindergarten.

Teacher professional development: for the purposes of this study it is defined as workshops, conferences, training sessions, and otherwise designated mandated efforts to train teachers in instructional methodologies aligned with school initiatives (Loeser, 2008).

CHAPTER 2: Literature Review

2.1 Introduction

Autism spectrum disorder is a neurodevelopmental disorder that affects multiple areas of life. It is characterized by impairments in communication and social functioning and the development of restricted or repetitive behaviors (APA, 2013). As we mentioned earlier, the prevalence of ASD has quickly climbed in the US over the past twenty years (CDC, 2014) affecting one in 59 8-year-old children and being four times more likely in boys than girls (Baio et al., 2018). While ASD affects the lives of those diagnosed, it also affects the lives of family members, teachers, and peers (Boyd & Shaw, 2010; Callahan, Henson, & Cowan, 2008; Hendricks, 2011; Heflin & Simpson, 1998; Simpson, McKee, Teeter, & Beytien, 2007). Taking this notion a step further, the gap between research and classroom practice impacts communities and educational organizations (Boyd & Shaw, 2010; Callahan et al., 2008; Hendricks, 2011; Heflin & Simpson, 1998; Simpson et al., 2007).

For the purpose of this study, the following literature review explores, analyzes, and describes factors that impact evidence-based practices implementation in early education classrooms.

The review of science around autism and implementation of EBPs in early childhood education is organized in this chapter as follows: evolution of ASD diagnosis and implications for educational needs; implementation of NDBIs into inclusive programs; science-based implementation frameworks for program success in child care settings; an introduction to the G-ESDM.

2.2 Evolution of ASD Diagnosis and Implication for Educational Needs

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder that emerges in early childhood and is characterized by deficits in social communication and the

presence of restricted and repetitive interests and or behaviors (American Psychiatric Association, 2013).

The first scientist who described autism was Leo Kanner in 1943 (Goldson, 2016; Geschwind, 2009). In his landmark paper, *Autistic Disturbances of Affective Contact*, Kanner described a special group of children who had failed to develop typical social relationships, were easily upset by changes in their routines and showed irregularities in speech and language development. The description that Kanner provided, despite the small sample, turned out to be accurate, and the symptoms he identified were fundamental for the international classifications that developed later: “inability to relate themselves, ... an extreme autistic aloneness, ... failure to assume at any time an anticipatory posture, ... delayed echolalia, ... literalness, ... personal pronouns are repeated just as heard, ... intrusion comes from loud noises and moving object, his performances are as monotonously repetitious, ... anxiously obsessive desire for the maintenance of sameness, ... limitation in the variety of spontaneous activity, ... excellent rote memory, ... good relation to objects” (Kanner, 1943, pp.241-246).

A year after Kanner's study, Hans Asperger, a German pediatrician, published a work describing a disorder that manifests in expressive functions and behavior with more or less severe social integration difficulties. This study went unnoticed due to its publication in German, and the scientific community would wait to know about Asperger Syndrome until 1991 when Uta Frith published its English translation.

Nowadays, ASD is considered an umbrella disorder since it encompasses the previous diagnosis of autistic disorder, Asperger's Syndrome, pervasive developmental disorder-not otherwise specified, and childhood disintegrative disorder (APA, 2013). The current diagnostic criteria focus on two main areas: 1) consistent difficulties in using and understanding communication, both verbal and nonverbal, in a variety of social settings and 2) patterns of consistent focus on specific behaviors or interests that are limited in scope and tend to be almost ritualized in use (APA, 2013). Moreover, ASD symptoms manifest differently in each person, creating a wide range of needs within the ASD population (CDC, 2014).

While ASD diagnosis focuses on the two key criteria of deficits in social interaction and repetitive behaviors, there are a variety of other medical conditions and disorders that may accompany an ASD diagnosis (CDC, 2014). Indeed, as many as 83% of people diagnosed with ASD have at least one accompanying condition that is not a result of autism (CDC, 2014), such as anxiety, attention, sleep disorders, difficulties with their immune or gastrointestinal systems. Furthermore, up to 10% of ASD are comorbid to genetic disorders, such as Fragile X syndrome, Angelman syndrome, or tuber sclerosis (CDC, 2014). Conditions such as sensory processing disorders or pica may affect those diagnosed with ASD, as well (CDC, 2014). In many people with ASD, intellectual disabilities may be comorbid (CDC, 2014). Wei and colleagues (2015) report that about 33% of students with ASD have an IQ score <70. Those students demonstrate extreme difficulties in functional communication, academic achievement, and daily living skills (Wei et al., 2015).

Because of the presence of so many accompanying conditions, pupils diagnosed with ASD have varying needs, and schools have to be prepared to take on the challenges of autism and its symptomatic manifestation. Issues may result from difficulties with each diagnostic criterion including communication skills, social skills, or restricted and repetitive behaviors (Boyd & Shaw, 2010). Some students may only have issues centered around one diagnosis criterion point, while other students may develop problems that center around multiple points of diagnosis. As a result, the disorder may be relatively invisible for some students who can attend preschool with minimal assistance or need little support to navigate social situations. In contrast, some children with ASD have complex needs which may require support, such as speech-generating devices, visual schedules, or specialized instructions focused on behaviors. Critical medical accommodations might also be required at school for some pupils with ASD.

Evidence-based studies focusing on behavior, communication, developmental, and therapeutic approaches impact the school setting. These approaches often focus on the elements of a student's ASD that can influence classroom success. Approaches that focus on a student's communication and behavior skills include Applied Behavior Analysis,

otherwise known as ABA (CDC, n.d.; Cooper et al., 2007; Lovaas, 2010); the Early Start Denver Model (Ryberg, 2015; Vivanti, Dissanayake, & The Victorian ASELCC Team, 2016); and the Social Communication/ Emotional Regulation/ Transactional Support (SCERTS) (CDC, n.d; Molteni, Guldborg, & Logan, 2013; Prizant, Wetherby, Rubin, & Laurent, 2003). A variety of additional approaches and therapies that focus on students' development, sensory issues, communication issues, and educational development include Developmental Individual Differences, Relationship-Based Approach (DIR), also known as Floortime (Pajareya & Nopmaneejumrulers, 2011; Wieder & Greenspan, 2003), Speech/Language Therapy (Low & Lee, 2011; Wei et al., 2014), Occupational Therapy (Bagatell & Mason, 2015), Physical Therapy (Downey & Rapport, 2012), Social Skills (Gray & Garand, 1993), the Picture Exchange Communication System (Ryan, Hughes, Katsiyannis, McDaniel, & Sprinkle, 2011), Sensory Integration Therapy (Schaaf, Benevides, Kelly, & Mailloux-Maggio, 2012), and Treatment and Education of Autistic and related Communication-handicapped Children (TEACCH) (D'Elia, Valeri, Sonnino, Fontana, Mammone, & Vicari, 2013; Kliemann, 2014; Mesibov & Shea, 2010).

While each student's symptomatology is different, and each child might respond to the treatments described above differently, it is known that autistic characteristics might affect a student's learning processes and close relationships with their teachers and their peers (APA, 2013; Boyd & Shaw, 2010; CDC, 2014). Indeed, the presence of students with ASD in early childhood education settings represents a challenge for schools that have endorsed the paradigm of full inclusion. The dyad of ASD symptoms impacts social abilities and seemingly hinders social participation, fundamental for inclusion within a community. Thus, personalized and individualized teaching methods are required to respond to the heterogeneity of autism learning needs (Aiello, Agrillo, Russo, Zappala', Sibilio, 2019).

2.3 Implementation of NDBIs into Inclusive Programs

In the United States, legislation on inclusion has led to the emergence of programs that support inclusive education for children with ASD (Yell, Katsiyannis, Drasgow,

Herbst, 2003). The previous section mentioned some of the interventions developed to respond to autism symptoms. Among those, a few have been designed to be implemented in preschools. It turned out that, in the early education landscape, many schools are looking for collaborations with well-known research institutions and experts on school implementation of EBPs such as Pivotal Response Training (Suhrheinrich, Stahmer, Schreibman, 2007; Stahmer, Akshoomoff, Cunningham, 2011), JASPER (Joint Attention, Symbolic Play, Emotional Regulation) by Kasari and colleagues (2014). If some of these practices are well-known among early childhood educators (for example, AAC, PECS, ABA, etc.), others, although documented in the literature for their effectiveness in childcare and preschools, are still hardly known (Vivanti, Dissanayake, Zierhut, Rogers, Victorian ASELCC Team, 2013; Vivanti, Dissanayake, Victorian ASELCC Team, 2016).

