PRESCHOOL TEACHERS AND SUPPORT STAFF'S EXPERIENCES

IN USING ASSISTIVE TECHNOLOGY IN SERVING PRESCHOOL

CHILDREN WITH DISABILITIES: A CASE STUDY

By

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A dissertation submitted in partial fulfillment of
the requirements for the degree of

DOCTOR OF PHILOSOPHY

WASHINGTON STATE UNIVERSITY
Department of Teaching and Learning

MAY 2015

To the Faculty of Washington State University:

The members of the Committee appointed to examine the

dissertation of DEBORAH EMEFA TAMAKLOE finds it satisfactory and recommend that

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ACKNOWLEDGMENT

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IN USING ASSISTIVE TECHNOLOGY IN SERVING PRESCHOOL

CHILDREN WITH DISABILITIES: A CASE STUDY

Abstract

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May 2015

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The purpose of this qualitative case study was to explore preschool teachers, paraprofessionals and a speech therapist's choices and uses of assistive technology (AT) in an early intervention preschool class. Using observation and face-to-face individual interviews, as data collection tools, the researcher set out to understand the experiences of these practitioners including factors that act as facilitators or barriers to AT use. A Framework analysis of the data collected indicated that teachers, paraprofessionals and the therapist's choices and uses of AT in the preschool class were driven by multiple factors. At one level, there were the factors that directly related to practitioners' own philosophies of teaching children with disabilities and beliefs about the effectiveness of AT in supporting early intervention. In addition, there were factors related to resource issues and working together as a team. AT was used in the classroom with children with disabilities: (a) as mediation technologies to support children's learning and development; (b) to facilitate higher psychological functions enabling them to make requests and take turns; (c) as tools that facilitated the lower and higher mental functions and social

Interaction; and (d) to facilitate social interaction among children, teachers, parents and therapists. Results further indicated that the use of AT required adults and more competent peers to take on different roles and AT use with children needs to be embedded in play experiences to extend children's learning and development. Effective professional development for teachers and their support staff as well as the provision of adequate AT resources to enhance children with disabilities cognitive, communication and social skill development were noted. These factors are discussed in detail within the context of the lived experiences which were analysed in light of current research and practice with implications for future practice, research, and policy development provided.

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Dedication

I dedicate my dissertation work to my family and friends. A special feeling of gratitude to my

mother, Rose Dzogbeta for being there for me throughout the entire doctorate program.

CHAPTER ONE: INTRODUCTION

The expansion of Assistive Technology (AT) over the last three decades has contributed to an increase in participation rates as well as helping children with disabilities develop competencies in various developmental domains (Hasselbring & Glaser, 2000; Light & Dragar, 2007; NAEYC & Fred Rogers Centre, 2012). This has led to multiple organizations and legislations calling for the use of AT as a central feature of high quality early intervention practice to contribute to the optimum development of children with disabilities. However, there is little information on how preschool teachers and their support staff are using AT in early intervention to enhance young children's development and learning. The effective use of AT in early intervention depends on teachers and support staff who know how to use it (Light & Dragar, 2007; NAEYC, 2009). This research explored the experiences of two preschool teachers and their support staff's experiences in relation to using AT to support the learning and development of young children with disabilities in their classrooms. The findings provide insight into how effective use of AT enhances the development and learning of children with disabilities.

Background: Complexities in Child Development and Building a Case for Assistive Technology

Child development is a complex process informed by genetic and environmental factors (Kling, Campbell, & Wilcox, 2010: Light & Dragar, 2007).While some children develop very well, children with disabilities often do not develop typically; therefore, need extra support to help them function to their maximum potential (Kling, Campbell, & Wilcox, 2010). In recent times, the potential of (AT) as an effective learning tool in early intervention for children with disabilities has informed policies that underpin early intervention (Parette, Boeckmann, &

Hourcade, 2008; Hasselbring & Glaser, 2000; Light & Dragar, 2007). AT has been recognized

by the Federal government of United States of America in the reauthorization of IDEA, which

mandates that it be considered for each child with a disability (NAEYC, 2009). Recent empirical

studies investigating AT for early intervention provided convincing evidence that effective use of

AT enables young children to bypass their weaknesses and use their strengths to reach their

potential; thus, compensating for their perceived deficits. (Parette, Hourcade, Dinelli, &

Boeckmann, 2009). The selection and use of appropriate AT devices is critical to tailoring the

technology to the individual needs. This increases the effectiveness of the intervention and

decreases the likelihood of frustration and withdrawal.

Research findings (Hasselbring & Glaser, 2000; Light & Dragar, 2007; Mueller &

Hurtig, 2009) have indicated that effective use of AT provides children with a range of

functional abilities to access everyday learning experiences with typically developing peers.

However, other studies also indicated issues of selection and implementation of AT for young

children with disabilities in promoting child engagement (Dugan, Millborne, Campbell &

Wilcox, 2004). In order to increase the effectiveness of AT use, the focus must be on the

individuals that use the technology. This positions preschool teachers and their support staff as

critical resources in the implementation of effective early intervention, where AT is often

deployed (Mistrett, 2001).

High quality, early intervention services that utilize AT is critical to the present and

future school success of children with disabilities and yet research suggests young children with

disabilities sometimes have limited access to meaningful and effective use of AT (Dugan,

Millborne, Campbell & Wilcox, 2004; Lankshear & Knobel, 2003). Some of these results have

been attributed to the lack of teachers and support staff's knowledge and preparedness to use the

AT resources effectively (Lankshear & Knobel, 2003). Therefore, research is needed to gain insights into the ways teachers and their support staff design environments, curricula content, learning activities, and materials to accommodate the needs of young children with disabilities using AT. This study employed a qualitative case study approach using the teachers and support staff as the units of analysis. The study analyzed the preschool teachers and their support staff's experiences in relation to designs of learning environments, curricula content, learning activities, and materials using AT to accommodate children with disabilities in their classrooms. Insider perspectives provide in-depth understanding of the experiences with AT and develop scholarly knowledge about the effective use of AT for early intervention in preschool settings.

Statement of the Problem

Most children want to interact and play with their peers. In this era of emerging technologies, it is a major concern that some children living with disabilities might not be able to develop social competencies and catch up with their typically developing peers, because some teachers and their support staff might not have the required expertise to utilize AT effectively. In other words, the professional needs of teachers and their support staff in relation to AT use, has to be established in order to ascertain what professional support should be provided. The existing evidence, in this understudied area is based largely on quasi-experimental or experimental studies (Dugan, Millborne, Campbell & Wilcox, 2004). Few studies have studied the teachers and their support staff who implement AT with young children with disabilities. In the light of this, a phenomenological qualitative case study was conducted to gain insight into how two preschool teachers and their support staff use AT as an effective tool for promoting quality learning for children with disabilities.

Research Questions

The overarching question that this study aims to address is: What are the experiences of the teachers and support staff in the use of AT with young children with disabilities? This study will also address the following research sub questions:

1. What is the overall learning climate in the classroom when AT is being used?

2. How do teachers collaborate with other stakeholders (families, therapists and Para-professionals) to use AT in the preschool classroom?

3. What are the facilitators and barriers to AT use from the teacher's and stakeholders perspectives?

Purpose of the Study

Purpose drives actions; the purpose of this study, was to use a phenomenological case study approach to explore and analyze the insider perspectives of two preschool teachers and their support staff and gain in-depth understanding of their experiences in using AT for early intervention services. In addition, this study explored how best practices in early intervention are being met through AT and identifies professional development needs for maximizing the use of AT in early intervention. Finally, future research needed to impact policy development, teacher preparation, and classroom practices is highlighted.

Significance of Study

This study contributes to new knowledge in three main areas: theory, policy and practice. The long term implications are also significant at a variety of levels; individually for children with disabilities, by identifying effective ways to use AT to increase their opportunities to enter the workforce as empowered, educated citizens, and to socially challenge deficit views of disabilities.

Challenging deficit perceptions on assistive technology use. Within the wider literature, young children with disabilities are treated in many societies as objects of study to be taught exclusively as separate 'groups' (Agbenyega & Klibthong, 2012; Agbenyega & Deku, 2011). However, this study has provided a space for a different conceptualization regarding the discourses surrounding young children with disabilities, as capable individuals whose development and learning can be enhanced through the use of AT. This study is significant in bringing these issues to the forefront so that appropriate actions can be formulated to improve the situations of young children with disabilities. In a similar vein, historically, research related to the use of AT for young children with disabilities neglected to involve the true voice of the teachers who utilize these resources to support them (Robertson, 2011). Collecting data via interviews and observations allowed for deeper understanding into the uniqueness of the individual experience, challenging our notions surrounding the use AT with children who have disabilities.

Significance at an individual level. My research also aimed to establish how teachers and their support staff utilize AT resources in their classrooms and to understand their professional needs. This is achieved through an exploration and analyses of how individual teachers and allied professionals experience policies and practices in the early childhood classrooms in order to bring to the forefront any tensions, misrepresentation or possibilities. The research addressed my personal professional needs by looking closely at the nexus between IDEA policy and current practice within the context of the lived experiences of individuals. The individual perspective is pivotal in moving away from perceptions which lump people together and assume that their experiences are the same. In drawing upon the principles of social justice and equity, this study aligns itself with the repositioning and reconceptualization of AT use with

young children with disabilities. Relevant to this study is also the transformative effects of my own personal positioning in studying abroad (Brown, 2009; Clarke, 2006; Dwyer, 2004). This research shows how study abroad significantly impacts on an individual's cross-cultural understanding and contributes to self-discovery, an increase in self-confidence, critical thinking skills and independence. This study is important in looking at the transformation of me as an international researcher of young children with disabilities and the profound changes I derive for my academic career.

Finally, this research positions me at both a professional and personal level, of developing my own intellectual and professional practices; particularly, within the context of preparing for working with children with disabilities in multiple contexts now and the near future. The overall significance, for me, is how this study gave me the opportunity to continue to question and challenge my own traditional and cultural views as I seek to become a more inclusive and reflexive researcher and practitioner.

Positioning Myself in this Research

This study is passionately linked to my personal commitment to develop deeper understanding of the role of AT in supporting the learning and developmental needs of children with disabilities. I am a woman from Ghana and my culture informs the way I view and experience social reality. Historically in Ghana, a belief that prevails very strongly is the perception of disability as a punishment and this has both cultural and religious connections. The birth of a child with disability is stigmatized as a curse, thought to be punishment from ancestral past wrongdoing or disobedience to the gods. These traditional conceptions often limit the development of effective policies and service delivery, and children with disabilities struggle to find quality care, education, livelihoods and most of all, dignity.

Research is not neutral and my positional reflexivity is what enables me to critically examine my place, biography, self and others to understand how these shape this particular research process. Delving into the unknown requires personal reflexivity a critical consideration of how Ghanaian and US beliefs, interests, experiences, political commitments and social identities might have impacted the research I have done with the view of how the research might have affected and possibly changed me as a person and researcher (Willig, 2010). In this important journey, I was directed by epistemological reflexivity, which is the reflection I brought upon my own assumptions about the world and knowledge and how these assumptions and beliefs have influenced the way I designed the research methods and questions and conducted the interviews, observations and how I analyzed and reported the data.

I have no disability but I am a black woman and experience some rejection just as some children with disabilities are treated with disdain. However, I am in the privileged position of studying in a country where children with disabilities are protected by legislation which is unlike where I originally come from and where I did most of my education. This privilege has allowed me the space and opportunity to express my opinion through this research that attempts to understand teachers' and their support staff's use of AT in enhancing the education of children with disabilities. I cannot claim to understand all that it means to be a person with disability or how it really feels to be working with young children with disabilities.

My little experience on arrival to the United States of America is a starting point for my transformation, that is, how I view and research with those who work with children with disabilities and how research should not be conducted on them, but with them. I have been a teacher of young children in Ghana for several years. Over the years I have developed interest in children, particularly those with disabilities. I believe interest brings passion and passion is what

brought me to this research site. The research I conducted is a useful example of the importance of considering the worth of others that have been historically constructed as disabled. I recognized the bias I bring to this research as the outside knower but the work of other scholars helped me make sense of the voices of the participants and guided the creation of both subjective and objective knowledge. This means, I was immersed in research that drew upon shared experiences.

The topic addressed by this research study is of interest for these reasons. First, there is the interest in the quality of early intervention services which include AT to meet the needs of children with disabilities. Interest in issues of engagement which can impact decision making and makes me lay bare my biases is also important. This has informed my views on this research as people living with disabilities are treated like outcasts in my country, and I feel it is a social justice issue. I do not suggest that all children with disabilities need to use AT to address the equity gap, but my ultimate goal is to advance opportunities for children to be engaged in the use of AT to maximize their developmental potentials.

Outline of Dissertation

This dissertation is divided into five chapters. The first chapter provides a brief overview of the use of AT in serving the needs of children with disabilities, the rationale for the study, the rationale for using qualitative methods, statement of problem, and research questions, and the researchers' positionality. The second chapter provides a detailed literature review and theoretical framework. Chapter Three details the research methods which include participant selection, data collection and analysis and trustworthiness. The fourth chapter presents the case study results obtained from the observations and interviews based on the themes that emerged from the data using thick descriptions. In Chapter Five, the results are discussed in relation to the

research questions drawing out major findings, implications for practice, limitations, and

provides recommendations and directions for future research.

CHAPTER TWO: LITERATURE REVIEW

Early intervention is a relatively young field as service provision for birth-to-three and three-to-five were added to IDEA in recent decades in the U.S.; such services remain limited to non-existent in many countries around the globe. Drawing on empirical, policy and theoretical literature, this chapter reviews related literature on the rationale for early intervention services for very young children with disabilities and their families, and addresses current early intervention legal mandates, evidence-based practices, and emerging practices.

Influences on Early Intervention

In recent times, the prosperity of families and nation states has been associated with the wellbeing of all children (National Scientific Council on the Developing Child, 2007). For some children, wellbeing does not come easily because of disabling and disadvantaged conditions (Morris, Duncan & Clark-Kauffman, 2006). Disabling conditions can result from chromosomal abnormalities, genetic or congenital disorders, sensory impairments, inborn errors of metabolism, disorders reflecting disturbance of the development of the nervous system, congenital infections, severe attachment disorders, and disorders caused by secondary exposure to toxic substances including fetal alcoholic syndrome, (Nelson, 2000). Disadvantaged conditions can result from violence against young children and poverty just to name a few. These conditions are classified into biological or environmental factors (Hertzman, 2004). Children born underweight (who have to spend most of the time checking in and out of hospitals) can also be at risk of developmental delays (Wise & Richmond, 2008). Developmental delay is experiencing interruptions in growth, as measured by appropriate diagnostic instruments and procedures in one or more of the areas of cognitive development, physical development, communication

development, social or emotional development, and adaptive development (Hertzman, 2004; Wise & Richmond, 2008).