According to the National Research Council, intervention for ASD should be intensive, at least 25 hours per week, and begin immediately after the diagnosis is given (2001). Current best practices for treating young children with ASD include interventions that integrate developmental approaches, which focus broadly on child-centered activities and adult responsiveness, and behavioral approaches, which focus on teaching skills via contingencies (Zwaigenbaum et al., 2015). In addition, it is considered best practice to involve caregivers, such as family members and teachers, in the intervention (National Research Council, 2001; Zwaigenbaum et al., 2015).

There is a piece of growing scientific evidence for several manualized interventions that reflect those characteristics, broadly classified as Naturalistic Developmental Behavioral Interventions or NDBIs (Schreibman et al., 2015). While individual NDBIs were developed in different clinical labs and emphasize different theoretical perspectives, they share several common elements, including child-led teaching episodes, environmental arrangement, natural reinforcement, use of prompting techniques, turn-taking, imitation, modeling, and caregivers' involvement (Schreibman et al., 2015). The Group-based Early Start Denver Model (G-ESDM), an intervention for children with autism suitable for child care centers and preschools, has gained attention for its possible feasibility in the education system (Vivanti et al., 2017). As its name

implies, the G-ESDM is based on the philosophy, principles, and strategies of the Early Start Denver Model (ESDM), an NDBI that targets teaching in typical settings, activities, and daily routines, considering the learner an active participant to the teaching-learning process.

Although NDBI approaches are recommended for use in the child's natural settings (Schreibman et al. 2015) and are recognized as evidence-based (Wong et al. 2015), several factors exist that impact their implementation in inclusive childcare and preschool classrooms.

First, scientific evidence highlights the variability in preschool practitioners' knowledge, skills, and competence to teach children with disabilities in inclusive settings (Dunst & Bruder 2014). Moreover, preschool practitioners report that they have insufficient knowledge to implement evidence-based practices for children with ASD in inclusive settings (Odom & Bailey 2001) and report concerns regarding their ability to work with children with extensive communication needs and to integrate individualized learning goals into school curricula (Bruns & Mogharreban 2008). Therefore, high-quality training is required to increase the evidence-based practice knowledge and skills of preschool practitioners in inclusive classrooms (Odom et al. 2013).

Second, at the leadership level, early childhood administrators (Barton and Smith 2015) and preschool practitioners (Muccio et al. 2014) cite numerous training barriers to successful preschool inclusion. Practitioners note the time, resources, cost, and implementation comfort as barriers to training (Wainer and Ingersoll 2013). Additionally, trainers report similar barriers to implementing effective and efficient training, including long waiting lists, high costs, scheduling issues, and time associated with travel (e.g., Wacker et al. 2013; Wainer and Ingersoll 2015).

In order to take aim at both teachers' and training barriers and effectively deliver NDBIs in inclusive classrooms, implementation frameworks have become the center of current research in the field of American Early Childhood Education.

2. 4 The Group-Based Early Start Denver Model: Literature Review

As Rogers and Dawson (2010) highlighted in their first manual, the ESDM “involves a curriculum and a set of teaching procedures that can be used in a variety of settings, including group preschool classroom programs” (p.185). Based on this proposal, since 2013, initial research has been carried out to investigate the efficacy of the ESDM delivered in groups (Vivanti et al., 2013; Eapen et al., 2013).

The group-based interventions took place at the Victorian Autism-Specific Early Learning and Care Center (ASELCC) affiliated with La Trobe University (Melbourne, Australia). Vivanti's research group (2013) conducted a one-year study involving 21 children for 15-20 hours per week. The children received 1:3 intervention in an environment that looked like a typical preschool, organized in activity centers and following specific routines. At the end of the intervention, data showed positive outcomes on children's cognitive and language development.

Since the first study, more empirical support for the G-ESDM was shared with the scientific community. One quasi-experimental study from the ASELCC team, involving 27 children receiving the G-ESDM in a 1:4 fashion, for 1 year, 15 hours per week, and compared to an age and IQ-matched control group enrolled in a different childcare-based intervention program that was similar in intensity and duration, showed superior outcomes in language and cognitive functioning (Vivanti et al., 2014).

Out of the La Trobe team, research with pre-post design documented increases in developmental rates and decreases in challenging behaviors for children receiving the G-ESDM (Eapen, Črnčec, Walter, 2013; Fulton et al., 2014). Furthermore, a pilot quasi-experimental study in Israel with closely matched groups showed that developmental and adaptive outcomes of 27 children receiving the G-ESDM were superior compared to those of 25 children receiving usual care (Gev et al., 2018).

A step further into the education system was made with a study by Vivanti and colleagues in 2018. This randomized trial, comparing specialized versus inclusive classrooms, showed that early childhood educators were able to implement the program

at a high degree of fidelity. In terms of children outcomes, the study showed that children experienced the same benefits to social, verbal, and adaptive functioning both when the G-ESDM was delivered in specialized childcare settings and when it was implemented in inclusive childcare settings, with similar child developmental gain outcomes across settings. To delve deeper into the benefit of the G-ESDM implementation in education, an independent standardized evaluation indicated that the quality of teaching and care in the childcare settings where the G-ESDM was delivered was well above the national average for Australia. These findings suggest that delivery of the G-ESDM improved the quality of teaching and care provided to all children involved, both with and without autism (Vivanti et al., 2019).

Around the world, the G-ESDM has been receiving a lot of attention. In Italy, Aiello's group at the University of Salerno has published several articles to inform the scientific community about the possible G-ESDM implementation in Italian educational settings. One study of the group, aimed at exploring the degree of acceptability, adaptability, and appropriateness of the G-ESDM by Italian teachers, has shown potential feasibility of its implementation in the Italian preschools from the analysis of the principles and practices of the model (Zappala', Zierhut, Aiello, 2020). Based on the work of Agrillo, Zappala' and Aiello (2019), the next paragraph will describe the core components of the G-ESDM and their possible application in early childhood education.

2.5 The G-ESDM in Early Childhood Education

The G-ESDM manual was published by Vivanti, et al. (2017) to provide compelling insights into the actual educational practices for children with autism in early childhood education contexts. It is designed to provide a feasible and sustainable empirically supported early intervention for young autistic children, implemented in special or inclusive early learning and care group settings. The model presents different core components, some of which provide opportunities for educational application: curriculum, classroom set-up, use of peer interactions, individualized plan, and teaching techniques.

The manual provides two important indications for the organization of the classroom: “(1) setting up learning areas and materials that cue the child about “what is going to happen”(2) and managing the quantity and quality of ‘competing stimuli’ that are present in each area” (p.47). Therefore, following these suggestions, the classroom is organized to visually support the child’s orientation in the environment and to guide him/her to choose an activity. At the same time, the adult can follow the child’s initiative, directing the teaching in the areas that motivate and capture the child’s attention. Furthermore, the organization of materials allows the adult to eliminate competitive stimuli, controlling the access to potential distractors and using only objects and tools consistent with the theme of the activity.

Another important part of the G-ESDM class is the set-up of activity centers, which are dedicated to specific developmentally appropriate themes (symbolic games, reading, art, logical-mathematical thinking, etc.), organized for small or large group activities and free play and built around daily routines that naturally occur in an educational context (e.g. washing hands after painting, cleaning up after sensory exploration, etc.). To further develop the setting, the authors suggest the use of a daily schedule, which not only explains the activities of the day (where they will take place and at what specific time), but also helps formulate teaching plans and learning objectives to work on.

In addition, the G-ESDM implementation depends on “team cooperation and daily symphony” (Vivanti et al., 2017, p. 64). Staff members communicate, cooperate and plan activities together. Because the model is built on co-teaching strategies, each team member has a specific role and explicit responsibilities for each activity performed in the classroom: lead, invisible support, and float. The lead has the responsibility to develop curricular activities in small and large groups and to pursue within the activities the individualized teaching objectives for the child with ASD. A second role in the G-ESDM class is the invisible support. Teachers who hold this role are responsible for supporting and facilitating the participation of children within the curricular activities in small and large groups without, however, entering into competition with the lead. The invisible

support “will be positioned behind the children, ready to help in several ways: (1) by silently prompting children from behind in response to the lead’s interactions with the child when needed, (2) by managing challenging behaviors, and (3) by redirecting children to the activity when directed explicitly by the lead” (Vivanti et al., 2017, p. 66). The last role is the float, responsible for monitoring the class and materially supporting the lead. The float can supply what the lead needs, maintain a consistent number of children in play areas, help children during the transition between play areas, ensure that the lead has enough time to organize group activities, and collect data. The G-ESDM organizational structure allows a possible redefinition of the roles within a typical classroom efficiently employing typical American preschool teachers.

Another element that characterizes the G-ESDM is represented by peer interaction and social participation. This is a distinguishing feature of the G-ESDM, which uses peer models to support development trajectories of children with ASD. The interactions between typically developing children and children with ASD naturally support the learning process of these children and provide a tangible opportunity to work on social skills, interactions, and social participation, which are the foundation of inclusive principles.

As we stated earlier, the G-ESDM shares the core principles of the ESDM while providing specific characteristics that make it a promising model that can be implemented by teachers in early childhood education. The ESDM adaptation in groups involves a set of strategies to adapt the physical and social learning environment in order to support the pupil’s participation in classroom activities and community school life and to promote social interactions with peers and adults. These characteristics make the application of this approach feasible within educational contexts as a possible intervention that fosters the inclusion of children with ASD.

Finally, we hypothesized that the G-ESDM might well be taken into consideration as a valuable addition to clinical treatment programs where teachers are directly involved in promoting early social learning in children with autism in contexts together with their peers. This also includes opportunities to work on educational goals such as participation

in cooperative activities, communication and engagement with peers, supporting families in everyday life, and addressing their needs. All of these principles are in line with those of NDBIs that can be implemented together with good inclusive practices. However, to the best of our knowledge, the G-ESDM has never been implemented in American community-based programs, making it a good candidate for research in the field of implementation science.

2.6 Science-Based Implementation Frameworks for Program Success in Child Care Settings

More recent approaches to implementation of evidence-based practices and NDBIs have looked at implementation science as the model. In the past decade, scientists have provided different frameworks to implementation science. The following overview of this body of work looks at a specific model, Fixsen's active implementation frameworks (Duda, Simms, Fixsen, & Blasé, 2012).

What does implementation stand for? Implementation means use. Implementation is defined as "a specific set of activities designed to put into practice an activity or program of known dimensions" (Duda et al., 2012, p. 2). Implementation science is defined, therefore, as the examination of components that affect the complete and successful use of innovations in practice (Fixsen, Blasé, Van Dyke, & Metz, 2015).

The historic root of implementation science can be found in the medical field. The main objective of implementation science was to study scientific health care methodologies, as well as proven interventions, and to embed them into routine practices. The belief underpinning this study was that the use of these findings would eliminate inappropriate care (Eccles & Mittman, 2006).

In the early 2000s, the University of North Carolina's National Implementation Research Network (NIRN), operated by Dr. Dean Fixsen and other research scientists, has been studying the science-to-service gap in education. In one of their most important publications, they clarify the difference regarding popular terms in the field of education and teachers' professional development: diffusion, dissemination, and implementation

align with three different categories of the activities described in professional development literature.

Diffusion is described by the literature as “the letting it happen” strategy of spreading information about innovations (Rogers, 1962, 1995) most of the time via workshops, conferences, and public events. “The helping it happen” or dissemination is characterized by strategies or forms of communication that urge understanding and use of innovations by assessing practitioners’ and organizations’ readiness, system influences, websites, guidelines, and specific training (Brownson, Colditz, & Proctor, 2012; Tabak, Khoong, Chambers, & Brownson, 2012). An outcome of dissemination is practitioners approaching and attempting to use innovative methods in practice. Finally, “the making it happen” or implementation strategy concerns factors contributing to the uses of innovations as intended (Fixsen, Naom, Blase, Friedman, & Wallace, 2005; Meyers, Durlak, & Wandersman, 2012). An outcome of implementation is the actual systemic use of innovation with good results in practice. While diffusion and dissemination efforts are necessary, the research found their use insufficient to support the implementation of new practices (Kessler & Glasgow, 2011). In contrast, the “making it happen” approaches, embracing “the complexities of spreading and sustaining innovation in organizations” (Greenhalgh et al., 2004; p 614), offer purposeful and persistent support for using innovations, and result in 80% use of innovations as intended (Fixsen, Blase, Timbers, & Wolf, 2001).

Moreover, in 2005, Fixsen and his colleagues published a comprehensive literature review, identifying universal factors for successful implementation that apply to any human service (Fixsen, Naom, Blasé, Friedman, & Wallace, 2005). After reviewing the literature, they found that effective implementation requires changes at the state and federal levels as well as purposeful support systems in place to create the needed change in knowledge, behavior, and attitude (Fixsen et al., 2005).

In a 2013 NIRN article, Fixsen defined all the components of implementation in detail: Implementation Drivers, Implementation Stages, Implementation Teams.

The term Implementation Drivers refers to three following categories: competency, organization, and leadership. Implementation Drivers can influence and ultimately improve practice proficiency, and create a more welcoming structural environment as well as positively impact routines and procedures for evidence-based program implementation:

1. Competency drivers are defined as the approaches to promote, encourage, develop, and sustain the innovation as intended. Competency drivers are then categorized into subsections, including enlistment and selection of staff, preparation, training, and performance assessment.
2. The term Organization Drivers refers to the manner in which procedures, routines, and structures are developed for successful implementation.
3. Leadership drivers focus on providing accurate direction for the types of trials and challenges the implementation will create. These complications frequently occur as part of the transformation process within the organization. Guidance and support are needed to make judgments, provide supervision, and sustain organization utility (NIRN, 2013).

Four are the stages of implementation that organizations experience in carrying out the process. The implementation phases are often nonlinear and typically take 2 to 4 years to be completed (NIRN, 2013). They require a careful and detailed analysis of what works and what can be improved, as well as experience and repetition in order for the best practice to become institutionalized and sustainable in the organization. The phases of implementation are the following:

1. Exploration. The organization assesses willingness, studies a potential adoption, and examines the practicability of the proposed change.
2. Installation. The organization confirms the accessibility of needed resources and supports such as staffing, tools, guidelines, and protocols.
3. Initial implementation. The organization learns the new way of work, unravels challenges, and begins to seek to realize the commitment of stakeholders.

4. Full Implementation. The organization sustains and improves practices and protocols throughout the system. Components are effectively operational and cohesive; practices are competent (Fixsen et al., 2005).

Moreover, Fixsen has created active implementation frameworks and corresponding assessment checklists to guide and measure the practice implementation. “Frameworks provide guidance for purposeful and effective action in complex human services environments” (Fixsen, Blasé, & Metz, 2016, p. 5). The frameworks foster accountability and have identified targets and metrics to facilitate their use. These documents have been designed to assist implementation teams (organizations and programs) in honestly assessing their stages of implementation in an effort to foster improvement.

Finally, the authors addressed the concerns regarding adults’ learning (NIRN, 2013). They stated that “anything worth doing is worth doing poorly,” as an acknowledgment of the learning process associated with implementation. Indeed, learning takes time. Educators can learn from the beginning of the process of change even with substantial mistakes and errors in thinking. Since the organizational structure of teams helps with problem-solving, they should expect more problems as the norm.

2.6 Conceptual Framework

There is a growing body of research looking at the processes and core components of implementing evidence-based practices and NDBI, in different settings. These processes specifically look at what it takes to move an evidence-based practice from the laboratory to the *real world* (Berkel, Mauricio, Schoenfelder, & Sandler, 2010; Durlak & Dupre, 2008; Fixsen, Naoom, Blase, Friedman, & Wallace, 2005; Meyers, Durlak & Wandersman, 2012). The importance of implementation has come to the fore within the early childhood field in recent years because, increasingly, early childhood program developers are being asked both to prove their programs’ efficacy before “scaling it up” and to articulate which components of their model are essential for making the intervention a success. This is true of individual programs, such as ASD behavioral

interventions, as well as for larger, systems-level interventions, such as American federal and statewide initiatives to improve early childhood educators' professional development or child care quality. However, until now, the early childhood field has lacked a common framework and language with which to examine important implementation strategies for successful initiatives.