Research findings indicate that children develop at different rates, which means, in a classroom setting, some children will be more matured in their thinking than other children (Howlin, Magiati, & Charman, 2009; Wise & Richmond, 2008). In the same classroom, some children will be larger in size and more coordinated in their thinking and social relationships while others will be slow in these areas (Sukkar, 2013). As children grow and develop, they go through qualitative and quantitative changes which is evident in various childhood developmental milestones including, babbling, crawling, crying, and language development (Trivette, Dunst, Carl & Hamby, 2010). The lack of evidence of some of these childhood developmental milestones in the critical periods may suggest a developmental delay (Wise & Richmond, 2008). Critical periods include the first three years in the life of a human being to attain developmental milestones or certain abilities needed to develop, such as linguistic skills (Strain, Schwartz, & Barton, 2011). The absences or delay in these developmental milestones warrant some form of support and services which is often referred to as early intervention (Wise & Richmond, 2008).

Conceptions of early intervention vary from country to country. The nature of conceptualization of the term has implication for policy, legislation and practice. Early intervention is conceptualized as the strategies and practices designed to help young children with disabilities or developmental delay to be full participants in social economic and educational aspects of life (Sackett, Pope & Erdley, 2004). Others refer to early intervention as service systems that harnesses support for children and families who potentially need early intervention services that relate to a child's disabilities or developmental delay (Wise &

Richmond, 2008). Some researchers, view early intervention as consisting of multidisciplinary services provided to children from birth to 5 years to promote child health and wellbeing, enhance their potential, minimize developmental delays, remediate existing or emerging disabilities, prevent functional deterioration and promote adaptive parenting and overall family functioning, (Bailey, Bruder, Hebbeler, Cart, Defosset, M., et al. 2006). Defining early intervention only in terms of what it does is not enough to meet the needs of all children; therefore, conceptions of early intervention should be framed as a process in terms of benefits and what it is intended to accomplish, particularly regarding all children who need early intervention services (Gilliam, 2008; Sukkar, 2013). Thus, it can be argued that early childhood intervention is a systems approach to service delivery aimed at the provision of support for families and children including, infants and toddlers who have disabilities, with an intention to promote and enhance the acquisition and use of behavioral competencies and effective social interactions with objects and people (Guralnick, 2005a; Wise & Richmond, 2008).

Rationale for Early Intervention Services

Biological and environmental complexities underlying the causes and effect of disabilities on individual young children, their families, and the risks associated with future life prospects, provide a strong rationale for early intervention services (Barnett, Belfield, & Nores, 2005; Sukkar, 2013). Available research suggest that disability categorisations, the diversity of families in which children grow and develop, and their socio-cultural settings require early intervention services to provide a framework that facilitates the design, implementation, evaluation and reduction in risks associated with disability and disadvantage (Blackman, 2003; Odom, Buysse & Soukakou, 2011). Blackman (2003) posits that an important rationale for early intervention is to "prevent or minimise the physical, cognitive, emotional, and resource

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limitations of young children with biological or environmental risk factors" (p. 2). From

Blackman's perspective, it can be argued that the ultimate aim of early intervention is to provide

services that restore hope to children and families living with disability, creating resilience and

the imagining of a better future (Wise & Richmond, 2008). These aims can flourish only when

there is recognition that there are real options for very young children and their families that they

have genuine service choices (Thomaidis, Kaderoglou, Stefou, Damianou, & Bakoula, 2000). In

this sense, early intervention is concerned with finding the best ways possible to help children

born with certain developmental conditions or special needs to become as functional participants

as possible in society (Sukkar, 2013).

The rationale for early intervention service is to enhance the development of the child, to

provide assistance and support to the family, and to maximize the child's and family's benefit to

society (Love, Kisker, Ross, Raikes, Constantine, Boller, Vogel, 2005). This rationale serves

societal, ethical, and economic needs of families, the child and the nation. In this perspective,

early intervention services are intended to provide wide-ranging, organized and collaborative

systems of supports for infants, toddlers, and their families to promote optimum child

development and pave the way for older children to continue to make progress in their

development (Lieberman & Yoder, 2012). It aims at enabling toddlers and infants to be active

and successful members during their early childhood years which are described as critical

periods for building potentials for the future in different settings that they may find themselves-

home, educational programs, schools and their community, (Landry, Smith, Swank, & Guttentag,

2008). Early intervention is also aimed at making a real difference in the lives of young children

living with disabilities and their families that can bring a future different from the present,

enabling the individual to develop potential and ability to have some control over their

circumstances, (Ludwig & Phillips, 2008; Thomaidis, Kaderoglou, Stefou, Damianou, & Bakoula, 2000).

Current researchers using well-designed randomized clinical trials provide strong rationale for the benefits of early intervention for children at biological and environmental risk (Landry, Smith, Swank, & Guttentag, 2008; Love et al., 2005; Ludwig & Phillips, 2008). Other researchers, reasoned that children with heterogeneous developmental delays including those with Down syndrome can benefit from improved social and cognitive skills through early intervention (Guralnick, 2005; Thomaidis, Kaderoglou, Stefou, Damianou, & Bakoula, 2000). Others, contend that early intervention goals are accomplished by providing individualized developmental, educational and therapeutic services for children; for example, early intervention services for children with autism have been found to be effective in reducing future learning and socialization risks factors (Dawson et al., 2010; Howlin, Magiati, & Charman, 2009). In this sense, early intervention provides infants and toddlers with disabilities support services to achieve cognitive, socio-emotional communicative, self-support and physical development goals (Ludwig & Phillips, 2008). These early intervention services may involve occupational therapy for example, to help a child hold her feeding bottle, physical therapy to help the child roll over, or speech therapy to help her learn to make sounds (Sukkar, 2013).

Research indicates that early intervention is important in lessening the effects of a disability or developmental delays on children and families (Meisels & Shonkoff, 2000). Children grow at different rates but when a child has special needs, which potentially may lead to developmental delays, early intervention services are effective in minimizing the long term effect of the disability on the child and family (Wise & Richmond, 2008). Timely intervention

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that is well designed, can improve the quality of life of toddlers and infants at risk of cognitive socio-emotional and physical disabilities (Moore, 2012).

Another important rationale is associated with cost and special education services. The early childhood years present a unique opportunity for addressing vulnerability. Early intervention services can influence lifelong development preventing or minimizing the accumulation of developmental educational cost to the nation and families later in life as well as reducing the need for institutionalizing children with disabilities (Tomlin & Hadadian, 2007). In other words, early intervention maximizes the potential for independent living (Moore, 2010).

Early intervention helps to minimize the need for special education services once the infants and toddlers reach kindergarten, as well as when the child enters school thus, reducing future problems (Schertz, Reichow, Tan, Vaiouli, & Yildirim, 2012). Infants and toddlers whose special needs are served in early years or critical periods have a greater chance of attaining developmental milestones or reaching their full potential and become productive members of society. If problems are left too late before addressing them, the child's problem might multiply leading to exclusion and separate education in special education programs, and later interventions which increase national and families' costs (Schertz, Reichow, Tan, Vaiouli, & Yildirim, 2012). Thus, there are numerous societal benefits to be accrued when early intervention services are effective. For instance, money saved through effective early intervention services can be channeled to resources to enhance family capacity to better serve children's needs. This suggests that individual families with children with disabilities may bear enormous burden with spill-over effects on society if early intervention services are denied to their children. (Spencer, Goldstein, Sherman, Noe, Tabbah, Ziolkowski, & Schneider, 2013).

Current Early Intervention Legal Mandates

As the current study was   conducted in the USA, this section of the related literature review focuses on current early intervention legal mandates of this country. Bearing in mind that families are important to the development of children and parents are aware of what their needs and those of their children are, the government has made provisions in Individuals with Disability Education Act (IDEA) Part C for early intervention services and supports to include families' experiences and expertise in intervention services (Trohanis, 2008). This legal mandate promotes collaboration between service providers and families. According to IDEA Part C, to be eligible for early intervention services a child must be from birth to three and be diagnosed with a condition that will potentially result in developmental delay or be a child who is experiencing some sort of developmental delay (Trohanis, 2008). In addition, there are requirements for parents to be considered as key members of the team providing services, and services provided must be based on sound evidence and must occur in natural environments.

The legislative history that culminated in the current system in the United States consisted of incremental efforts that eventually encompassed specific groups of children at risk for developmental delays as well as virtually all young children with established disabilities (Gilliam, 2008; Meisels & Shonkoff, 2000; Wise & Richmond, 2008). The requirements of the legal framework are aimed at the anticipation, identification, and response process to the concerns of the child and families in order to enable the healthy development of babies and toddlers including, minimizing their potential adverse effects. Early intervention can either be corrective or preventive in nature; that is, either correcting the existing developmental problem or preventing its manifestation (Gilliam, 2008; Meisels & Shonkoff, 2000).

Under this legal mandate, early intervention services are to conduct a targeted evaluation of a child's strengths and needs, provide   appropriate educational experiences, special therapy sessions such as physical, occupational or speech therapies, and family supports such as home visits or parent to parent networking opportunities. In addition, there is service coordination and transition support to facilitate a smooth change from early intervention to preschool programs.

In addition to the U.S legal framework, the UN has developed two treaties namely the convention on the rights of the child (CRD) (UN, 1989), and convention on the rights of people with disabilities (CRPD) which have become worldwide treaties for the rights of individuals with disabilities including infants and toddlers. These two conventions mandate substantive action by countries to protect not only the health and wellbeing of infants but also to provide special education services and support as needed to enhance community involvement and improve quality of life. These legislations describe the standards by which countries can guide the provision of developmental programs and services, and laws necessary to comply with the conventions. The rationale for this convention is for the long term benefit in the support for early intervention to ensure governments' direct attention toward its compliance.

Turkey for example, has legal mandates that support early intervention for children between the ages of 0-8. This legal mandate is aimed at providing social rights for children living with disabilities or at risk between the ages of 0-5 and continuing services in terms of health, education, primary care rehabilitation as well as informing society about individuals with disabilities in an effort to minimize stigma and barriers associated with disabilities. In fact, Turkey has early preventive screening for pregnant women for early diagnosis and appropriate intervention.

In Australia, even though the government is concerned about early intervention services, there are no legal mandates put in place currently, to implement early intervention services for infants and toddlers, (Sukkar, 2013). Though the UN treaties CRD and CRPD seek to provide principles by which early intervention services are implemented through an international perspective, the U.S, and South Sudan for example did not ratify the CRD. It must be noted that conventions are not legally binding unless they are ratified so the UN convention is not binding on individual countries which did not sign it.

In the U.S there are laws that support early intervention services aimed at enhancing the development of infants and toddlers with disabilities and to minimize their potential for developmental delay. Effective implementation of these laws could reduce the educational cost to society, including the national schools; limit the need for special education and related services when infants and toddlers reach school age. Thus, the laws minimize the likelihood of institutionalization of individuals and maximize the potential of independent living in society as well as enhance the capacity of families to meet the special needs of infants and toddlers with disabilities.

Historically, in the U.S., early intervention is a federally mandated program which had its roots in the 1975 as the Education of All Handicapped Children Act. Currently, it is known as the Part C of the IDEA (see for example, www.idea practices .org). The reauthorization of IDEA provides the opportunity to bridge the gap between knowledge about the benefits of early childhood intervention and what should be done for families and infants who are at risk or have disabilities. IDEA part C regulations sec.303.12 regarding early intervention services states: Early intervention services means services that are designed to meet the developmental needs of each child eligible under this part and the needs of the family related to enhancing the child's

development; are selected in collaboration with the parents; To the extent appropriate, service providers in each area of early intervention are responsible for Consulting with parents, other service providers, and representatives of appropriate community agencies to ensure the effective provision of services in that area; Training parents and others regarding the provision of those services; Participating in the multidisciplinary team's assessment of a child; and the child's family, in the development of integrated goals and outcomes for the individualized family service plan (IDEA 1997).

Currently, IDEA has four parts. Part A for general provisions, Part B for assistance for education of all children with disabilities, Part C for infants and toddlers with disabilities and Part D for national activities to improve the education of children. In 1997, the reauthorization of Part C included in IDEA, required states to facilitate the development of a statewide comprehensive system of early intervention services entitling all children from birth through three years of age, experiencing developmental delays, as defined by the individual states, to Part C Services.

IDEA regulations allow states considerable flexibility in the area of defining eligibility for services with specific criteria to determine eligibility left to the discretion of the individual states. Variability in eligibility criteria, along with the application of the definition of eligibility at the local level, the discipline of the professionals determining eligibility, and other community-based differences such as the availability of services and local child find efforts, creates significant variation in the percentage of children served in individual states and in the disability characteristics of those children (Dunst & Bruder, 2006).
Part C authorizes the creation of early intervention services for infants and toddlers with disabilities, and provides federal assistance for states to maintain and implement statewide

systems of services for children who meet the eligibility criteria, aged birth through three years, and their families. Part C is a discretionary program, which means that a particular state may choose to participate or not. If a state chooses to participate, the state must fully apply the statutory requirements of the law. Currently, all 50 states in the US are participating in the Part C program. Under the legislation, each state receives annual funding according to the population of children aged 0-3. Under Part C, states and jurisdictions must provide early intervention services to any child below the age of 3 who is experiencing developmental delays or has a diagnosed physical or mental condition that has a high probability of resulting in a developmental delay. In addition, states may also choose to provide services for infants and toddlers who are *at risk* for serious developmental problems, defined by circumstances (including biological and/or environmental conditions) that will seriously affect the child's development unless interventions are provided. For example, a low birth weight baby who stays in the hospital for 3 months after birth, continues to require supplemental oxygen, is temperamentally difficult to soothe, and has a parent with a substance abuse problem will have a better developmental outcome if the family and child are provided with an individually tailored combination of health, educational, and therapeutic supports. Under the current law, Congress must periodically review and reauthorize Parts C and D (usually every five years) to ensure the continuation of their programs and services. Part B, the section of the legislation that authorizes special education and related services for children ages 5 through 21, is authorized permanently.

Currently, Part C of IDEA states that early intervention services are mandated and are designed to meet the developmental needs of an infant or toddler with a disability in one or more of the following areas: Physical, cognitive ,social –emotional communicative and or adaptive. On September 6, 2011, the U.S. Department of Education announced the release of the final

regulations for the early intervention program under Part C of the Individuals with Disabilities Education Act (IDEA). These final regulations were designed to help improve services and outcomes for America's infants and toddlers with disabilities and their families. In this regard Part C is a 436 million dollar program administered by States (Dunst & Bruder, 2006).

The final Part C regulations incorporate provisions in the 2004 amendments to Part C of the IDEA (Dunlap, Hemmeter, Kaiser, & Wolery, 2011). Additionally, the final regulations provide States with flexibility in some areas, while ensuring State accountability to improve results and providing needed services for infants and toddlers with disabilities and their families. The regulations focus on measuring and improving outcomes for the approximately 350,000 children served by the Part C program with the goal of ensuring that such children are ready for preschool and kindergarten.

U.S. Secretary of Education, Arne Duncan said, "One of the most important things we can offer children is a high-quality early learning experience that prepares them for kindergarten." This is true for all children but it is especially important for infants and toddlers with disabilities to have access to high quality early intervention services that prepare them to successfully transition to preschool and kindergarten. The part C regulations enables the Education Departments to be committed to the goal of preparing more children with high needs with a strong foundation for success in school and reducing developmental delay or physical or mental conditions associated with developmental delay. Though States follow IDEA guidelines regarding the specific conditions of established risk, some have added additional disorders that constitute established risk.

The third optional category for eligibility is based on the presence of biomedical or environmental conditions placing children at risk of having substantial delay if early intervention

services are not provided. There are well-known biological and environmental factors that place infants and toddlers at risk for developmental delay. Some commonly cited factors include low birth weight, respiratory distress as a newborn, lack of oxygen, brain hemorrhage, infection, nutritional deprivation, and a history of abuse or neglect (Hertzman,2004; Wise & Richmond, 2008). Risk factors do not inevitably lead to developmental difficulties, but indicate children who are at higher risk of developmental delay than children without these problems.

There is no clear cut definition on how to determine eligibility to serve children *at risk* for developmental delay because of the considerable variability in the nature and number of risk factors that establishes eligibility. California for example, provides services only to children with biomedical risk; whereas, Hawaii considers individual risk factors, such as maltreatment alone as potential eligibility for Part C. According to services provisions, early intervention could also be aimed at serving the needs and priorities of the families of children eligible for early intervention support. These families' supports are tailored towards equipping families with the requisite skills to better understand their children with disabilities or developmental delays.

Evidence Based Practices

An important aspect of early intervention is evidence-based practice. Evidence based practice is a complex and evolving concept in the field of early childhood education and intervention services (Dunst, 2009). An evidence-based practice combines research evidence, clinical expertise, client choices, available resources and circumstance to arrive at the most appropriate intervention services (Dunst, 2010). The key to effective evidence-based early intervention services is the availability of good quality research evidence sourced through, location of evidence, critical appraisal of the evidence, synthesis of evidence and application of the evidence. A useful way to gather good evidence is often through systematic reviews or meta-

analyses, which is the use of statistical methods to summarize the results of independent studies. This approach can provide more precise estimates of the effects of early intervention than those derived from the individual studies (Dunst, Boyd, Trivette, & Hamby, 2002). In evidence-based intervention, professionals identify the goals of a particular intervention, why it works and the situations in which it works in order to set quality time on activities to achieve set goals. Such an approach to early intervention ensures that valuable and scarce resources utilized effectively maximize outcome effects for infants, toddlers and their families living with disabilities (Dunst, 2010).

Some evidence-based practices include child focused models of practice and service delivery, family-centered approaches, strength-based approaches and participation-focused models (Dunst, 2009). Family-centered practices focus specifically on the needs of families, their desires and capacity to meet their own needs (Dunst, Boyd, Trivette, & Hamby, 2002). It considers families as active decision makers in the planning and implementation of services that support the wellbeing of their children, their development, learning and full participation in the communities (Dunst, 2009, 2010; Espe-Sherwindt, 2008). Strength-based and developmental systems approaches to early intervention focuses on the child as well as the family's systems and strengths, and work from this point to provide intervention in needed areas (Guralnick, 2005b). By considering the family's and the child's strengths, intervention moves away from deficit model to an empowerment model (Dunst, Boyd, Trivette, & Hamby, 2002; Guralnick, 2006). In this perspective, care providers aim at developing the competence and confidence of their clients and positive outcomes for children and families are enhanced through strength-based approaches.

Families of infant and toddlers are greatly impacted by early intervention services that are evidence-based. Families of young children with disabilities suffer a great deal of stigma,

isolation, disappointment and helplessness. These problems may affect the wellbeing of families in turn affecting other siblings without disabilities and their growth and development (Dempsey & Keen, 2008). Research indicates that families of children with disabilities are susceptible to withdrawal and sometimes become suicidal (Guralnick, & Conlon, 2007). Evidence-based early intervention practices such as family-centered approaches, strength-based approaches and participation-focused can enhance positive attitudes in families and increase their self-esteem (Guralnick & Conlon, 2007; Sukkar, 2013). Families are also capable of learning more about their children and how best to meet their needs (Guralnick, Neville, Hammond, & Connor, 2008).

Emerging Practices

Early intervention practices are still emerging. There is currently a move from professionally-directed practice to family-centred practice where the focus of service delivery is no longer professionally controlled diagnosis and treatment; but rather, to one that engages families as active role players with professionals in the identification of needs and priorities (Dempsey & Keen, 2008; Moore, 2006). Additionally, a child-focused approach is being replaced with a family-focused approach. In this approach, services consider the needs of the whole family rather than focusing early intervention on the child as an individual. It is also documented that there is dramatic shift from an isolationist model of family functioning to a systemic ecological model. The purpose of this model is to gain insights into the way families function and the socio-cultural environmental impacts on family functioning (Dunlap & Fox, 2011; Moore, 2006). Moore (2006) argued that there is the need to recognise that child-focused therapeutic and educational programmes do not necessarily create long-lasting changes in children, but rather, it is when the dynamic reciprocal interaction between the child's

intrapersonal characteristics on the one hand and family and community factors on the other, are carefully considered and integrated into service delivery models that produce more enduring effects.

Emerging models also include transdisciplinary teamwork rather than multidisciplinary approach thereby breaking down the service boundaries of specialists and teachers working with the child independently of one another (Brown & Woods, 2013). In this perspective, specialists from different disciplines are working together with teachers to provide the child and family with a coordinated intervention. Another emerging trend is replacing segregated centre-based services with inclusive community-based services where children with disabilities have the opportunity to learn with children in mainstream early childhood education and community settings (Dunst & Dempsey, 2007). Generally, there is a greater emphasis on functional approach rather than on a norm-referenced (developmental) approach (Dunst & Bruder, 2006). These emerging practices of early intervention are based on the notion that programs and policies should be examined and revised as needed to ensure that they reflect and respect the diversity of children, families, personnel and administrators that should be affiliated with professional early childhood/early childhood special education. This means, organizations should encourage staff to maintain their affiliations. In addition, to be effective, continuing education such as staff attendance at meetings and conferences is critical to enhance professional growth. The ultimate goal of these emerging models is to advance the engagement of children with disabilities and their families in educational, health, and functional living programs as well as related services.

Assistive Technology and Child Engagement

Literature regarding the use of AT in early childhood brings to question how assistive technology is used to meet the needs of children with disabilities and increase their engagement

in learning with typically developing peers. A number of studies (Dugan, Millborne, Campbell & Wilcox, 2004; Lankshear, & Knobel, 2003; Mistrett, 2001; Reed, Bowser & Korsten, 2004) have supported the use and benefits of AT in early intervention. The identification and use of appropriate AT in early intervention is based on the idea of fully including all children irrespective of their disability in learning programs and communities (NAEYC, 2009).

AT can help infants and toddlers with disabilities or at risk to participate in natural and inclusive environments, and qualitative case studies can provide insights into barriers that exist to fulfilling this need. It is argued that AT helps young children with disabilities to gain mastery over their environment while working independently on tasks in the enhancement of mobility communication and access to environment (Reed, Bowser & Korsten, 2004). Assistive technology has been found to be effective in teaching emotional recognition skills in children with Asperger syndrome using computer tablets (ipads) (Barth, 2012; Grandin, 2012). In this way, AT makes it possible for infants and toddlers with disabilities to learn, play, and socialize like their typically developing peers (Dugan, Millborne, Campbell & Wilcox, 2004).

The effectiveness of AT depends on how it is implemented. When implemented effectively, AT use results in achieving independence and helps to focus participants on tasks (Lankshear, & Knobel, 2003). For example, in a case study by Reed and Bowser (2012) with a child with cerebral palsy who uses a power wheel chair, it was found that the use of the AT facilitated the child's independence in performing daily activities and even uses a joystick to play with his computer although there was difficulty experienced in writing. The researchers concluded that the child needed an alternative keyboard (intellikeys) to produce good writing leading to an effective intervention for the child.

Another study, using a mixed method approach in measuring the effect of multi –symbol utterance production during story book reading sessions, found that children improved considerably with the use of the AT (Binger, Kent-Walsh, Berens, Delcampo & Rivera, 2008). Even though there are legal mandates stipulating consideration and use of AT in early childhood, AT uses have not been well developed for preschool children with disabilities (Hutnger, Bell, Daytner and Johanson, 2006; Reed, Bowser & Korsten, 2004).To be able to implement AT services for young children with disabilities, AT providers need adequate training and the technical know-how in provision of AT services to young children. Hutnger, Bell, Daytner and Johanson (2006) posit that the frequency and duration of technology use is greatly influenced by the teachers' confidence and perception of how useful the technology is. In this way, teachers who are knowledgeable about the conceptualization and operationalization of the technology are able to provide enhanced activities, and do not see the AT as the source of knowledge (Alliance for Technology Access, 2000).

According to Wiekle and Hadadian (2003), the lack of acceptance of AT use by some parents for young learners creates barriers to implementation. Researchers (Huck, 2006; Wiekle & Hadadian, 2003) recommend involving parents in research regarding AT use so that they become familiar with the early intervention process. Such familiarity could help parents continue intervention for their children at home. Lankshear and Knobel (2003) found that studies on AT use in early childhood is inconclusive as the majority of these studies where quantitative, neglecting the voices of teachers, parents, and children (Abbott, Brown, Evett, Standen, & Wright, 2011; Alper & Raharinirina, 2006; Cramer, Hirano, Tentori, Yeganyan & Hayes, 2011). This shows the need for qualitative research in terms of AT in early intervention services.

Stakeholders who provide AT services need to collaborate, communicate and invest resource and time in alignment of technology and strategies and carefully document outcomes (Huck, 2006).

Addressing socio- economic issues can also minimize some challenges faced in the implementation of AT with young children (Hutinger, Bell, Daytner & Johanson, 2006). Affording training opportunities for professionals can boost their confidence in the use of AT and good qualitative research involving teachers and other professionals could help identify professional development needs (Stoner, Parette, Watts, Wojcik, & Fogal, 2008). Reed and Bowser (2012) argued that a barrier to the use of AT might not be always resistance but the know-how of AT at the correct time and for the appropriate need that can reduce frustration. Therefore, educators need support so they can in turn, support their children. This argument also borders on adequate training in technology with an educational component. While many people view assistive technology as a potential to enhance academic achievement, others view it as something which can potentially make children with disabilities dependent and lazy thus not making them as functional (Battocchi, Ben-Sasson, Esposito, Gal, Pianesi, et al., 2010; Edyburn, 2006). This is why assistive technology should not be provided in isolation but with developmentally appropriate strategies that entails partnership with parents, other professionals and care-givers.

The Potential of Insider Perspectives in Transforming Early Intervention Services

Studying the effectiveness of assistive technology use in early intervention is a complex and difficult endeavor. This requires gleaning the authentic insider perspectives of those who are involved in the process. Mills and Gale (2007) citing Harding (1998) regarding the importance of insider perspectives noted:

Starting thought from the lives of those people upon whose exploitation the legitimacy of the

dominant system depends can bring into focus questions and issues that were not visible,

'important,' or legitimate within the dominant institutions, their conceptual frame-works,

cultures, and practices (p. 439).

Insider perspectives are significant in making sense of teacher professional and disability issues.

The acceptance of the authenticity and legitimacy of an individual's voice is a fundamental right

(Mills & Gale, 2007)

Insider perspectives enable uncovering deeper elements of a person's lived experience

which requires suitable analytical tools to note subtle nuances such as the psycho-emotional

dimension of those who work with children with disabilities (i.e., any situations where a person

working with a child with a disability feels put down, undermined, stressed, or worthless)

(Reeve, 2002). Insider perspectives are important to understand the story of practice and the

person speaking in terms of societal and cultural, school and family contexts. Through insider

perspectives researchers can unravel the complexity behind individuals and their myriad

positions by framing these positions within the contexts of "historical trajectories across social

space" (Couldry, 2005, p. 356). At the same time, the researcher is challenged to uncover the

constraint experienced by individuals as the result of "uneven distribution of symbolic power"

(Couldry, 2005, p. 359) which is more associated with disability research. The significance of

insider perspectives requires that the researcher must critically examine:

all the elements necessary to analyse the interviewees' positions objectively and to understand

their points of view, and…must accomplish this without setting up the object advising distance

that reduces the individual to a specimen in a display case (Bourdieu, 1999, p. 2).

This perspective shows that the researcher must not distance him/herself from the research process but must become involved in research as a part of one's own development and transformation. Hence insider perspectives enable the researcher "the means for the construction of scholarly argument and the formation of the scholar simultaneously" (Gulson & Parkes, 2010, p. 80). Thus, thick description is a way of presenting the original insider perspectives of the participants to be preserved as well as account for the full context of the interaction with the participants in their research (Denzin & Lincoln 2005).

Theoretical Framework

    Cultural-historical theory. This study used Cultural Historical Theory of Vygotsky as the theoretical framework to inform data collection, analysis and relevant arguments in the discussion. This section reviews the key ideas underpinning this theory. The main theorist of the cultural-historical theory was the Russian psychologist Lev Semenovich Vygotsky (Vygotsky, 1978). The *cultural* in the cultural historical theory refers to the socially developed ways in which human societies organize the various tasks that the growing child encounters and the various tools that are developed and use by the society. The *historical*, according to Vygotsky relates to successive generational aspects of the use of human knowledge to perform actions overtime - mastering and using tools in the environment to perform various forms of action through which further knowledge is acquired (Smidt, 2009). Tools developed over several generations by humans enables them to operationalize the present, and develop better understanding of the past and predict the future (Smidt, 2009). In this sense, AT can be considered part of this historical assemblage of tools.

    One critical aspect of the cultural-historical theory is its emphasis on the cultural and social nature of development, where children's psychological development takes place when they use various tools in interaction with others within social and cultural contexts (Fleer, 2010;

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Davydov, 1982). Children are born into communities with different social practices and tools. These tools can be psychological and physical (Kozulin, 1998). Social practices connote human participation, and contributions to social activities are embedded in social practices. Physical and psychological tools allow both children and adults within their community to work, share information, beliefs and ideas with others. A child's development is therefore, tied to its social and cultural context, as social and cultural context have profound influence on how an individual thinks and acts (Rogoff, 2003; Wertsch, 1985).

The Use of Assistive Technology as a Mediational Activity

Mediation is central to the cultural historical theory (Bodrova & Leong, 2007; Kravtsov & Kravtsova, 2009; Leontyev, 2009, Smidt, 2009). Mediation can be considered as a form of intervention. For young children with disabilities early mediation is critically important. Vygotsky (1978) argued that human activity is dialectical interaction between the subject and the object and that a mediator often comes between the stimulus and the response when humans interact with any learning tool. This means, relationship between a subject and object is not direct, but it takes place with the support of a mediating artefact or psychological tool in between the subject and the object (Vygotsky, 1978). Therefore, every activity has components of a subject, and an object, mediated by a tool. A subject can be a person or a group who is engaged in the activity. An object is held by the subject and motivates the activity, which in turn gives it a specific direction. A mediating activity is one that allows an individual to create new relations between the stimulus and the response (Vygotsky, 1997). The use of AT (mediating tool) by children with disabilities (subject) helps them develop better understanding of their world (Vygotsky, 1997). Thus, the ways preschool teachers, paraprofessionals and therapist use AT as mediation tools for children with disabilities to learn and develop is central to this study.

Social Interaction and Development

Effective use of AT takes place in social interaction. According to Vygotsky (1978), children's development and learning is not based on the individual action alone but takes place in social interaction. For an individual to understand their environment, communicate their needs and receive feedback, can effectively occur only when they interact with others (Smidt, 2009). It is on this backdrop that social interaction is crucial to young children with disability's development and learning.