CHAPTER 3: RESEARCH AND METHODOLOGY

3.1 Purpose

In the previous chapter, we have discussed the reasons why traditional approaches to diffusion and dissemination of EBPs and innovative interventions for children and families have been found insufficient. The Active Implementation Frameworks (AIFs) emerged as a science-based implementation framework to actively build the providers' capacity to implement EBPs with high fidelity and good effect.

Given the limitations in the existing literature, the purpose of the research project is to further extend the literature and evaluate AIFs for inclusive early childhood educators' training to increase implementation fidelity of NDBIs for children with ASD.

The purpose of this chapter is to describe a case study in early childhood education, where the AIFs were used to facilitate the implementation of the G-ESDM and inclusive practices. The study provides data that suggest AIFs are promising frameworks for promoting the high-fidelity classroom implementation of G-ESDM and inclusive strategies through multilevel training programs.

3.2 Research Questions and Hypotheses

NDBIs researchers have long been aware of the issues of accessibility to early intervention for children with autism and their families. Likewise, disseminating research-based programs and innovations in ECE while relying only on traditional professional development programs, has been found insufficient (Odom, 2003). The growing interest in strategies that “make it happen” by actively building the capacity of teachers and schools to implement innovations with high fidelity has guided the following research questions of the present study:

- 1) To what extent do the AIFs help implement the NDBIs, particularly the G-ESDM, and inclusive strategies in an American community-based preschool?

2) Do AIFs' applications impact teachers' G-ESDM implementation and fidelity in their classrooms?

To answer the first question, we hypothesized that the application of the AIFs would help identify alignment between the G-ESDM, inclusive didactics, and the school educational profile. Following Fixsen's conception, we hypothesized that the implementation science framework would purposefully support the school system's change, showing an increase in teachers' knowledge and an improvement in their attitude toward autism.

Moreover, to answer the second research question, we hypothesized an increase in ESDM and G-ESDM classroom fidelity after the training.

3.3 Significance of the Study

According to Ryan Jackson et al. (2018), the Active Implementation Frameworks represent operational structures to guide the school's EBPs implementation process. The scope of this case study is twofold: documenting the application of the AIFs strategies in the ECE system for teacher's professional development; providing data about the AIFs employment to promote the NDBIs implementation in inclusive early education classrooms.

During the 3-year project, this case study reviewed and documented the AIFs application process, including implementation stages, implementation drivers, and implementation teams. The research procedure can potentially provide valuable information and inspire the ECE system to partner with other institutions that possess the expertise necessary to implement and train NDBIs. The continued cycles of assessment of the AIFs application provided critical information for action planning and strengthened the infrastructure to improve G-ESDM fidelity over time.

In addition, there is very little literature regarding the implementation of the NDBIs in community-based programs. As one of the few case studies, we have tested the application of the AIFs as the operational structure for effective implementation of the G-ESDM in a community-based preschool. In fact, this research aims at describing the

insights and perspectives emerging from the study to promote teachers' professional development to adapt and adopt evidence-based practices in ECE.

3.4 Research Methodology

In 2017, the Department of Humanities, Philosophy, and Education of the University of Salerno, in partnership with Early Days Autism Center, Every Child non-profit, and Capital Christian Early Education Center, embarked on an initiative to introduce evidence-based strategies for pupils with autism, with the goal to include them and their families into the preschool community.

The implementation research project was developed with the institutions mentioned above in Sacramento, California; the objective was to create a G-ESDM training program while ensuring educational outcomes and inclusion of learners with autism in some of the preschool classrooms. The collaboration with various experts at these institutions developed a continuum of services for children with ASD and their families that were both evidence-based and inclusive. Several interventions were selected and developed: ESDM training program for 1:1 interaction between teachers and children with ASD (introductory and advanced workshops); G-ESDM training for Classroom Implementation (modeling sessions and workshop); G-ESDM training for small group activities (supervision and coaching for activities planning and implementation); and a training course and supervision on inclusive didactics and pedagogy (workshop, supervisions, and meetings). Table 3.1 provides information on the attendance per participant to the various training activities.

The AIFs, specifically the implementation stages, the implementation drivers, and implementation teams, helped create successful program operations for the project. During the various stages, the research focused on collecting different information to create a training program for the implementation of G-ESDM and assess the adoption and adaptation by the school and its teachers.

In order to achieve these objectives, this study used a multi-method design, collecting qualitative and quantitative data to answer separate but related research

questions and explore multilevel strategies of the implementation. The use of a multiple methods strategy was necessary to develop a complete understanding of the impact of training on knowledge and attitudes toward autism and behavioral outcomes, tested as G-ESDM fidelity. To answer the research questions, data from multiple sources were collected using rigorous qualitative and quantitative methods. See Table 3.2 for research questions, data type, and data collected, and data analysis method.

Table 3.2 Research Questions, Data, and Analysis

Stage	Research Question	Type of Data	Data	Analysis
Exploration	1. What are teachers' need?	Quantitative and Qualitative	G-ESDM Fidelity	Pre-post training
	2. Do the G-ESDM strategies fit with school didactics?		Participants' Journal	Content Analysis
	3. What are the innovative core components that the G-ESDM brings into the school?		Post workshop questionnaire	Descriptive Analysis
Installation	4. What is the general knowledge on Autism among teachers?	Quantitative and Qualitative	KCAHW ASST	Pre training
	5. What is the general attitudes toward autism among teacher?			Descriptive Analysis
Initial Implementation	6. Does G-ESDM Training impact teachers' fidelity?	Quantitative	G-ESDM Fidelity	Pre-post analysis
	7. Does training impact teachers' knowledge		KCAHW	
	8. Does training impact teacher's attitudes?		ASST	

3.5 Participants and Setting

The study was implemented at the beginning of the school year 2017-2018 in inclusive preschool classrooms with children with ASD. Over the three years of research, four preschool classrooms at Capital Christian Early Education Center were the setting for implementing the G-ESDM. The inclusive classrooms enrolled 18-24 children and maintained a 1:6 adult/child ratio. Children with ASD comprised an average of 10-15% of enrollment per classroom. The selected classrooms welcomed a total of 10 children aged two to five with a formal diagnosis of autism. We don't exclude that the classrooms enrolled more children with development issues but without a formal diagnosis.

All early childhood classrooms at Capital Christian Early Education Center are staffed with credentialed early childhood teachers and assistant teachers who work collaboratively in one or multiple classrooms depending on enrollment and budgetary factors. In addition, the Early Days Autism Center provided instructional assistants assigned as invisible support teachers to children with ASD. Participants in the research were early childhood educators (N= 25): lead teachers (LT=6), assistant teachers (AT= 8), instructional assistants (IA=10), and the director of the early education program (DI=1). Inclusion criteria for the present study were: (1) educators employed either by Capital Christian Early Education Center or by Early Days Autism Center for at least six months; (2) educators committed to attending training sessions for at least six months (workshops, coaching, supervision); (3) educators who agreed to submit videos of their practice for fidelity review. Individuals who did fall under these requirements were excluded. Table 3.3 presents descriptive statistics for the selected participants: a total of early childhood educators (N= 19), lead teachers (LT=5), assistant teachers (AT= 4), instructional assistants (IA=8). The early education program director (DI=1) was involved only in the leadership and organization activities, therefore not tested for the variables under this study.