Vygotsky (1978) posits that every function in a child's cultural development appears twice, initially on the social plane and then on an individual level (Bodrova & Leong, 2007; Fleer, 2010). First, the process is shared between child and adult/more competent peer (interpsychological) and later the child is able to respond to the world on their own (intrapsychological). At the centre of the movement from the interpsychological mode to the intrapsychological is also the notion of 'internalisation,' which Vygotsky (1978) defined as the internal reconstruction of an external activity. Although the internalised behaviors in the child are difficult to visualize external observation provides a window into some of these individual behaviors (Bodrova & Leong, 2007). By engaging with AT in interaction with peers and adults like teachers, paraprofessionals and therapists, children are drawn to their group and internalize means of participating in their school's community. Therefore, it is through social interaction and communication with members of a given community that the child begins to learn the rudiments of the rules and activities that contribute to their community's function, such as values and beliefs and their niche in the cultural community (Bodrova & Leong, 2007).

This study draws on the concept of social interaction to examine the ways in which children with disabilities use AT with teachers, therapists and paraprofessionals as tools to

facilitate social interaction between peers and adults in the early intervention classroom. The notion of social interaction is crucial for explaining how interaction with assistive technologies support children to connect with others in the classroom and internalise ways of participating in their classroom community.

AT can be said to be an addition to tool development over successive generations (Kozulin, 1998; Rogoff, 2003). Tools can be either psychological or physical. Psychological tools are tools that various societies have developed over the course of human history and change with the type of society and the level of its cultural development (Kozulin, 1998; Rieber, 2004; Wertsch, 1985; Vygotsky, 1978). Psychological tools are those tools which helps to extend and master one's mental abilities. Examples of psychological tools include language, counting, numeration, algebra, signs, symbols, maps, diagrams, charts and pictures that are relevant to various communities and cultural group. These psychological tools support the intellectual functioning of individuals and form the bedrock of the cultural-historical theory. The ability to use psychological tools, Vygotsky (1978) claimed, enables a form of competence amongst humans and distinguishes them from other living things (Gray & McBlain, 2012; Smidt, 2009).

Language and Assistive Technology

Vygotsky's literature perceives the role of language or more specifically speech as a psychological tool that supports children's intellectual development within their society. In the use of AT, language serves as a mediator in facilitating the overall development of an individual, as language is identified as a "highly personal and social process amongst human beings" (Vygotsky, 1978, p.126). For example, language exists in many different forms, verbal, gestural and symbolic. Children with disabilities can use picture schedules to communicate ideas, needs and expectations. In this way, the different forms and uses of language that have been created by

all human cultures can be regarded as cultural tools, as they enable people to think and share ideas that maybe unique to that group. Language has been identified as a universal tool, because every community has its own unique form of language to communicate and problem solve with members of their communities (Bodrova & Leong, 2007).

In this way, AT such as a picture schedule serves the function of communication, making children more effective problem solvers (Gray & McBlain, 2012). AT have their own unique language and children and their teachers need to master those languages to be able to use these tools efficiently. Mastering assistive technology language in its various forms is powerful for children's intense interactions, to listen and reply to one another's ideas, extend and develop their own understanding (Bodrova & Leong, 2007; Smidt, 2009; Tudge & Winterhoff, 1993; Rieber, 2004). The notion of language is powerful for understanding the ways children with disabilities use AT to communicate.

Assistive Technology and Higher Psychological Functions

The use of AT enables children with disabilities to shift from dependence on others to become competent individuals (Minick, 2005). A child's transition to independence and social competence bring into focus the concept of higher mental functions. Vygotsky talks about psychological tools in the cultural development of an individual in terms of the development of lower/elementary/primitive (Vygotsky, 4.83) and higher mental functions (Davydov, 1982; Gray & McBlain; Smidt, 2009).Vygotsky claims that lower psychological functions include sensorimotor intelligence, spontaneous memory, sensations and reactive attention and higher psychological functions include memory, logical thinking, mediated perception and deliberate attention (Kozulin, 1998; Wertsch, 1985). While elementary psychological functions are determined purely by stimulation from the individual's surrounding environment (Vygotsky,

1978), higher mental functions are stimulated by factors, including language, tools, signs and symbols (Daniels, 2005; Smidt, 2009).

An effective use of AT can serve to help children with disabilities to move from elementary mental functions into higher mental function because the AT serves as mediation to psychological tools, signs and symbols within the child's social and cultural context (Kravtsov & Kravtsova, 2009; Wertsch, 1985). As children reach higher mental functions their actions will move from involuntary to purposeful and deliberate (Vygotsky, 1997). It would be useful to see how children with disabilities are making this transition from lower to higher psychological functions through the use of AT because higher mental functions enable individuals to master their own natural behavioral and psychological process (Kozulin, 1998). It is argued that children are able to attain higher mental functions through mediated and socially cooperative experiences (Gray & Macblain, 2012; Smidt, 2009; Vygotsky, 1978; 1997). Higher mental functions are built upon elementary functions (Bodrova & Leong, 2007; Smidt, 2009); therefore, it is critical that the ways AT is integrated into children's learning is carefully planned, and must take place in social interaction (Rogoff, 2003). This is important because, through social interaction children engage in complex thinking (Rogoff, 2003).

Using Assistive Technology in the Zone of Proximal Development

The 'Zone of Proximal Development' (ZPD) in Vygotsky's theory is useful for understanding the form of support children with disabilities in intervention classrooms receive. In cultural historical perspective, knowledge development is a socially mediated process and language serves as an important tool that enables knowledge to be shared with other members of a given community (Rogoff, 2003; Smidt, 2009; Wertsch, 1985). The ZPD is defined as:

The distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or collaboration with more capable peers (Vygotsky, 1978, p.86). Each child with a disability has an actual developmental level, which is what each child can do independently, indicating functions that have already matured and are mastered. The ZPD on the other hand, identifies those functions that have not yet matured, but are in the process of developing. Vygotsky (1978), claimed that the mental development of a child cannot be examined by what they can do independently (actual development), and should be assessed by what the child can do in collaboration with their peers. For Vygotsky (1978, p.86) children's actual development can be situated as "buds" or "flowers" of development instead and not "fruits" of development" (1978, p. 86). These "fruits" develop within the zone of proximal development when a child is supported by more competent peers or adults. This is where the role of the preschool teachers, therapists and paraprofessionals in early intervention are paramount. Children with disabilities who receive effective support through the use of appropriate AT can move from ZPD to actual development. In other words, what a child with a disability can do with the assistance of therapists or teachers today will become what they can do tomorrow without assistance (Vygotsky, 1978; Kravtsova, 2008).

Working with children with disabilities in early intervention requires that teachers and children take on different positions in interaction. Kravtsova (2008) elaborating on the ZPD suggest that professionals and children can take on positions as as 'independent', 'equal', 'under', 'up' and 'primodal we' (Kravtsova, 2008). In this study, independent position relates to what children with disabilities can do without or with minimal assistance from others. If for example, children with disabilities are asked to use a picture schedule to match objects but failed,

then the learner and adult or a more competent peer would take the *equal* position within the ZPD. In the equal position, the children with disabilities are then provided with some examples and motivated to repeat the adults or the more competent peer's words and later they are able to perform the task on their own. Should the children or a child with a disability fail the task in the *equal* position, they move to the '*under*' position in the ZPD where the children are asked series of questions to prompt their thinking. At this stage, teachers can deliberately make errors to see how the children would react. Again, should the learner fail the task performance, the teachers would move to the *up* position in the ZPD, where the learner is shown how the task is performed. According to Kravtsova (2008), the final level of the ZPD is 'primordial we' and this is where the learner and more competent peer/adult perform the task together. At this level the communication between children with disabilities and more competent peers or adults becomes a part of the children's thinking through shared interaction (Bodrova & Leong, 2007; Santrock, 2007).

Summary

This chapter has focused on the literature to establish a solid rationale for early intervention services for very young children with disabilities and their families and addressed current early intervention legal mandates, evidence-based practices, and emerging practices. It can be argued that early intervention is still developing and gaining wide recognition as research evidence of its efficacy continues to mount. It is important that program policies provide clear job descriptions, identify personnel competencies, establish on-going staff development guidelines, and provide for technical assistance, supervision, and evaluation to inform and improve the skills of practitioners and administrators providing services. Program policies should also reflect recommended practices including personnel standards, child-staff ratios, group size,

caseloads, safety, AT, and Early Intervention/Early childhood special education services and practices. Incentives, training, and technical assistance should be provided to promote the use of recommended practices in all settings. Furthermore, program policies should establish accountability systems that provide resources, supports, and clear action steps to ensure compliance with regulations and to ensure that recommended practices are adopted, utilized, maintained, and evaluated resulting in high quality services. It is by these that the important rationale and goals of early intervention can be achieved. As scientific knowledge on early intervention continues to grow, both low tech and high tech AT devices will continue to be developed or be modified. It is therefore important that in designing intervention for young children with disabilities, technological advances be considered.

As research suggests there are challenges as well as benefits of AT as well as questions that need to be studied in future research. Issues of AT continue to be an understudied area in terms of insider perspectives, suggesting that many children with disabilities continue to be underserved. Research designs from studies show that the majority of this research are experimental or quasi-experimental and do not include insider perspectives of those who are the implementers of AT services. It can be argued that research needs to explore in-depth insider perspectives of the lived experiences of teachers with the use of AT in serving the needs of children with disabilities. Explorations of this type are indeed timely as we seek to understand how to maximize AT in early intervention settings and within home and community environments as we simultaneously address policy issues to increase young children with disabilities access to high quality early intervention across the globe.

This chapter also examined the theoretical literature on cultural historical theory which was used to frame this study. As a result of the exploration of the literature, I would argue that

research needs to address AT use in early intervention services. A qualitative method is needed to explore or gain an in-depth understanding of the experiences of teachers, children, parents and other stakeholders in the use of AT. Therefore, the proposed study explored the lived experiences of two teachers and related stakeholders as AT is used in an early intervention classroom.

CHAPTER THREE: METHODOLOGY

Good research is informed by particular theoretical and methodological decisions (Bogdam & Biklen, 2003; Creswell, 2012; Punch, 1999). Methodology is the theoretical basis of the research and plays an important role in conceptualizing the research, data collection, analysis and interpretation of the findings. In this way, good methodology ensures that the data collected and analyzed addresses the research aims and questions (Johnson & Christensen, 2004; Creswell, 2012). Theoretical and epistemological paradigms provide clear justification for assumptions about reality and human knowledge (Bogdam & Biklen, 2003; Gay, Mills & Airasian, 2010) and it is our epistemological positions that shape our beliefs about the knowledge we produce for public utility in our research. In view of these important considerations, this section presents the methodology that was used in this research, informed by sound theory and a particular epistemology.

The Interpretive Phenomenological Research Approach

This study was conducted by applying an interpretive phenomenological approach to explore two preschool teachers' and their support staff's experiences in using AT in teaching children with disabilities. An interpretive phenomenological research approach is a generic term referring to qualitative research that is significant in the study of how people experience phenomena or social situations (Gay, Mills & Airasian, 2010). In terms of this research, interpretive phenomenological approach allowed for in-depth exploration of how AT is used within a real-classroom learning context (Yin, 2009; Creswell, 2012). In order to understand human actions and societal meanings assigned to them, the beliefs and values informing them must become an important consideration in the research process (Creswell, 2003, 2005, 2012; Denzin, & Lincoln, 2005). The uniqueness of human inquiry is related to the individual person's

views and actions which are based upon their interpretation of personal experiences (Creswell, 2003, 2005, 2012; Yin, 2009). For example, teachers and support staff using AT services may create and associate their own subjective and inter-subjective meanings as they interact and interpret AT use. Subjective meaning implies a person's knowledge acquired through socialization with various ways in which that person views the world, which subsequently forms the foundation of their thoughts and actions (Yin, 2009). Inter-subjective meaning is about a person's agreement with ideas which are created through shared common concepts with others (Gay, et al., 2010). By interpreting the different beliefs people and groups bring to the use of AT, this can contribute to the understanding and appropriate use of assistive devices. Therefore, by utilising an interpretive phenomenological approach for this study it was possible to engage critically with the participants' beliefs, values and thoughts and understand how they appropriated meanings to AT services in early intervention classrooms.

Method and Design

Various case studies have been widely used to explore phenomena in educational settings (Yin, 2009). Although case studies are considered as time consuming resulting in unreadable documents, a prudent researcher is able to overcome all these challenges (Gay, Mills & Airasian, 2010). Researchers have also questioned the validity and reliability of case studies, but this study went through rigor by triangulating different sources of data, reflective thinking, member checking and field notes were reviewed. Case studies allow researchers to import various verification data to capture complex or rare phenomena through in-depth investigation within real life contexts (Gay, Mills & Airasian, 2010). It is reiterated by other researchers that the case study method provides a good understanding about behaviour in complex education settings and education issues (Creswell, 2012; Yin, 2009). The case study approach is flexible for use in a

single setting or multiple settings to contribute to knowledge of a single subject or multiple

subjects of an individual, group, organization or events (Yin, 2009; Gay, Mills & Airasian,

2010). Thus, a unique strength of the case study method is its ability to deal with a full variety of

evidence allowing for a deeper investigation of the research context of teaching and learning

(Gerring, 2006; Yin, 2009) A case study method also ensures that the case being investigated is

explored through a variety of lenses to allow for multiple facets of the phenomenon to be

unpacked and understood (Baxter & Jack, 2008).

Yin (2009), identified three approaches to case study - exploratory, descriptive or

explanatory case studies. Exploratory case studies allow researchers to look for general patterns

within a range of various research data collected. Descriptive case studies provide connections

within possible theories and by using the research questions to lead to the discovery of key

constructs embedded in the phenomena being investigated. Explanatory studies are situated

within exploratory and descriptive elements and can be extended in order to determine a specific

problem associated with the study (Yin, 2009). According to Merriam (1998), a case study can

be particularistic, descriptive, and heuristic.

A particularistic case study focuses on specific phenomenon such as practical problems

or everyday practices (Merriam, 1998). Descriptive case studies provide a thick description of

the study with detail description of the context so that the situation comes alive for readers.

Heuristic case studies are linked to a greater understanding of a case through individual

discovery and investigation (Merriam, 1998).In this study, I used a particularistic case study

(Merriam, 1998), as it focuses on specific phenomenon, which is AT use, denoting practical

problems or everyday practices in early intervention services for young children with disabilities.

Drawing on the idea of phenomenology, I was able to explore in-depth the topic of AT use in the

classroom context, leading to an explanation of the relationship that exists between the participants and the object of study (Baxter & Jack, 2008; Hatch, 2002).

Participants

I used purposeful sampling to select participants from one preschool. These sampling procedures have involved non-probability sampling technique where I have selected participants because of their willingness to participate, proximity and work experience in using AT with young children with disabilities. Participants included two preschool teachers, two paraprofessionals and a speech therapist who work directly with children in the preschool. The participants were approached personally by the researcher after permission was obtained from the district superintendent and the institute review board of the university's ethics committee. Prior to recruiting the participants, I visited the school to speak to the teachers and paraprofessionals and therapist about the research and left the explanatory statements for the teachers. Hatch (2002) suggested that it is important to build rapport with participants and explain the research process to potential participants to enable them make informed decisions about their participation.

Data Collection

This case study set out to examine teachers and their support staff's use of AT to support and enhance the development and learning of children with disabilities in a preschool. It explored the types of AT the teachers use and how support staff such as paraprofessionals and therapists work with the classroom teachers to support children with disabilities. Rouse (2008) argued that what practitioners 'do', 'know' and 'believe', in terms of their classroom practices, are interrelated. Therefore, a focus on teachers and their support staff's use of AT seemed important, particularly in early intervention because it offered an alternative to helping children

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build strong foundations for future learning in light of the recognition that traditional approaches devoid of AT may not be effective in early intervention for some children with disabilities (Joftus & Maddox-Dolan, 2002). In this way, identifying what teachers, paraprofessionals and therapist do is important to working out effective strategies and also for establishing professional needs.

The research itself took place in one preschool self-contained special education classroom in a U.S. school in the Pacific Northwest, over a period of 16 weeks. The self-contained special education classroom was selected because it is both an early intervention class and uses AT in their intervention practices. It was essential that the class comprised of a diverse range of children with disabilities (autism, Down syndrome, physical disability and behavioural issues). The two teachers, paraprofessionals and therapists were self-selected because they volunteered to be involved in the research. During my observations I saw a variety of staff at work including not only the two classroom teachers, but also learning support paraprofessionals and therapists. Prior to, and after the observations, numerous informal conversations took place with the teachers and therapists involved. The purposes of these were to clarify any immediate questions about the observations regarding their use of AT and to help build rapport in preparation for the extended interviews in the second phase. The data collection went through two phases:

Phase 1: Observation. The first phase of this study involved unstructured observations of teachers' use of assistive technology in facilitating instructional practices with children with disabilities and how support staff worked with the teachers in these processes. All the other schools that were approached were very concerned about the timing and sensitive nature of disabilities related studies. In short, access negotiation to the research site was difficult. The

school that agreed mainly did so because of the importance they placed on research, their long

standing relationship with the university and how the findings might serve as opportunity for

further improvement in their practices.

AT can be effective for facilitating instructional practice and teachers' instructional

behavior towards children with disabilities in the classroom which in turn, can significantly

influence the nature of children's learning and development (Joftus & Maddox-Dolan, 2002). An

effective classroom observation offers an opportunity for researchers to assess on the spot

instructional capabilities and experiences (Westberg, Archambaul, Dobyns & Salvin, 1993).

Through a set of classroom observations and subsequent interviews, I set out to encourage

teachers to articulate how they make use of assistive technology and how the paraprofessionals

and therapist compliment this practice.

The observation of teachers' use of assistive technologies in the preschool classroom

enabled insights into how the teachers, supported by paraprofessionals and in some cases

therapists, demonstrated capabilities that are required in enhancing children's learning including

the challenges involved in the process of teaching children with disabilities (Tomlinson &

Callahan, 1992). In all, a total of 16 weeks comprising of 40 hours observation was carried out to

reach data saturation. The detail observation schedules are included in Appendix…A. Although

the observation was not structured, I focused particularly on collaborations among various

professionals in the classroom, teacher's lesson delivery, and responsiveness to the needs of

children, management of behavior, children's engagement, wellbeing and how children make

requests. I used non-participant observation approach which means, I did not participate with the

children in any of their activities within the classroom. Liu and Maitlis (2010) argued that non-

participant observation allows the researcher to have more concentration and focused abilities to

document observed behaviors in a more consistent way. Tables 1 and 2 provide a summary of

the participants involved in the first and second rounds of observations.

Table 1. Participants present for first observation (February-March 2014)

Participants	Number	Gender	Role
Preschool teacher	1	Female	Responsible for the overall running of the classroom
Paraprofessionals	2	Males	Support the teacher to carry out normal classroom duties (e.g. toileting, cleaning)
Occupational therapist	1	Female	
Speech therapist	1	Female	Provide one on one speech therapy to children who need it in pull-out sessions
Children	9		Diagnosed with varying disabilities (autism, down syndrome, behavior challenges communication delay and other developmental delays)

Table 2. Participants present in the classroom during the second round of observation (October-

December 2014)

Participants	Number	Gender	Role
Preschool teacher	1	Female	
Paraprofessionals	2	1 male 1 female	Support the teacher to carry out normal classroom duties (e.g. toileting, cleaning)
Occupational therapist	1	Female	
Speech therapist	1	Female	Provide one on one speech therapy to children who need it in pull-out sessions
Physical therapist	1	Female	Provide therapy to children with physical disabilities.
Children	8		Diagnosed with varying disabilities (autism, down syndrome, behaviour challenges, communication delay and other developmental delays).

Phase 2: Interviews with teachers, therapists and para-professionals. The purpose of the research was not only to observe the teachers' use of AT, but also to encourage them through in interviews to articulate their thinking about their practice as well as the challenges they face. Semi-structured interviews were conducted with two teachers, one speech therapist and two para-professionals to gain insights into these professionals' experiences in using assistive technology with children, the kinds of relationship they establish with children, and to identify facilitators and barriers to the use of AT. The interviews also served to establish professional development needs of the teachers and the para-professionals. The interview questions used in this study with the preschool teachers and para-professionals were informed by the research

questions, classroom observations and literature. The questions asked during the interviews centered on professional experience, teaching philosophy, the kinds of assistive technologies in use, assessment of children's progress and challenges. The questions for teachers were aimed at capturing their experiences of teaching children with disabilities using AT and their views about that experience. The aim of the interviews with the para-professionals was to gain a sense of their collaborative practices with the teacher in implementing AT and best practice for children with disabilities. Copies of the interview questions are included in Appendix B.

Due to its flexibility, I used semi-structured in-depth interviews to collect data from the participants. Semi-structured interviews are valuable for generating different answers to the same questions from the participants for later comparison and contrasting (Fraenkel & Wallen, 2006). Although some of the interview questions were pre-written based on the observations in the first phase of the study, some branching questions emerged during the actual interviews. The interview sessions lasted approximately 30 minutes per participant. All of the participants agreed for their answers to be audio-recorded during the interviews. I conducted the interviews in the selected classrooms during times immediately after the children had been collected by their families. Prior to the interviews, I established good rapport with the teachers and para-professionals by talking about general issues in teaching to encourage them to share their ideas freely. I assured participants of the confidentiality of what they would say to me during the interviews with the assurance that their identity would not be disclosed to anybody or in any publication. The interviews conducted in this study were important because they "permit the exploration of topics in depth…, allows for a greater degree of transparency" (Murray & Laurence, 2000, p. 119). During data collection for both classroom observations and interviews, I took detailed field notes which augmented the audio-recorded data.

Data Analysis

This study generated qualitative data from two sources, observations and interviews. Analysis of qualitative data requires a researcher to understand how to make sense of a plethora of data collected in order to answer the research questions (Creswell, 2012). There are various approaches to analyzing qualitative data including techniques such as discourse analysis, grounded theory analysis and phenomenological analysis however; the choice of analysis is based on what the researcher is looking for as well as the skill of the researcher (Creswell, 2005, 2012).

Although there was preliminary categorization of the data during the data collection process as ongoing data analysis, I used the framework analysis approach developed by Ritchie & Spencer (1994) to make sense of the data by following five steps:

Step 1: familiarization with the data. At this level of analysis, I thoroughly read and re-read each transcript and field notes, and listened back to the audio-recorded interviews to become familiar with the whole data set as well as identify the general patterns. My presence as a researcher at the research site, first-hand observations and interviewing, elicited memories of personal attachment to the data set. In this first step, I painstakingly scrutinized the data and wrote down initial impressions in the margins of transcripts, for example where participants expressed exceptionally strong or interesting views regarding issues I was exploring. Familiarization through reading and making notes enabled me to negotiate through several pages of observation notes and interview transcripts later in the analysis to map out categories.

Step 2: Coding to identifying a thematic framework. The second step involved developing a coding scheme and coding the data in order to identify a thematic framework. I

started with different colour highlighters by underlining interesting segments of the transcripts

and used the left hand margin to describe the content of each passage with a relevant coded label.

I marked few words, short phrases and parts of sentences or whole paragraphs which designated

important points I wanted to revisit later in the analysis. In this process, I used the right hand

margin of the data analysis sheet to record more detailed notes and ideas, for instance, important

points that need to be revisited or investigated further in the data, and which could lead to ideas

for explanations, patterns and theming of the data. Table 3 below presents an excerpt of my

coding process. All the codes emerged from the data as there was no pre-coding prior to the

observation and interviews.

Table 3 Sample *Coding of observation data*

Coding labels	Preschool classroom	Notes and ideas
Resource availability	IPad, Tap it, picture schedules, Dynavox,	Variety of AT, children have choice of what works for them most.
Collaboration	Collaborations among professionals in the classroom to support children	Some form of disagreement between the class teacher and the occupational therapist in terms of the behavior plan to implement
Social competence	Schedule activities, turn taking, making choices, working collaboratively	Children seemed to engage very well, focused and respond using their AT resources when the lesson relates to real life situations

Table…4
Sample Coding of interview data

Coding labels	Sample quotes	Notes and ideas
Experience and competence	*Using assistive technology, it is sometimes difficult unless you have on the job training (teacher). I have on the job training so I am able to use AT resources very well before my employment here (para-prof.)*	Facilitated by on the job training. Para-professionals are competent in using AT than teachers
Philosophical	*Well, I am a mom, and I have four kids and I consider that my most important job is to be a mom for the kids. I have so much joy in doing what I am doing. Teacher happiness and willingness affects the children and all the collaborators.*	Empathy appears to drive the teacher's philosophy of teaching

Step 3: Indexing. After I completed the initial open-coding all the transcripts, I went through all the coded data to ascertain the meaningfulness, what I wrote down about participants' views on AT use and their overall classroom practices, and how these might be useful in answering the research questions. I revisited the transcripts taking into account the research questions to ensure the codes better captured the ideas being expressed by the participants.

Step 4: Charting. Once I coded all the data using an analytical framework, I summarized the data in a matrix for each theme. The matrix I used comprised of one row per interview and each para professional. Following this, I abstracted data from the transcripts for each participant and codes, and summarised these using verbatim words from the participants that corresponded to the theme codes.

Step 5: Mapping and interpretation. In the final stage of the analysis, I generated themes from the data set by reviewing the matrix and making connections within and between the interview data with teachers and para-professionals and categories. To accomplish this, I revisited the aims of the study and research questions as reference points in addition to conceptual ideas I generated inductively from the data. At this stage, I started the interpretation of opinions expressed by the participants and going beyond descriptions of individual participants' comments and the observation to develop coherent themes which offered possible explanations for the data. I used relevant theoretical ideas and literature to extend the interpretation of the findings (Stake, 1995).

Chapter Summary

This chapter has presented the methodology, methods and design of this research. It also described the participants, data collection processes and how data was analyzed. The case was made in this chapter that qualitative research method is flexible and its usefulness in knowledge generation relies on the rigor of the method. The next chapter provides the results of the study as detailed analyses are presented.

CHAPTER FOUR: RESULTS

Qualitative research is flexible, and how data is presented, depends on the skills of the

researcher as well as the type of qualitative research that is conducted (Saldana, 2011). In

presenting qualitative research:

Most important to consider is selecting the most appropriate representational and

presentational modes that will best describe and persuade for your readership the core context

and analytic outcomes of the study (Saldana, 2011, p. 139).

The results of this study are presented in the order, in which data were collected, with the

observation results presented first followed by the interview results.

Observation Results

This study took place in a preschool classroom in a public elementary school serving 429

children in grades K-5 in the Pacific Northwest. As indicated in chapter 3, the observation

focused on the teachers' use of AT, what they use them for and how paraprofessionals and

therapists support the teachers in carrying out their daily routines. The results are presented using

pseudonyms to represent actual names of the teachers and para-professionals.

The results presented in this section involved close observations of every aspect

of teachers and para-professionals interacting with children with disabilities in teaching and

learning, supported with AT. A total of 40 hours over 16 weeks was spent observing every aspect

of how children with disabilities accessed and used AT to facilitate their interactive and

communicative competencies within the classroom. Prior to the observations, I spent three days

in the school getting to know the children, teachers and para-professionals in the class so that my

presence to conduct observations would not surprise the children. Initially, as the observations

were not structured, it was quite difficult to focus exclusively on one thing at a time because a lot was happening. However, as the weeks progressed and observations were repeated, clarity began to emerge until data saturation was reached during 40 hours of observation. A wide range of ideas emerged from the observation data. The observation data reported here begins with the classroom context information, general learning climate, developing social competence, collaborative numeracy learning, collaborative literacy learning, and engaging science with AT, collaboration and support, and moments of stress followed by the interview results.

Classroom context. The preschool classroom which was the focus of the study is a self-contained special education preschool class approximately 30x45ft in size and included nine children diagnosed with a range of disabilities (autism, speech delays, communication disorders and physical disabilities). Observations showed that the classroom is stocked with an oven, sink and teaching and learning materials that can be seen on shelves in lockers, baskets, and on the walls. The classroom stocks both high-tech to low-tech assistive technological devices such as IPad, Tap It, Picture exchange communication system and Dynavox, in the classroom although there is not enough for each child. There is a shared bathroom for both boys and girls connected to the classroom with child level facilities. Available also, are carpet floor coverings decorated with bright colors which provided warmth, and fluorescent lightings to illuminate the classroom. There is one certified special education teacher with two paraprofessionals, a speech therapist and an occupational therapist who pull out the children who need special services to address their specific developmental delays. The classroom is furnished with a stove a dishwasher and a wardrobe. The children are between the ages of three to five years old. There were five boys and four girls. Three girls and two boys were white and the rest were children from different ethnicities such as: Korea, India, and Saudi Arabia . All nine students met the criteria for

receiving early childhood special education service which includes an individualized service plan

and developmental delay in one or more areas of language, cognitive ,physical, adaptive or social

domains. The classroom is well lit with fluorescent lights but a bit congested which had children

bumping into things sometimes. There is a giant iPad called the Tap It and two mini-iPads which

are the personal properties of children. The class had a stop watch with an alarm and picture

exchange communication system(PECs) that teachers use particularly for children with autism.

The teacher used both PECs, Tap It, and allowed children to use their Dynavox and iPads.