Table 3.3 Participants' Descriptive Statistics

Classroom	Total Participants	Roles	Gender	Age	Education	Training in ECE	Training in Special Ed	Years of Experience
1	7	1 (LT)	14% M	57% < 30y	44% High School	58%	58%	28% No Experience
		1 (AT)	86% F	15% > 30y	14% Collage			58% < 5y
		5 (IA)		28% > 40	14% BA 28% MA			0% < 10y 14% > 10y
2	4	1 (LT)	25% M	50% < 30y	0% High School	75%	33%	0% No Experience
		1 (AT)	75% F	50% > 40y	50% Collage			100% < 5y
		2 (IA)			25% BA 25% MA			0% < 10y 0% > 10y
3	3	1 (LT)	33% M	33% < 30y	0% High School	100%	33%	0% No Experience
		2 (AT)	68% F	66% > 40y	66% Collage			33% < 5y
					0% BA 33% MA			0% < 10y 66% > 10y
4	3	2 (LT)	33% M	33% < 30y	33% High school	66%	66%	0% No Experience
		1 (IA)	66% F	33% > 30y	0% Collage			33% < 5y
				33% < 40y	33% BA 33% MA			0% < 10y 66% > 10y

It is important to note that the study participants engaged in similar and various training sessions. Their training depended on the school organizational structure and the implementation stage during which they started the training. More specifically, the director received leadership and organizational training from the G-ESDM trainers from the Exploration to the Full Implementation Stage; participants from classroom 1 received training only during the first Exploration Stage; participants from classroom 2 received training during Installation Stage; classroom 3 and 4 only during the Initial Implementation and Full Implementation. The training structure intended to provide an example of expanding the intervention to different classrooms while fading the involvement of the school's trainers. In addition, all participants were supervised and mentored by their institutions' supervisors, either by Capital Christian or by Early Days. The participants received ongoing instruction, mentorship, and supervision through these relationships in line with the objectives of their individual programs and could not be controlled by the research. Therefore, these relationships may have influenced the training outcomes of focus for the current study.

3.6 Procedures

3.6.a General Procedures

The research project applied the AIFs (Fixsen et al., 2009; Fixsen et al., 2005; Metz & Bartley, 2012) between 2017 and 2020 to promote successful program operations for the G-ESDM implementation in inclusive classrooms. The use of the AIFs helped to build the project and various multilevel strategies to implement the G-ESDM and to train teachers in inclusive pedagogy. Three key aspects of the AIFs have been deployed: Implementation Stages, Implementation Drivers, Implementation Teams.

3.6.b Enrollment Procedure

Prior to the start of data collection, all the parties met for collaborative planning. During the pre-service professional development workshop organized by Capital

Christian in August 2017, the stakeholders were introduced to school leaders and teachers. The teachers and instructional assistants were asked and given a choice to participate in the research project.

3.6.c AIFs Application Procedures

The project has used the following AIFs components to operationalize the G-ESDM implementation:

1. *Usable Intervention Criteria*— A clear description of the G-ESDM program, principles, and theory, strategies, techniques, and assessments of practitioners’ fidelity as manualized by Vivanti and colleagues (2017).
2. *Stages of implementation*—Stage-appropriate implementation activities and data collection necessary for successful service and systems change. Figure 3.4

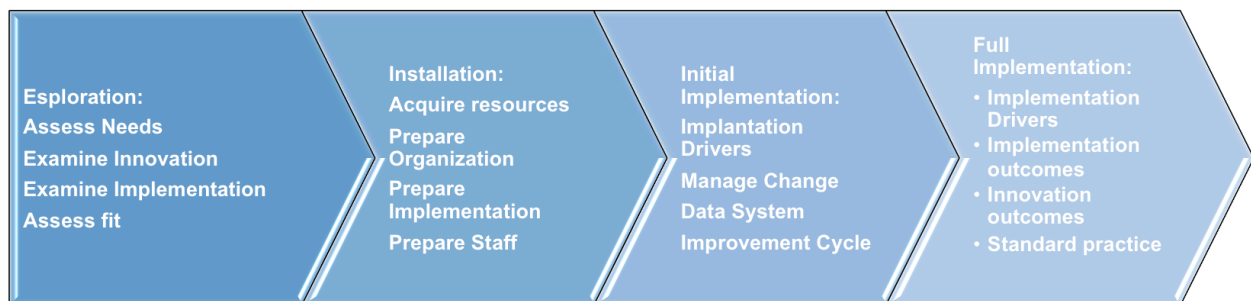


Figure 3.4 Implmentation Stages

3. *Implementation drivers*—Core components of the infrastructure needed to support practice, organizational, and systems change. Figure 3.5

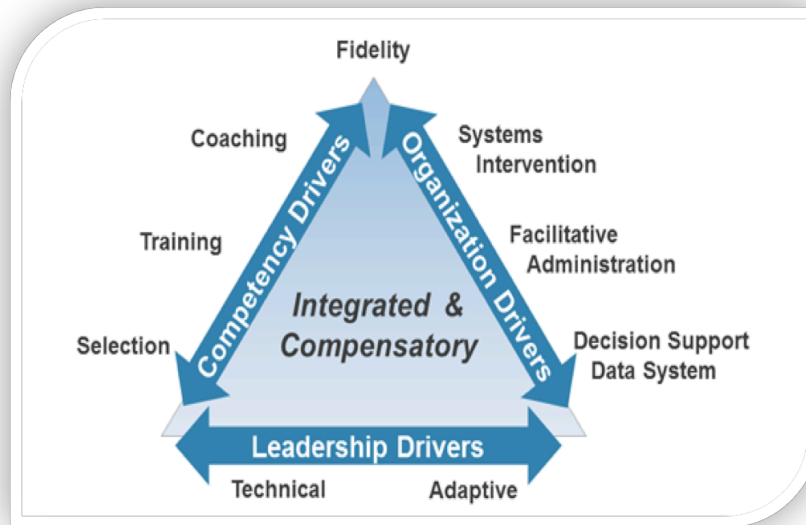


Figure 3.5 Implmentation Drivers

4. *Improvement cycles*—Processes to use data to drive decision-making and institutionalize policy–practice feedback loops within Capital Christian Early Childhood Education Center. Figure 3.5.

5. *Implementation teams*—Accountable teams structure for moving innovations through the stages of implementation.

Table 3.7 Implementation Teams Structure

Implementation Teams	Roles	Objectives	Meeting
Leadership Team	Leadership of Capital Christian and Director of the Early Childhood Center; Leadership of Early Days Autism Center, Leadership of Every Child, University of Salerno research team.	Decion making and Data Analysis Implementation planning; investment of resources.	Twice a year of the overall project;
Organization Team	Director of Capital Christian Early Childhood Center; Early Days Autism Center Supervisors; G-ESDM Trainers	Data Analysis and Decision Making of the implementation; Organizational changes; Implementation of new polices,	Once a month
Practice Team	Capital Christian Early Childhood Center teachers; Early Days Autism Center instructional assistants and supervisors; G-ESDM coaches and trainers; ESDM coaches and trainers; University of Salerno Ph.D.Students.	Staff Selection; Training, Practice; Performance assessment, Data Collection	Once a week

The whole implementation research lasted for three years and ended in March 2020, with the outbreak of Covid-19 in California (Figure 3.6). Because each stage of implementation does not cleanly and crisply end as another begins, implementation and training activities related to one stage occur or reoccur as activities related to the next stage begin.