General learning climate. Although the classroom context that was observed was the

same, Jasmine (first class teacher) and Maggie (second class teacher) operated slightly

differently. While Jasmine worked in a cluttered environment, the second teacher (Maggie) who

replaced her, created a lot of space by removing all the clutters in the classroom for example,

unwanted boxes and pictures which have been hanging on the walls for decades. Maggie

appeared stricter with the children than Jasmine and often enforced rules to get the children to

complete activities. While Jasmine used both high-tech and low-tech devices, Maggie used

mostly picture schedules for all the six children who were present most of the time. She appeared

to be a successful teacher in the ways she supported children's learning by designing and

employing a range of strategies that builds on each child's strengths, needs, and prior

experiences. For example, she used PECs, board maker and the PECs in teaching young children

with disabilities to communicate their needs. She was a lot younger and full of energy compared

to Jasmine, the other teacher. Usually she would follow the same routine using PECs to guide

children in their learning and appeared more organized and structured in her class procedures

than Jasmine. Maggie was also conscientious and often persuaded the children to attain their goal

and she would make sure she attained set learning goals. During snack time, Maggie would

follow the children with the PECs and utilize it to teach socio emotional and communication skills. She also demonstrated a lot of interest in using picture book reading with the children outside of the classroom to show them the days of the week in relation to the weather patterns. This shows that Maggie's teaching extends beyond the confines of the classroom and that she recognizes the ecology of the neighborhood as contributing to children's development and learning. Not only did Maggie demonstrate keen interest in academic learning, she would regularly be seen teaching the children good manners. For example, she taught the children how to raise hands when they needed something or making requests and wait for their turn. Both Jasmine and Maggie demonstrated care for children's health and safety and used soft cushion and a box chair for those who needed them to feel comfortable. For children who couldn't write with small crayons, the teachers would give them big round ones to use.

The teachers and their paraprofessionals often used music and dance to calm down children who appeared somewhat stressed, tired and agitated, which they appeared to enjoy a great deal. Maggie in particular, appeared to work well with the para-professionals. Some children with speech problems were pulled out by the speech therapist for therapy using picture schedule. An important aspect of Maggie's practice was how she would facilitate independence and skill development by allowing the children to pour their own drinks and drink from cups, wear their own coats and take them off by themselves unless there was need for extra support. If the children needed help, she would encourage them to ask for help. This enabled the children to strive for independence. Her use of PECs is fantastic, for example, if children wanted something, Maggie would present the picture schedule and the child would verbalize it. Those children without verbal language were taught to point or sign using sign language. . Maggie's teaching

approach exemplified a constructivist teaching approach where both the teacher and the learners are engaged in co-construction of knowledge.

It appeared that Maggie's teaching approach was different from the practices of the occupational therapist who tried to do things for the children instead of guiding them to do so. For example, the occupational therapist, used dry erase to write 13 and helped the children to write it by holding their hands to trace. She did other activities with the children by holding children's hands in tracing names and letters with crayons.

Paraprofessionals also supported children who needed extra support. For example, one paraprofessional helped a girl with the Dynavox to make requests and to press names of peers so that if a peer was absent, she could identify that through the Dynavox. A boy with mobility problem was encouraged to use his walker to get to circle time activity. In fact, that was the first time I saw him use his walker. Sometimes, the teachers would pick shapes and show to the children to name the type of shapes. In one particular instance, a child with Dynavox had it on her iPad and she used it to choose the right shape, verbalize as well as color it. Other children put the shapes on the correct pegs and verbalize them, for example, "Blue Square". Interestingly, a child who is nonverbal said "blue" after scaffolding from peers. Circle time was usually started with singing; while the children sang a Korean child with no English sang along with big smiles on her face. Children with nonverbal abilities murmured with happy and smiling faces.

Children posted their own pictures and guessed who were not in class and who were in class. In addition, children did beading to improve their fine motor skills and teachers often gave hugs to improve emotional stability to some of the children. I was surprised to identify that when it was time for cleanup, a nonverbal girl verbalized three words, "do your share". It is difficult to understand why she could not talk but could sing words correctly or say surprising short phrases.

The teachers and their support staff used picture schedules to distribute responsibilities, for example; Teacher helper, snack helper and a line leader to enhance leadership skills in children.

In the classroom, at the sensory table non-toxic cream was used to teach the children to write letters. Writing was also done using magnet letters. During this process, while the teacher helper moved materials to the project area one child said "help please" referring to the occupational therapist who helped her dress up. There was color painting time and the paraprofessionals made sure they enforced rules using prompts, rewards and encouragement .The occupational therapist discouraged using a brush to paint with for one boy and ask him to use his fingers instead. One verbal child did art with precision during the stamping with colors, but another boy seemed frustrated and doing nothing. He was later supported.

Generally, the classroom learning context showed children's excitement about PECs and children with Dynavox used it to answer questions asked. The activities the teachers planned and taught to children appeared to have increased the children's knowledge. For example, a Korean boy increase vocabulary skills from using Tap It. I heard him say "*I wanna take it home with me*". Teachers seem happy about the vast improvement that the children were making using the AT.

In general, observations showed that the lessons taught to the children were (a) centered on developing social competence (e.g. turn taking, making choices); (b) using art as a venue for facilitating activities for sensory development, eye-hand-coordination, fine motor development, and language opportunities (e.g. painting, coloring, cutting and pasting); (c) addressing science through naming body parts and their functions and exploring objects in their environments; (d) building literacy through reading, naming objects using games, and through integration of learning activities across domains; and (e) exploring numeracy through matching, sorting shapes,

counting, etc. The aim of the lessons were to use assistive technology as mediation tools to support the children's perform on tasks that they would otherwise find difficult to do without the use of the technologies. Further, it was about supporting the children to develop functional abilities and capabilities for future learning and living as they develop skills to use successfully in society.

In this instance, observing the teachers in particular and paraprofessionals and sometimes the therapists, allowed for documenting evidence of the explicit strategies, used with reference to AT to support the children and enhance their learning. This also enabled me to gain a sense of how the children were using the AT that were available to them. The AT devices were observed to be used with the children to help them accomplish learning tasks in various thematic areas that emerged from the data including (a) developing social competence; (b) collaborative numeracy literacy; (c) collaborative literacy learning, engaging science with technology, collaboration and support discussed in more detail below.

Developing social competence. The first theme that emerged from the observations is related to the development of children's social competence. Social competence is a multidimensional phenomenon, involving a variety of qualities and traits such as positive self-image, social assertion, frequency of interaction, social cognitive skills, and popularity with peers (Matson, 2009; Vahedi, Farrokhi, & Farajian, 2012). All children need to develop social competence because of its undeniable constructive role in shaping adjustment abilities both in childhood and adulthood (Vahedi, Farrokhi, & Farajian, 2012). The teachers, paraprofessionals and the therapists explicitly taught and modeled social competency skills for the children in terms of how to take turns and make choices. The teachers perceive social competency skills as one of the critical developmental areas for children with disabilities in particular, building and

maintaining relationships. For children with autism, these are complex tasks but important requirements, which can take a long time to develop.

The teachers and the paraprofessionals were seen supporting the children to complete one task before they can move on to the next even when the children would like to skip other tasks. For example, one child said "I want to do pizza" but the teacher replied "do letters first then you can do pizza". The classroom observation showed that children responded well when the teachers and paraprofessionals use positive practice. During an activity, a child who was mean to his peer was asked to apologize. At a closure of an activity, an alarm would beep and children know that they have to clean up.

At the beginning of everyday, the teachers would teach children appropriate sitting and posturing skills. They would ask for example; who is sitting nicely today? Children who demonstrated exemplary appropriate sitting and posturing were rewarded with praise or given time to work with computers. While doing this, the teachers, paraprofessionals and therapists would consider the physiological needs of the children, and children with physical disabilities were provided specific support by the physical therapist.

The teachers, supported by the paraprofessionals and therapists, often used PECs and Tap It to support the children's social competence development. They taught and modeled turn taking, how to make requests and negotiation skills using AT devices. For example, children were taught to wait for their turn to use the Tap it as there is only one for the whole class. The Tap it was enjoyed by many of the children because it is an interactive form of AT. On the other hand, the PECs was used mostly for children with autism who had limited or no verbal communication. This enabled them to communicate their needs to peers and teachers more efficiently.

Patience and turn taking was taught through the use of the Tap it interactive technology. Each child had opportunity to choose a song from the *Tap it* in turn, which other children join in singing and dancing in pairs. Some of the songs the children selected from the Tap it included: IF YOU ARE HAPPY AND YOU KNOW IT; ROW,ROW,ROW YOUR BOAT; WHEELS ON THE BUS , and TWINKLE,TWINKLE, LITTLE STAR. The singing was accompanied with physical movements and dancing in pairs, helping the children to socialize with others. The children seemed to enjoy rolling with partners with a happy face suggesting their keen involvement and satisfaction with the social skill development taught through music. Children were also taught repeatedly how to raise their hands when they needed something or wanted to answer a question. According to the teachers, the turn taking exercises were aimed at inculcating social values of patience so as to reduce "me, me, me" when the children wanted something or wanted to answer a question. In addition, the children were taught how to use the Dynvox to made requests.

Children's social skills development was furthered through working together in a family play park stamping. The teacher and paraprofessionals served as guides, encouraging cordiality in the classroom. The children used the Dynavox to mention the names of their peers. This was possible because the technology tool had the names and pictures of the children and included appropriate words that were downloaded on it. During the Tap It, there were some children who used square or box chairs while others sat cross legged. . A child with behavior issues called the teacher maam. The teacher corrected her by saying I am not maam, call me teacher Jasmine. The boy obliged and called her teacher Jasmine since. In essence, the observations demonstrated that the use of appropriate assistive technologies is effective in supporting children learning social competency skills such as, taking turns, asking questions, communicating needs and learning

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about other children. There was evidence to suggest children answered questions and waited to take turns.

        Collaborative numeracy learning. The observational findings showed that assistive technology use supported collaborative numeracy learning and engagement in the preschool. Data indicated how collaborative learning involved the joint intellectual effort by the children, teachers, paraprofessionals and therapists. During classroom observations, children and their educators were seen engaged in common numeracy tasks in which each individual depended on, and was accountable to each other. The children were involved in small groups and used Tap It, PECs and iPad to maximize their learning and that of their peers. It depicted a process of shared creation of knowledge where children persisted on task with others when play, appropriate AT and reward were used to facilitate the teaching and learning of numeracy. Numeracy learning often started with icebreaker activities. For example, 'circle time' was used and children sat cross legged on a woolen carpet, which was designated in four squares to give room for each child to accommodate a square. The children were encouraged to verbalize "square" while other children used PECs to demonstrate their understanding of the concept of square. A girl who composed herself well during the activity was rewarded by the teacher and asked to choose a song from the Tap It. The child verbalized what she had chosen: *"I chose ROW,ROW, ROW YOUR BOAT"*. This initial activity was extended to other children whereby each child chose a partner and sang the song; ROW ROW ROW YOUR BOAT. The teacher explained the partnering as a pairing and went on to ask the children to count the number of times 'row' was repeated in the song. These learning processes act as a starting point for developing the children's numeracy skills. The class proceeded with numeracy activities such as sorting colors, toys and shapes. The paraprofessionals supported the children to use their IPad, PECs and Tap It in furthering their

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numeracy conceptual development by matching pictures to real life objects in the classroom. Children who needed extra intervention to be successful in their numeracy learning, for example, those without verbal abilities, were pulled out by the speech therapist for one on one session after which they returned to join in with the group.

In some cases, the children worked in pairs giggling and laughing while they work on puzzles collaboratively at a sensory table. While the teacher was busy using PECs as a low-tech AT to further conceptual learning of shapes for a girl who has limited verbal expression, the paraprofessionals were involved with some of the children, guiding them to play numeracy matching games using the high-tech interactive Tap It . During this time, a boy with challenging behavior was given an opportunity to try his hands on the Tap it and match objects. When he successfully accomplished the task, he exclaimed, *'I did it'*. Children with limited verbal abilities used Dynavox to choose and classify colored objects and shapes such as circles, triangles and rectangles. Most of the children seemed happy when they were engaged with collaborative numeracy learning because they had choices of what they would like to work on and with whom they would collaborate during puzzle time.

Collaborative literacy learning. Building effective partnerships for literacy learning for children with disabilities requires that teachers, paraprofessionals and therapists initiate and promote connections and relationships with other children. My observation of this practice in context demonstrated that the teachers, paraprofessionals and therapists did this by reflecting on how much they value the contribution of each child. Tap It and PECs were mostly used during literacy learning. Most children were excited about the use of the Tap It because of its interactive nature and the sounds it makes. Literacy learning mainly focused on collaborative reading and naming of objects using games on the IPad. For example, they name objects they often found in

their environments such as bowl, apple, books, cups, television, radio and phones just to mention a few. During one literacy activity, a non-verbal girl who was engaging with the Tap It shouted, '*hurray*'! The class teacher who was close to me at the time whispered; "this girl is non-verbal and she just shouted hurray that is incredible, technology can do wonders don't you think?" To my surprise before the activity concluded, the girl repeated *hurray* two more times, indicating her excitement and engagement with what she was learning. Every child seemed excited in the classroom during the literacy activities because what they were doing with the AT connected well to their everyday experiences. In one of my observations, one boy refused to participate in any of the literacy activities and efforts from the teachers, therapist and paraprofessionals to get him engaged proved futile. It could have been that the boy was having a bad day at that time.

Engaging science with assistive technology. Observations show that the preschool teachers, paraprofessionals and therapists develop dutiful relationships with children and their families, which allowed them to know more about the children's interests, skills and abilities. This knowledge positioned them to determine which assistive technology can provide learning atmospheres that respond to the children's interests and needs, extend their learning and support their development. Children's engagement with science learning using AT was full of fun. For example, one of the nonverbal children kept laughing during science activities but did not use any words at all. Instead, he joined in with the other children and used the Tap It, Ipad and PECs to engage with themes such as transport and parts of vehicles and how these work, farm animals and their usefulness, and the weather variations. The teacher and paraprofessionals encouraged the children to work collaboratively with their peers by listening and taking turns to repeat after a voice on the Tap It. During sensory time, teachers demonstrated to the children how to write

their names using Dynavox on their own and after that discussed how they are unique as individuals but similar in many ways.

During the science activities, a boy with autism who usually exhibits challenging behavior went to the Tap It all by himself, dragged a plant on the matching and sorting area and said '*yay'!*, demonstrating his attainment of success and satisfaction in doing that. The teacher replied, "*Good job*" as a reinforcement which led to a big smile on this boy's face. This demonstrated that not only do the teachers and paraprofessionals tell children what to do with the technology but the children are encouraged to take initiative to use the technology in ways that assisted their engagement with what was going on around them.

Other science activities were connected with the weather. The teacher chose two boys and one girl and asked about the weather patterns using the Dynavox: They discussed cloudy, sunny, snowy and windy conditions to co-construct scientific knowledge. The children also used the Dynavox to learn about star identification. During sensory motor skills children rolled objects to form letters that correspond with animals like elephant, fish, mouse, zebra, and also shapes and colors.

Collaboration and support. Some of the children with disabilities were identified as having extra needs that required para-professionals to support the classroom teacher in delivering adequate services. In one particular instance, the class teacher handed out red cards and yellow cards to indicate which tables she wanted the kids to go to during sensory time. Some of the children went for writing while others went for sensory activities like molding and lettering. The occupational therapist in the classroom was asked by the teacher to take care of the kindergarteners but at the same time the occupational therapist was busy with another child on a one- to -one basis. This led to ignoring other kindergartners who were idle bringing confusion

into the classroom for a moment. It appeared that there has not been prior planning between the classroom teacher and occupational therapist. The relationship between the teacher and paraprofessionals appeared mutual except for the therapists. Peer to peer relationship was great and likewise the interaction among all teachers, peers and paraprofessionals.

It seemed that the speech therapist worked as an individual rather than collaborate with the paraprofessionals or teachers in the classroom. She often would pull out children with speech problems for one-to-one therapy sessions. It appeared that some of the children do not like the pulled out sessions as they seemed to enjoy the company of peers. For example, the speech therapist pulled out a girl who was enjoying a session with other children. There was a bit of reluctance from the girl.

Although the room seemed crowded with teaching materials, children often participated effectively in various activities such as finger simulation and Tap It sessions. For example, a child during a Tap It session was excited when she chose SLIPPERY FISH and verbalized it. To celebrate her achievement, the children sang with joy and both teacher and children simulated the fish the girl has chosen using the Tap It. Children did other activities like art rolling clay into letters and balls with the speech therapist occasionally joining the circle time. During projects time occupational therapists brought in toys and said, "These are for the kindergarten group". She then drew the kindergarten group and asked them to do stickers. The children could not do the stickers as they found it too difficult. The teacher tried to intervene but the therapist told her it was fit for kindergarteners.

While Jasmine one of the preschool teachers appeared to have no control over the para-professionals who work with her; the second teacher, Maggie, was different as she seemed to have control over the paraprofessionals and the children. Due to the lack of control, Jasmine's

classroom appeared somewhat disorganized. For example, some of the children were found idle most of the time leading to a waste of instructional time.

Although the classroom depicted a good working atmosphere there were times that the teachers' tone of voice showed stress as they would raise their voices against the children. It could be that they were overwhelmed by the demands from the children as each child presented with different disabilities and peculiar challenges. In addition, some children, from time to time would refuse to join in with other children in an activity and the teachers would need to develop on the spot strategies to persuade them to participate. The teachers sometimes appeared to be frustrated by the therapist's dictatorial practice as she seemed to control the teachers from expert point of view rather than collaborating with them. Coupled with these challenges, the teachers seemed to be running around a lot to keep some children calm for teaching and learning to progress.

Interview Results

The case study interview data provided by the individuals who participated in this study is presented collectively. Representative quotes from the individuals are denoted by pseudonyms at the end of each quote. The data presentation begins with brief biographical information followed by experiences with AT in the preschool classroom.

Biographical. *Class teacher 1.* Jasmine was the first teacher I interviewed after observing her classroom practices for 16 hours, from February through March. Jasmine is a special educator who had previously taught at a Head Start program in the Pacific Northwest but recently hired on at the school district as part of the special education team. She had been in this position for almost 2 years at the time of this interview. Her role involves teaching at the

developmental preschool from birth to three as a special education coordinator. Specifically, what this means is that when children turn three they are eligible for special education services through the school district and Jasmine helped them to transition to preschool. According to Jasmine, not only does she teach at the preschool in the morning but does a whole bunch of paper work. She has been teaching for the past 10 years although she took time off to do other personal things. Jasmine had a Bachelor's degree in early childhood development and special education and is certified to teach k-8 education. As a special educator, her focus is on early intervention from birth to three. She is currently working on her Masters' degree and hoping to get it done in a year because she is special education endorsed.

Class teacher 2. The second teacher interviewed for this project was Maggie whose classroom practices were observed from October through December. She graduated from a local university in the Pacific Northwest with a double major in early childhood special education and elementary education and is endorsed in both. Unlike Jasmine with 10 years' experience, Maggie has been teaching for the past 5 years. According to the teachers, they have children with varying developmental delays such as socio emotional, fine motor, gross motor and communication. Some of the children have more than one disability, for example, social emotional difficulty and communication disorder. In addition, the class included a few children that have health impairment and a child who had undergone a tracheotomy because of difficulty swallowing, a child who uses a wheel chair because of physical impairment and another child diagnosed with Down Syndrome.

Speech therapist. Cyndi, was the qualified speech therapist with responsibility for providing therapy sessions to the children. She was in her second year in the school district at the time of this interview. . According to Cyndi, she works in three other districts. Cyndi reported

that she normally works on the children's communication goals which range from their understanding and use of language, speech sound development, social skills development, attending imitation and play. She also uses AAC devices to support her work with the children.

Paraprofessionals. Two paraprofessionals, James (male) and Christie (female) were interviewed for this project. James has been doing paraprofessional work for the past five years and Christie just became a special education   paraprofessional for the present preschool recently but, had six years of experience in another setting. She has three boys, one who is 19 years old with ADHD and autism with learning disability. She chose special education support work because she thought she could gain some skills to help her own children. According to the two paraprofessionals, their roles were to support the teachers in performing their instructional tasks and daily routines. They claimed to be well-vexed in as familiar with the routine and they shuffle between two of them. The paraprofessionals stated that they do not have a preference but rather they make sure they work with ages 3-5. They indicated that they feel pretty fortunate to work with good teachers and wonderful children who bring different potentials to the table. According to them, the teachers are all really good with the children which they consider the most important thing. However, one paraprofessional stated emphatically, "Well I just started here and I have worked with various teachers but Maggie is wonderful. We know our expectations and what we should be doing and that works" (Paraprofessional 2).

Philosophical beliefs and use of assistive technology. All the participants demonstrated a strong belief that children with disabilities are capable of learning as other children when appropriate support is given to them. They noted that this can be accomplished when children know teachers care about them.

My teaching philosophy stems from…you can't teach a child in a way that they know you don't care about them so I try to …we all have our moments when we get frustrated I always dial it back to a time we all get to… times when we calm down and ask does this child know you care about them what are we doing to keep them safe and confident and make an impact on them. (Jasmine).

These statements indicate that Jasmine's belief about teaching is grounded in reflective practice. Reflective practice enables teachers to question their everyday practice which can lead to deliberate efforts to make innovations to their present and future professional practices (Johns, 2000; Mulvey, 2004). Jasmine also held a strong view about the use of AT to support children's development and learning.

Maggie, the second teacher, believes that appropriate use of AT can make a difference to children with disabilities with respect to their learning and development.

I think it's really important to use assistive technology in the classroom in various ways because all students learn differently. Although it's important to use it, we should not overuse it and create kids who are dependent on it. It is a tricky thing, we need a balance and we need to ask, do they need it or do they not need it? Are they dependent on it? If so how do we fit in? I start more with least restrictive and then back up and integrate more if needed such as a picture schedule (Maggie).

Compared to Jasmine, it seemed that Maggie is a bit cautious about the use of high tech AT for everything that happens in the classroom. Although it can be said that she believes high tech AT contributes to children's development and learning, her expressions suggested that teachers must carefully consider learning situations before implementing AT to avoid over-reliance on these tools.

The data showed that both Jasmine and Maggie are strong believers when discussing the usefulness of AT devices in educating young children with disability. They made the following arguments in favor of AT use:

…erm well, as far as I am concerned I think that it's the way of the future. And I think in a few years every child is going to stop using the talk box and have iPad. assistive technology is critical in special education…especially children on the autism spectrum don't respond to other people as well as they do to technology so it's a critical piece of tool to them to learn to progress' (Jasmine).

Assistive technology is really good for learning for the kids…I have a general picture schedule on the board there are certain kids that need a smaller picture schedule. Because they don't go to the picture schedule on the board but can't register the routine. It's important such as the Tap It that we have…not only the schedule in special education but those in general education. It is important whether it is picture or technology such as the tap it that we have that we are working on making it more user friendly. It's important to integrate assistive technology in teaching for all children to do well in their natural environment and school (Maggie).

Jasmine and Maggie's views echoed strong beliefs of how assistive technologies contribute to children's development and learning and as leverage for children with disabilities to experience their natural environment. Research has identified that the use of assistive technologies can assist in supporting young children with additional learning and developmental

needs (Hasselbring & Glaser, 2000; Light & Dragar, 2007; NAEYC & Fred Rogers Centre, 2012; Kling, Campbell, & Wilcox, 2010: Light & Dragar, 2007).

Interestingly, Jasmine went on to report that she uses what is available to her according to the children's needs and what they are learning:

> …erm we have an iPad that we use. It is kind of a reward right now. I am trying to see a way we can use it on a daily basis we have our Tap It that the college of education has given us graciously… it is wonderful… we love that thing, kids play games with them make choices, use my computer the kids get on there. We play educational games on my computer… I let the children get on there and play educational games .Besides the iPad and the Tap It that is all we have, I have some donations to share I'm looking at getting more tablets. It's a way to push them to learn (Jasmine).

> Maggie on the other hand, described what she uses with the children in this way:

> Mainly what we use in the preschool classroom are pictures and we have picture exchange communication system that we use with our kids on the autism spectrum. The reason we use it is because they are nonverbal. It enables them to communicate their needs and wants so that they are able to express themselves. We also use different Chairs, devises, Wiggle cushions guide, and sandwiches to help soothe them. Anything that is really going to benefit them whether modified, adding something to their education…additional things we use are slaNT boards for a kid who is having a rough time on a table surface we slant towards them a little bit .A couple of students that have worked with a couple have not . We also have a new student that use a box chair they sit in at carpet and then for table time we have

allowed her to have a little tray that goes on the table for to use that as well (Maggie).

The data also demonstrate that the therapists and the two paraprofessionals have strong confidence in the use of AT as tools that facilitate learning and development for children with disabilities.

I believe in assistive technology…it really makes a great difference to the lives of children with disabilities. We use pictures, visual schedules, visual cues, Go talk, dynavox, and AAC device program on the iPad… picture exchange communication system (Speech Therapist). It is very important. I think the iPad is a game changer for AT in a lot of ways the touch screen interactive tech not only iPad bringing down the cost of AAC devices the way we work with our kids in terms of making them accessible to almost everyone just a wide variety its really changed the way we work with kids with disabilities I think done correctly and giving the right training, teachers and parapros, it will make learning accessible and help students access the curriculum. Right now it is the best way to help our kids to be able to initiate communication …it is easy for teachers and parapros to implement. We have a difficult time for kids to use interactive technology, because it is always associated as a reward and have a hard time using it as a communication device. We have to distinguish between using it for a reward system or as a communication device .we run into behavioural issues a lot of screaming, sometimes we have to lock the device up and take it away.so there is a fine line between how interactive technology is being functional as opposed to picture schedules (Speech Therapist).

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The speech therapists elaboration demonstrates the use of a wide range of assistive technology to support children with disabilities who would otherwise be excluded from learning. Interestingly, the support staff who work with the teachers noted, that the assistive technology devices enable them to meet the developmental and educational goals of the children, parents and teachers.

> Assistive technology enables us to meet expectations. We still expect them to ask for their food through the use of the picture card otherwise we won't have a system… there is all kinds of assistive stuff that we use in this classroom because we believe they work (Parapro 1).

> I am all for assistive technology. I think it works. It takes a lot of time to teach them how to use it but when they know, it is wonderful. We take a lot of time for kids that are nonverbal it helps them to step into our world (Parapro 2.)

These comments suggest that the teachers, support staff and the therapist use assorted assistive technologies to support the education of young children with disability in their class. There is further evidence that these technological tools were used for the purpose of making children meet their specific learning needs as well as enjoy the process of learning. One of the participant teachers added that:

> …kids with special needs require cognitive and some adaptive skills. I do know that kids respond better to interactive technology and we get better results in adaptive and cognitive skills. Like I said before kids are not going to write in the near future because it's a way of the future. Training every student on the planet not

only student with special needs is important. Everybody needs to be able to know how to use technology (Jasmine).

It is interesting that Jasmine not only thinks about the present situations of children but their future. Her prediction of what might happen in the future if children do not have the necessary skills, informs her passion to support all children irrespective of their situations to acquire technological skills that would make them adaptable in our current technological world.

Inclusion a case by case issue. This study also provided the opportunity to probe into the participants' beliefs about inclusion regarding the children with disabilities they teach. It was important to understand their perspectives as it is possible that some of the children might be eligible to make transition from the special education contain class to inclusive educational settings. The participants' expressed varying degrees of views regarding inclusion.

It is hard to make general statements because every child is different. I like inclusion but it may not be good for every child. Eventually some can go to inclusive classrooms… I do I think that there are three kids in our class if they finish out this year in the preschool they will be able to transition to inclusion not at this point right now but by June 2015 (Jasmine).

The second teacher, Maggie elaborated on her views on inclusion in the following statements:

My goal is to hopefully help them out with services. Most of the children lacked adaptive socio emotional skills so I think it will be only a 20 min pull out for some children into inclusive classrooms. We are making progress through exiting some kids…I do believe in some that will be successful. Some kids have behavioral and adaptive goal and they would need to master those skills before they can be

acceptable by peers in inclusive classrooms. For example, I have a girl here, she

will sit and play with an adult all-day… she will come up to me and say this is you

and I will say, show your friend, she has a behavior goal and adaptive goal. If she

was in inclusion classroom she won't be given that wait time and someone has to

do it for her then she will not learn. She is more than capable for her to put on her

coat. We have a name to picture matching activity. Go show your friend and it

stops. Why don't you want to? I just don't. If she was in an inclusive classroom she

wouldn't have that support. Take the time to work through the adaptive skills that

she is working on (Maggie).

Interestingly, some of the participants perceived inclusive education as too complex to

force every child into it. For them, inclusive education for students with disabilities should be

considered on a case by case basis. This would enable children who are making progress to

continue to make progress even if they enter into inclusive schools. They thought that a

"wholesale" approach would not help many children with disabilities.

…to me it is not a good idea to send every child with disability to inclusive class.

Each child should be treated as a case, verified well in terms of what the child can

do if he or she gets into the inclusive class, and not just stay there doing nothing.

Besides there should be those who have the required skills to support them there

otherwise it is not worth it. I don't think technology alone is the answer. We have

to consider many things, the environment, teacher quality etc. (Jasmine).

These views demonstrate that although inclusion is a good idea for children with

disabilities to socialize and learn with other children without disabilities, the beliefs

expressed by these participants take a cautionary approach to inclusive education. They do

not think that assistive technology provides all the answers for children to experience quality inclusive education.

Inter-professional and parent relationships. The findings demonstrated that there are positive relationships among the various professionals because they all put the children first.

> I work well with my paraprofessionals because we both put the kids first. We all have the mindset of the kids first and you don't get that with a lot of paraprofessionals in other schools. They are good at what needs to be done so we are all on the same page and as long as the children are put first, everything else will work out (Maggie).

It was noted that the effective collaboration between the teacher and the paraprofessionals is facilitated through weekly meetings where they discuss issues of mutual interest including planning for teaching.

> We have weekly staff meetings just to talk about what we can be doing better for this kids…they come with differences and they jump in… I think we have a pretty good relationship in the sense of collaborating and thinking about what is good for the kids. I am blessed because they feel comfortable giving suggestions to me and I feel comfortable giving suggestions it is how we see ourselves as teachers in the classroom (Maggie).

Surprisingly, the speech therapist thought otherwise:

> …I mean it is tough there is dynamics because anytime you get more people in the classroom where everyone has the best intentions of wanting what is best for the kids it becomes difficult. Everyone appears to be doing their own thing… of course when you specialize in a certain area then you see all these areas that you want to

have input in and at that point some people don't like your approach, there is only

so much you can do. When you are trying to make everything about speech works

it becomes very overwhelming but you know it is that balance of integrating those

skills and still focus on the main thing of getting the skill on board for those

working with you (Speech therapist).

The participants also felt that there is lack of effective collaboration with some parents and

teachers.