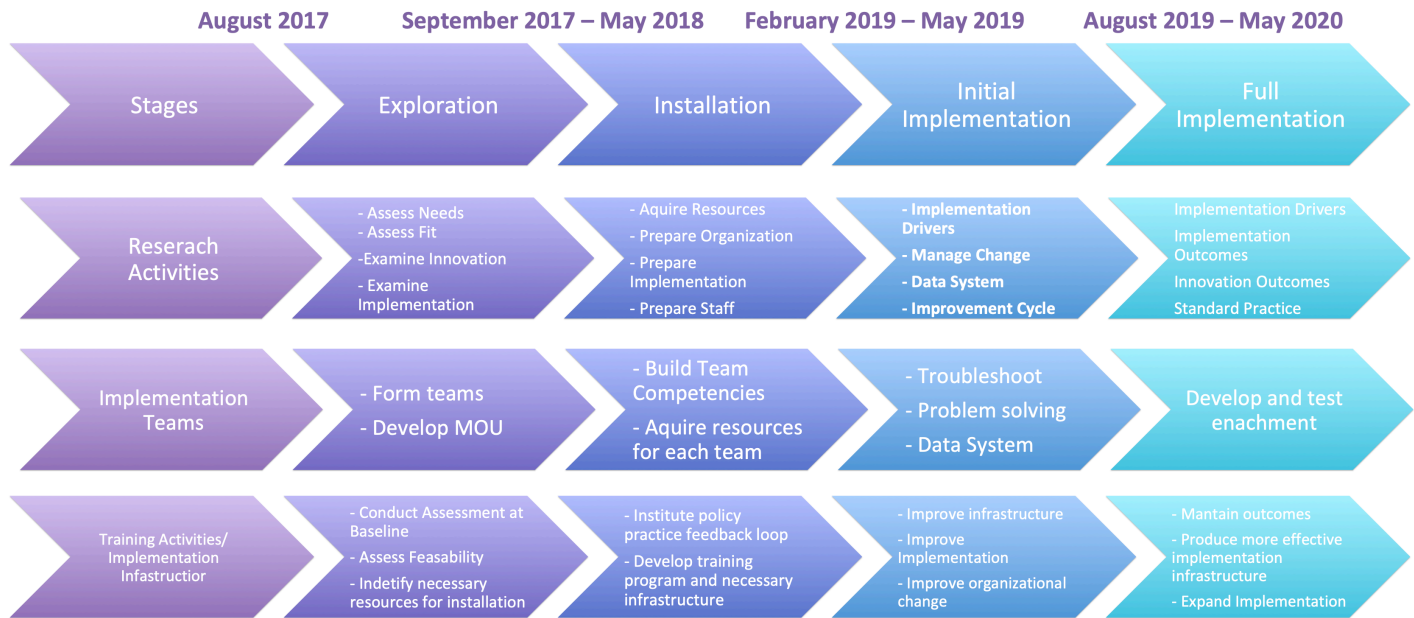


Figure 3.6 Project's Timeline

3.6.d Implementation Stages

EXPLORATION

During the first year, a quantitative and qualitative study was piloted to assess the needs and the fit of the G-ESDM, to examine innovation and implementation, and to set the activities for the following stages. In addition, first training activities such as classroom setup, workshops, supervisions, modeling sessions were carried throughout the academic year. Data were collected at the beginning and at the end of the school year.

Between the end of the first year and the beginning of the second year of implementation, the parties organized the implementation stages, identified the implementation drivers, and selected personnel for the implementation teams (Fixsen, Naoom, Blase, Friedman, & Wallace, 2005).

INSTALLATION

Based on the data of the first year, the study demonstrated the promising nature of the AIFs for developing local capacity and leadership, improving G-ESDM fidelity in Capital Christian Early Childhood Education Center's first classroom.

Once the decision to adopt the G-ESDM was made, many structural and organizational changes in a number of settings and systems were needed in order to initiate the new practices. Practical efforts among all the parties were central to the installation stage, including activities such as developing referral pathways for children with ASD, ensuring that financial and human resources were in place, reviewing school policies, and organizing the physical space, purchasing equipment and technology. Developing the competence of educators in the second classroom (classroom 2) was key to ensure that programs could be implemented with fidelity. Workshops, supervisions, observation, and coaching were the training activities carried throughout the academic year 2018-2019.

At the end of the Installation Stage, all the parties developed a memorandum of understanding (MOU) that described how they were going to function, communicate, make decisions, and move forward with their mission and objectives.

INITIAL IMPLEMENTATION

During the initial implementation stage, the G-ESDM was put into practice following a specific structure. The key activity of the initial implementation stage was to find strategies to promote continuous improvement and implementation in more

classrooms through rapid-cycle problem-solving. Two champions² were selected. Their responsibility was to become proficient in the G-ESDM, using data to assess its implementation, and learning coaching strategies to support the G-ESDM implementation in other classrooms. The rest of the implementation teams focused on identifying solutions and driving decision-making. It was critical between the installation and the initial implementation to address the issue of implementation barriers among teachers and leaders, and develop systematic solutions quickly rather than allowing problems to re-emerge and reoccur.

As stated earlier, the project ended between the initial and full implementation stage as the Covid-19 health care emergency hit the state of California.

3.6.e Implementation Teams

During the installation stage, all the participants in the project organized the implementation team structure. Multiple implementation teams at each level of the system (leadership, organization, and practice) were necessary. Teams had clear objectives and supplied an internal structure to move the G-ESDM program through the implementation stages. Also, cross-sector leadership competencies were essential in each group to develop alignment between school educational practices, inclusive pedagogy, and G-ESDM and inform implementation team members. All teams included a mix of experts, who played an essential role in using evidence-based strategies to actively support implementation, and practitioners. An advantage of relying on mixed implementation teams is that the teams collectively have the knowledge, skills, abilities, and time to succeed. Collectively, the core competencies of the implementation teams included: expertise in inclusive pedagogy and didactic; extensive experience in early childhood development and education; extensive knowledge and understanding of the G-ESDM and its linkages to fidelity and children outcomes; knowledge of implementation

² The development of program champions is a key part of the initial implementation stages because it assure the diffusion and continuity of training after the implementation and training is completed (Metz & Bartley, 2012)

science and best practices for implementation; and applied experience in using data for program improvement.

3.6.f Implementation Drivers

As stated earlier, the implementation drivers are the core components or building blocks of the infrastructure needed to support practice, organizational, and systems change. The drivers serve both integrative and compensatory functions so that strengths can compensate for weaknesses among drivers. (Metz et al., 2015).

Competency drivers were part of the implementation core components (staff selection, training, coaching) carried by the practice team to develop, improve, and sustain teachers' ability to implement the G-ESDM and inclusive practices. Organization teams were responsible for the core components of organization drivers: to ensure the organizational structure and systems interventions; to create the settings for the G-ESDM; to base decisions on data for implementing continuous improvement. Finally, the leadership team carried the leadership driver's core components to ensure that leaders used appropriate strategies to address various school system challenges (See also Figure 2.).

3.6.g Data Collection Procedures

Pre-training and post-training data were collected at the beginning and at the end of each school year to observe implementation differences in the training classrooms. At baseline, coaches and trainers recorded a 20-minute video in each room (classroom 1, classroom 2, classroom 3, and classroom 4) and a 15-minute video of each teacher interacting with a child with ASD in a 1:1 activity. According to the literature, inner context variables, such as provider attitudes and engagement in training, knowledge, and attitudes toward autism are associated with successful implementation. Therefore teachers' attitudes toward and knowledge of autism were assessed using the same set of tools every year.

Moreover, teachers assessed each modeling session with a prompted journal in order to collect information necessary for the installation stage and assessed the G-ESDM workshops with a quality survey.

3.7 Training

In partnership with the school leadership, the implementation teams conducted stage-appropriate implementation activities (workshops, supervisions, coaching sessions, monthly staff meetings, director meetings, monthly mentoring meetings, etc.). They developed core implementation components to support competent and sustainable service.

The training encompassed various activities:

1. **Introductory Workshop:** one-day workshop developed from the MIND Institute of the University of California, Davis, and delivered by a certified ESDM trainer to learn about the theoretical and empirical framework, curriculum, and teaching principles of the Early Start Denver Model (ESDM).
2. **Advanced Workshop:** 3 days hands-on workshop developed by the MIND Institute and delivered by a certified ESDM trainer to learn how to carry out ongoing therapy using the ESDM with children with ASD.
3. **Behavioral Workshop:** 1h course to learn about behavioral intervention and ABA principles.
4. **Play Workshop:** 2h course to learn about developmentally appropriate play stages and how to promote play skills in children with ASD.
5. **Inclusion Workshop:** 2h course to learn about inclusion from both theoretical and empirical underpinnings, and about American laws.
6. **G-ESDM Workshop:** 3 days hands-on workshop to learn how to carry out ongoing G-ESDM activities with children with ASD and their peers.
7. **Modeling Sessions:** 8 weekly sessions together with G-ESDM trainers in the classroom

8. Coaching: 1h weekly sessions in classroom with G-ESDM trainers providing minimal coaching for the implementation of the G-ESDM
9. Supervision: 1h weekly meetings with ESDM and G-ESDM supervisors to review child-specific trainees' questions, provide feedback on their practice, and review inclusive practices.
10. Monthly Meetings: 1h implementation teams meetings to review the implementation process.

3.8 Variables and Instruments

This study's general objectives were to test teachers' skills pre-post training with ESDM and G-ESDM fidelity tools (Dawson, Rogers, 2010; Vivanti et al., 2017) and observe if the AIFs could support the G-ESDM implementation.

At baseline, ESDM and G-ESDM fidelity measures were necessary to create a training program and establish which ingredients of the model teachers naturally have in their teaching practices. Moreover, during the exploration stage, qualitative data were collected by comparing four core components of the G-ESDM with those in the school: observation tool to track children's skills and progress (ESDM Curriculum Checklist and the Desired Results Developmental Profile), curriculum program, daily schedule, and teachers' roles. During training and coaching, teachers expressed their perspectives on a journal, assessing: the G-ESDM fit; the potential use of the NDBI as a classroom model, the barriers to G-ESDM implementation. Each participant completed five reflective journal entries at the end of the modeling or coaching session. The journal prompts were designed to allow the participants to describe specific situations and events supporting their implementation of the G-ESDM and inclusive practices. These narratives provided a richer context for the descriptions of the participants' experiences during the training sessions. Table 3.7 displays the journal prompts.

Table 3.7 Participants Journal Prompts

Roles	Please Describe what was your role in class today
	Did you feel prepare for this role
	What could have help you today?
Engagemnt	Describe in a few sentence your thouhgs of children’s engagment
	Share one moment from today that was meaningful or new for you and you would like to see happen again
	Add a suggestion or a thought based on what you experienced

For the purpose of assessing training outcomes (Research Question #6, Table 3.2), teachers were evaluated with the ESDM and G-ESDM fidelity tools (Dawson, Rogers, 2010; Vivanti et al., 2017). Therefore, the primary quantitative dependent variables were related to practices promoting G-ESDM implementation in the classroom. This variable was tested with the Classroom Measure of fidelity provided in the G-ESDM manual (Vivanti, 2017). Fidelity of implementation is the degree to which teachers deliver the critical components of the G-ESDM in the way it was designed (Century, Rudnick, & Freeman, 2010). It is an essential component of evidence-based implementation, so much so that funding agencies have required intervention studies to include measures of treatment fidelity (Institute of Education Sciences [IES], 2018; O’Donnell, 2008) to improve treatment efficacy. Fidelity of implementation is essential for several reasons (Hume et al., 2011), including determining whether the treatment effects are valid (Gresham, MacMillan, Beebe-Frankenberger, & Bocian, 2000; Mandell et al., 2013) and whether the treatment is transferable to the real world (Strain & Bovey, 2008). For the G-ESDM fidelity, there are several dimensions to consider:

- (a) adherence/integrity: implementing an intervention as intended and described in the manual;
- (b) exposure/dosage: frequency of delivery, number of learning opportunities delivered to children;
- (c) quality of intervention delivery: implementation of G-ESDM principles, strategies, and teaching techniques.

The teachers' knowledge of autism and their attitudes toward it were exploratory dependent variables. They were the focus of the exploration stage study to guide the following implementation stages and provide any relationship with the implementation outcomes. In particular, the research project utilized the following instruments: teachers' knowledge of ASD, specifically in early childhood, was tested with the Knowledge about Childhood Autism among Health Workers (KCAHW) questionnaire (Bakare, M.; Ebigbo, P.; Agomoh, A.; Menkiti, N.; 2008); the Autism Attitude Scale for Teachers (AAST, Olley, 1981) was used to explore teachers' attitude.

3.9 Analysis and Results by Research Questions

For the purpose of this paragraph, data analysis follows each question of the research as presented in the table 3.2.

3.9.a. EXPLORATION

Question #1: What are teachers' needs?

At the beginning of the Exploration Stage, G-ESDM trainers presented the model to the school leadership. The Director of Capital Christian Early Childhood Center received a clear description of the G-ESDM program, principles, theory, strategies, techniques. The G-ESDM was presented to the school as a practice to be implemented because:

- It is an EBP and NDBI;
- It has been implemented in specialist and inclusive child-care centers;
- It has been empirically supported;
- It fosters participation and interactions with adults and peers;
- It targets autistic core deficits and social-cognitive development.

In order to create a training program, G-ESDM trainers assessed teachers' needs using the ESDM and G-ESDM fidelity tools. Participants showed low G-ESDM Classroom fidelity ($M=50\%$) and some ESDM strategies with higher fidelity ($M=73\%$, $SD=11\%$, *Range 48%-86%*). Therefore, the training was initially focused on the G-ESDM Classroom implementation.

Question #2: Do the G-ESDM strategies fit with school didactics?

Qualitative data collected from the teachers' journals required a content analysis.

Journals narratives were transcribed and analyzed using a constant comparative analysis method. The data were read, coded, analyzed, organized, and reviewed to create categories and subcategories with specific examples drawn from the transcriptions (Creswell, 2014). The process began with open coding: the researcher read the data several times and created preliminary groups. Once the data was saturated with the initial coding, the codes were examined for duplication, refined for clarity, and condensed into emerging themes.

The content analysis showed that teachers identified four feasible G-ESDM core components that could fit in and ameliorate their practices: G-ESDM Curriculum; Teaching plans; Daily Schedule; Definition of the G-ESDM Roles.

Question # 3: What are the innovative core components that the G-ESDM brings into the school?

To examine innovation, we used both qualitative and quantitative data. From the qualitative data of the journals, the content analysis identified the following themes: engagement of children with ASD; focus on social skills; teachers' roles definitions; data-taking; focus on specific learning objectives. In the quantitative data analysis, we observed pre-post changes in teachers after the first year of implementation. The pre-post analysis of the G-ESDM Classroom Implementation fidelity showed a greater improvement into specific items of the fidelity: participation, peer interactions; data; roles and responsibilities; implementation of individualized plan.

Questions # 4 and # 5: What is the general teachers' knowledge on Autism among teachers? What is the general attitude toward autism among ECE teachers?

In order to create a training program, and following Fixsen's suggestion, knowledge of and attitudes toward autism were assessed. At baseline, teachers responded correctly to

most of the questions in KCAHW ($M=70\%$, $SD=12\%$), and from the analysis of the AAST, they showed agreement with the inclusion of children with ASD. The average AAST score was 60, corresponding to “mostly agree” on the Likert Scale.

3.9.b AIFs APPLICATION for the G-ESDM IMPLEMENTATION

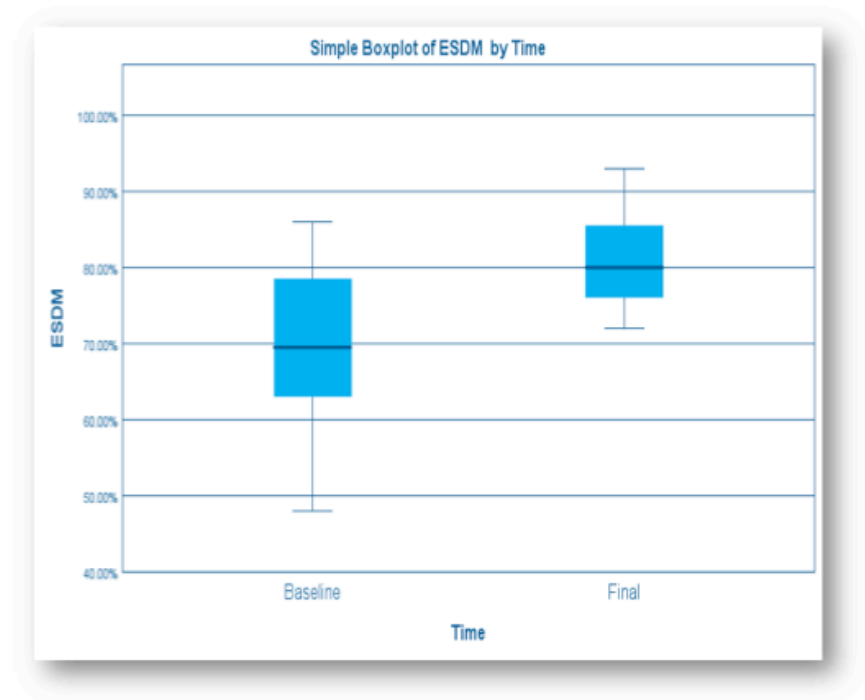
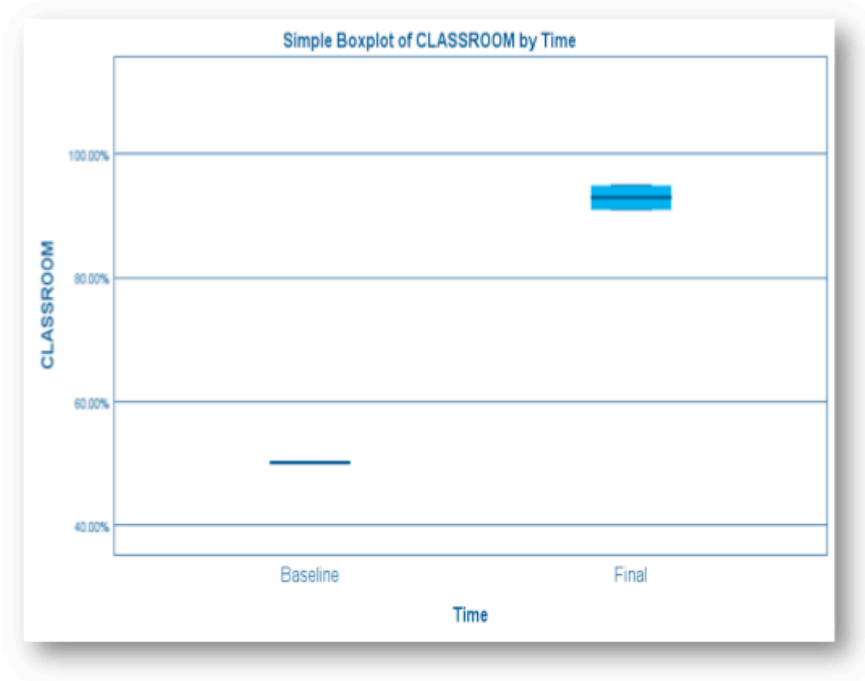
Question #6 and #7: Does G-ESDM Training impact teachers’ fidelity? Does training impact teachers’ knowledge and attitudes toward autism?

Pre-post analysis of the ESDM and G-ESDM fidelity shows a functional relationship between training and use of practices as demonstrated by participants’ fidelity changes following the introduction of the training. The pre-post test, with a paired t-test, shows this increase across all seventeen participants with moderate changes in their ESDM fidelity ($p=0.004$) and G-ESDM fidelity ($p<0.001$). Moreover, the training had impacted all participants’ attitudes and knowledge, with a significant increase in both variables: attitudes ($p<0.001$), knowledge ($p<0.001$).

In order to highlight the differences among participants, we used the ANOVA to calculate differences among the educators (lead teachers, assistant teachers, and instructional assistants) and between different classrooms. Then we used the independent samples t-tests to calculate the difference between specific groups. From the analysis, we found significant differences in autism knowledge between the groups ($p=0.001$), with differences between lead teachers and assistant teachers ($p=0.018$) and assistant teachers and instructional assistants ($p=0.026$). The different classrooms also showed significant differences post-training in ESDM fidelity ($p=0.010$) and G-ESDM fidelity ($p<0.001$), specifically post-training ESDM fidelity differs between Classroom 1 and 2 ($p=0.020$), and Classroom 2 and 4 ($p=0.013$); and post-training G-ESDM fidelity differs between Classroom 1 and 2 ($p<0.001$), and between 1 and 3 ($p<0.001$), and 1 and 4 ($p<0.001$).

The study also wanted to test if the variables correlated to each other. We found that knowledge pre-training correlated with teachers’ participation to Introductory workshop ($R=0.5$, $p=0.041$) and Advanced Workshop ($R=0.537$, $p=0.026$), post-training knowledge ($R=0.632$, $p=0.020$) and post-training G-ESDM Fidelity ($R=0.654$, $p=0.040$).

Finally, we found that pre-training ESDM Fidelity correlates with post-training ESDM Fidelity ($R=0.763$, $p=0.010$).



3.10 Discussion

This single case study provides promising data for the application of the AIFs to promote fidelity implementation of empirically supported practices, such as the G-ESDM.

The exploration stage study describes a process of obtaining qualitative information from frontline stakeholders, who face the challenges of individualized programs for pupils with ASD and guarantee the educational goals of the class are attained. Moreover, those qualitative data were essential to strengthen the G-ESDM training following the “make it happen” logic.

Investing in the development of a project that utilized implementation stages, drivers, and teams, and built cross-sector competencies was vital to the success of the G-ESDM implementation in inclusive classrooms at Capital Christian Early Childhood Education Center. Implementation teams engaged in the development and installation of implementation drivers to provide the infrastructure for change. Assessments of the implementation drivers offered critical information for the future action-planning to strengthen this infrastructure and improve fidelity over time.

The experimental study used a multi-method design to examine AIFs application to implement the NDBIs, particularly the G-ESDM, and inclusive strategies in an American community-based preschool. The data showed the AIFs application has not only provided important information to develop an effective G-ESDM training program but also has influenced teachers’ knowledge and their attitudes toward the inclusion of children with ASD. Moreover, as the AIFs application progressed through the various stages, teachers’ knowledge, positive attitudes, and competent practices showed a statistically significant increase between the groups and classrooms.

Although the study provided interesting qualitative and quantitative data, purposeful, rigorous research designs are needed to test these findings more thoroughly, perhaps considering measures of children’s outcomes in future research.

Consistently with the literature review, the Active Implementation Frameworks were crucial to “making it happen” in human services, specifically in education. Our study provided an infrastructure to support the cross-sector involvement in implementing NDBIs in school contexts. Our infrastructure consisted of linking Implementation Teams to align innovations effectively, considering all the various competencies. The development of implementation capacity using such an infrastructure is essential to achieving the goals of implementing NDBIs in education and purposefully producing socially significant outcomes for children with ASD and their families.

3.11 Conclusion

One of the most cited works on educational change is Fullan’s 1991 book, *The Meaning of Educational Change*. Fullan stated, “The purpose of educational change presumably is to help schools accomplish their goals more effectively by replacing some structures, programs, and/or practices with better ones” (Fullan, 1991, p. 15). Fullan studied education reform and programmatic transformation and found that change is a mysterious process and far more complex than what is typically expected. He defined educational change as “technically simple and socially complex” (Fullan, 1991, p. 65).

Moreover, in a 1992 study, Fullan and Miles detailed reform efforts of schools and school districts, acknowledging frequent barriers to educational change. These barriers include an overload of transformation projects in public education and the resulting pressure on staff to accommodate a multitude of changes. According to the authors, staff resistance is often cited as a significant barrier to reform. More importantly, Fullan and Miles deemed it essential to acknowledge the complexity of the problems in schools where there are more questions than answers as well as uncertainty regarding how to proceed. The challenges associated with solving these real problems are overwhelming, and solutions have not been developed. The researchers also recognized that with change comes the need for new learning, which often results in staff anxiety during the process. Fullan and Miles (1992) cited the need for a “cross-role” group to manage change, noting that policymakers and practitioners should recognize and accept a

certain amount of ambiguity and anxiety to be present through the change process. Collaboration among administrators, teachers, and parents does not always result in reform efforts; Fullan and Miles summed up their view of change by stating, “Wishful thinking and legislation have poor records as tools for social betterment” (Fullan & Miles, 1992, p. 752).

In summary, although the problems associated with implementation have been studied for many years, they have not been solved. Implementation of educational change is complicated, time-consuming, and highly dependent on the people putting legislative intent or theory into practice, which will determine the ultimate success of a change effort and its sustainability within the school system.

In the present study, an implementation model seemed appropriate. In examining a training program that was implemented for a few years, I determined that implementation science offered the best way to conceptualize the practical application of an NDBI into the early childhood education system. Using implementation science, we can create a shared understanding of what it takes to have effective, replicable, and sustainable early childhood programs and systems in community-based settings. This research aims at providing a useful overview of the current state of the field of implementation science research and its applications to the early care and education field. We hope that researchers, program developers, funders, and other stakeholders will find our study helpful in facilitating the use of implementation science frameworks, methodologies, and analysis in early care, education research, and program evaluation.

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