A lot of parents don't follow a set schedule at home. They don't seem to agree with

us sometimes but we are working on that. We have some parents that use our

strategies at home, for example the 10 step toileting schedule…but a lot of parents

don't follow a set scheduled at home. It is something that we are working together

on because it is important that a child follow a set schedule and routine for

consistency …anything the parents say I need some more help with blah…...if they

don't reach out to me I don't send those things home just because you don't want to

be invasive but I do offer suggestions because I don't want to be invasive I do offer

them suggestions the suggestions are there when the thing is detrimental to the

child they definitely need this and take this and implement it at home (Jasmine).

Maggie and Jasmine elaborated on their frustration in working with the parents to get good

results for their children.

We are working with parents on getting their children here on time. Sometimes it is

hard to suggest things to the parents. Our relationship is a work in progress where

the parents have to be open and come to me for help. Working with parents in their

time frame is more fluid and fluctuate so that is something we are working on right

now. A lot of positive reinforcement to their kind to encourage the parents and the children, like, "oh we're so glad you made it to school on time" in front of the parent or "I am sorry you missed recess but we have something interesting for you….. this just to get the kid here on time and it's a work in progress (Jasmine)

`   **Experiences with assistive technology.** It is important to go beyond the participants' philosophy to identify their experiences with assistive technology uses for teaching and learning and the particular children they teach. Jasmine one of the teachers said emphatically:

We use a lot of picture schedules we do rely on a big picture schedule in the classroom. Few students have their own picture schedules that they check in with to wash their hands… part of it that it is visual. This low tech assistive technology helps a lot, for example, it guides a few students who have to get their coat on and take their back pack. Part of the importance of assistive technology is visual low tech devices it's really helpful to children with autism (Jasmine).

Jasmine added that she preferred teaching children with autism because they bring so much variety of potentials and behaviors that challenge professionals' skills.

I love teaching children on the autism spectrum…they keep you on your toes and you need to keep thinking all the time and the moment you understand them your work becomes fascinating

(Jasmine).

Maggie the second class teacher added her experiences.

The main experience I have is in the preschool setting, other experiences have been in general education classroom. I use a little bit of iPads that will speak for the children. For example, children tap on four and it says the word for them…I want

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crackers' or whatever…they communicate their wants and needs through the iPad. I used it again last year in one of my classrooms since they were able to choose and it spoke to them what to communicate in terms of their wants or need and it was able to speak for the kids…for me, I don't have a preference, all children are equally enjoyable to teach if you know what you are doing (Maggie).

The two paraprofessionals who work with the teachers on daily basis elaborated on their experiences in the following way: My experience so far has been very positive… For me, obviously autism interests me and intrigues me at the same time any kid on the spectrum is different. It is fantastic what the brain does and doesn't do with kids on the spectrum. I work with a student with great disability and he is like may be a stage level of 2 or 3 year old but somehow could read. He could read everything you gave him but on picture schedule he can't match pictures, for example, dog with a dog and cat with a cat (Paraprofessional 1)

These experiences tell beautiful stories about the dynamics of the classroom ecology demonstrating that generally, the participants' experiences have been positive and challenged. In addition to these experiences, the speech therapist indicated her preference for high-tech assistive technologies than low-tech; however, she claimed high-tech assistive technologies isolate individual children making it difficult for them to acquire social skills.

I like high-tech but it often isolates the children. In my role, my goal is for children to communicate and participate. I think high tech is ok but it has the tendency to isolate the children as they are only interested in playing with it on individual basis. Choice should be made based on what the children are supposed to learn (Speech therapist).

One of the class teachers noted that although she prefers high-tech to low-tech because they are versatile, yet can be quite frustrating when not working properly. She also noted that some of the children have not gained the skills needed to operate the high-tech devices.

...obviously high tech but unfortunately not all kids get there. And especially the preschool level so I prefer high tech it's not as bookie. It's a lot more versatile you can choose to do a lot more with it that is preferable for nonverbal like pictures but not all are generalizable for them. More than iPads…it is easier to generalize pictures. A lot of kids have and they can choose from multiple fields however the pictures are more of a starting point…it is easier for them to generalize pictures. If you hold up a bowl of cereal for example, and instead of using Tap It when it's not working effectively, waiting till it starts working effectively is not a good idea (Jasmine).

The participants experiences reported in the findings indicate that they regarded assistive technologies as important to children's learning but choices and uses of AT must be informed by specific learning needs of the children. Some participants further argued that it is not a matter of preference for either high-tech or low-tech assistive technology but the decision to use it must be based on availability and purpose of what they are teaching and learning.

> I don't think it should be a matter of preference, for one over the other erm…I might use the low tech more right now just because of what I want to teach the children. I think the learning goal should drive choice of the assistive technology (Jasmine).

Another participant provided insight into some of the transition complexities that children with disabilities face when moving from low-tech such as pictures to high-tech like iPads and Tap It.

…a lot of kids have a rough transition from the pictures to the iPad… if they don't

have a solid foundation in pictures it's difficult to transition to the high tech. I don't

know if it is the fact that pictures are something they can touch…I prefer the

ipad…you can do anything you want with it…you can carry it anywhere if they

don't have a solid foundation its difficult though (Maggie).

Maggie's experiences demonstrate disappointment with the high-tech assistive technologies in

terms of its reliability.

Sometimes I do not use the Tap It because I don't have a computer that will run

it…the software is outdated so we currently have a computer on order it's just not

here as soon as we get a computer it will be done once we do that we will be using

the tap it… right now we have tried to use it a few times and it glitches that is a bit

aggravating for our kids because it's not working effectively. I decided not to use it

…I would rather wait until its working effectively to use it (Maggie).

The effectiveness of these tools is seen in their function and the needs they serve for the children

as well as the teacher. Further probing during the interviews, suggested that Jasmine has

experience and is skillful in making low-tech resources for the children to use and does not rely

on external supply of what she could do herself.

I make most of the picture schedules myself. We have the board maker we use in

the district, it is consistent so that if they move up to kindergarten through upper

classes pictures are still the same and I send picture schedules home sometimes for

parents to use at home because they find them useful (Jasmine)

By personally making these resources, it can be suggested that Jasmine's training as a

special educator might have played a part. In addition, personally developing the resources

provides an opportunity for her to match the resources to the skill of the children. In addition, her revelation that she makes resources for parents to use at home to support children's learning, including focusing on their transition to school further confirm her reflective practice. Jasmine also claimed she uses best apps on the iPad with children and the support she receives from the paraprofessional makes her work successful.

> …when using iPads I always aim to select the best apps to use for kids and visual cues… in the last 3 years we have Tap It and iPads. My paraprofessional is very good with technology and he does most of the downloading. I don't know what I would have done without him. For kids with different disabilities/mostly I use PECs (Jasmine).

The data also indicated that although both teachers like working with all children with disabilities, they find it more interesting when working with children with autism.

> I will say it is interesting to me working with kids on the autism spectrum and I think I like them most because every child is unique and no two children on the autism spectrum are the same. These kids are a piece of puzzle that you have to solve. They are visual learners and if you know them well, it is fascinating (Jasmine)

> …kids on the autism spectrum, I mean the ones that are more severe and nonverbal can be fascinating to teach if you know them. Just trying to get into their hearts and figure out what they want, knowing what they want is the most interesting but not knowing is frustrating. I think those two tie together you don't know whats up but if you figure it out it is very rewarding (Maggie).

The speech therapist explained her role and experiences in this way:

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I advise, I provide direct therapy and help them to improve the children's communication but I have a narrow view about the curriculum but communication is where I am trained in so I look at what they do and I advise. I advise Maggie and say you need a pictorial communication system to help the children understand this or that… (Speech Therapist)

These comments suggest that Jasmine and Maggie are teachers who are dedicated to making a difference in the lives of children with disabilities and as such ready for challenges, teachers who are ready to learn and solve problems rather than being reactive.

Measuring progress. Determining outcomes for children with disabilities in preschool programs can be complex and tedious. In this study, outcomes relate to the gains or changes that result from children's learning with AT were explored. To identify this process, I asked the teachers to explain how they determine if the children are making progress or not. Jasmine one of the teachers explained:

I continuously collect data. My paraprofessionals and I carry a little book and we do a lot of note taking and data collection… I observe and write things down every day. Every Friday we have a meeting and talk about what has been successful. Try kids who can't speak and you give them something like an ipad to learn with, it's almost instantaneous they respond much better to high tech devices especially. Kids with autism are used to not being touched, talking to my team about successes helps.

We have a creative curriculum it's the curriculum that we use and it shows us when they are 3 this is where they should be in social and adaptive skill development. With my paraprofessionals the main thing that we use to measure progress and

compare goals is the curriculum standard in addition to everyday documentation (Jasmine).

Maggie the second teacher added that:

> The only way to know progress is being made is keeping track. Teacher data is important, I have a binder where I keep data collection and IEP goals not just that but also goals that I want them to achieve…I do that each week .The only way to truly tell is with data if they are making progress or they are growing using it functionally to communicate. If they are able to get what they want, it means assistive technology is being useful (Maggie).

The speech therapist, reporting on how she measures children's progress indicated:

> So I take data on each session I write down and I record responses basically when there is a point on voice output…I measure and I write down how many times they point correctly when they do it three times in a row basically recording all responses. I record how many times they hit tha and I ask myself, is the accuracy increasing or no. Also language samples help…writing down every time they speak and if I don't see that increasing then we have to go back and adjust… accuracy in pronunciation how many words do they mention correctly (Speech therapist)

The paraprofessionals also claimed that they use observational skills in determining progress and often report to the teachers when they see something remarkable happening.

> We observe their everyday functioning to determine if they are following the routine better or staying where they are… we observe that through the daily activities they do. We see if they are interacting with friends through cooperative

play. With interact with them just by observing how well they are doing. We compare their progress with objectives there also (Paraprofessionals)

The professionals approaches to measuring children's progress is consistent with what researchers have long argued that documentation provides information about children's learning and progress (Turner & Wilson, 2010; Wien, Guyevskey & Berdoussis, 2011).

Successful stories. The teachers, paraprofessionals and the therapists shared about their successes in using AT in teaching the young children with disabilities. Jasmine, one of the teachers reported:

I think of a couple of little girls in my class who are on the spectrum and are nonverbal if you just see the way they pick songs from the Tap It sing, it is incredible. There is this girl with autism if you just sit and have a conversation with her you don't get anything out of her so we have conversation through music… push her to learn more. She likes to work on the ipad and with that a whole part of her is alive all of a sudden and she responds and makes eye contact when we have conversation through music. I have a little boy too, the Tap It pushes him to learn more (Jasmine)

Other incredible success stories were reported by Maggie the second teacher in relation to how assistive technology contributed to enhancing development of children with disabilities. .

We have a kid who did not know how to choose things when she first started. She would choose something but it does not meet her needs. We introduce her to the picture communication system and Tap it, now she is actually making choices we see her reaction of joy when she chose yoghurt and yes yoghurt was what actually

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what she needed at that time. That makes us feel really good when we see that it is working, they are able to functionally make little gains (Maggie)

The participants also mentioned successful stories in terms of children who were able to transition into mainstream schools.

I have a little boy in 2010 /2011…I met his dad a few weeks ago he is on the spectrum but very high functioning He in mainstream and does not need intensive special education services anymore. They can make adaptations to his learning without having an Individualized Education Plan or specific educational services...he is in the second grade (Jasmine).

It appears that children with autism benefit immensely from the use of AT

Like I said earlier, we are using the picture schedules pretty much for children with autism and they are able to communicate their needs, it helps them in social competency development. For the children with developmental delays the AT is enriching their development tremendously (Maggie).

The speech therapist confirmed other success stories with the use of assistive technology.

The use of the PECs and the use of snacks and the picture schedule communication is tied with behavior that is what we are dealing with and it has helped many of the children to communicate really what they are trying to tell you. It transformed many children's behaviors because they are able to express their needs more easily with the AT.

Challenges to using assistive technology.

Despite the successful stories, the use of assistive technologies with the children with disabilities in the preschool programs often prove challenging to the teachers. In the current study, Jasmine reported challenges in terms of limited iPads to go round for every child that needs it.

> The main challenge is not having enough of the tools, wish I had I had an ipad for every child so they can pair together for activities… just not enough resources. Technology is great for the kids it is great for kids who are autistic or have speech delays I wish I had more conversational tools because it's great for adaptive and socio emotional skills development. Sharing having conversations and taking turns sometimes is difficult (Jasmine).

Maggie on the other hand commented on the frustrations she encountered with the obsolete Tap it technology and lack of software to download resources onto the ipad. In addition, she echoed sentiments on lack of adequate computers.

> To use the tap it as a machine was frustrating sometimes because it broke down when I needed to use. We don't have the software for downloads and besides, we lack computers, hopefully I will be getting my computer soon. I don't know when we talked to people about what is going to be the best computer that will run the Tap it machine do not get a definite answer. We need fast to avoid having a glitch on us (Maggie).

Jasmine extended the conversation to monetary issues:

> Well, a lot of it has to do with money…just not having money to try more programs is a big challenge. I know we can do a lot of things if we have more resources but we don't have enough money. Just that we don't have money wish they had more

money we live in amazing town with amazing resource but I wish we had more but we are doing our best with the little we have. The kids love technology and flow with it but not having enough money is frustrating (Jasmine).

Maggie added another dimension to the challenges. Her ideas were related to the complexity the Tap it for example, presents to children who have not yet mastered the devise. This means they have to be monitored all the time to use it otherwise they become frustrated.

> If we are doing pictures it is a lot of prep work which involves a lot of switching and making sure u have the right pictures.   If a child is not at the level where they can comprehend for example, yoghurt comes in different containers, you have to take a picture of a yoghurt container for them to know what yoghurt is. The Tap it is a bit challenging for some children and some of the children need frequent scaffolding to give them the best education that they can have so that's pretty tough (Maggie)

Apart from these challenges the teachers also spoke about the diversity among the children which poses some difficulties that appears to have no end.

> The diversity of students that I get are multiple… gaps between the kids, you go from a kid who is nonverbal and can't attend to a task for 5 minutes to a kid that is learning their letters. The main struggle with the resources that I have how do I provide an appropriate education for those students with higher needs without taking away from the learning from the other child that is probably the biggest challenge… it feels like a tight rope act but it is coming together and it is getting figured out then another student will be thrown out at us (Maggie).

Apart from technical and pedagogical issues the participants mentioned some cultural challenges.

The challenge here is working together to integrate different languages which the kids speak at home. Working on dual language communication is not easy with children with disabilities. Our goals are for them to learn five new words. We just want them to know those words it can be Arabic, English or sign language that is the only way to differentiate between English language learner and kids who have language disorders. It is a real difficulty for us (Maggie).

The paraprofessionals on the other hand pointed out that:

There are challenges you don't necessarily think about. We all get tired, but the children even when they are hungry, you would wish they can verbalize that but not all of them. In this setting they need structure, because sometimes it is chaos. Some of the children cannot learn in inclusive classrooms…not all of them can succeed in the regular classroom. The structure leads to more functioning and more progress but this is a big challenge to implement (Paraprofessional 1).

The second paraprofessional reiterated that:

There are challenges that you wouldn't necessarily think about unless you have the experience…but specifically with what you are asking there is absolutely no training…I mean no official training. And you know we do own reading at home so that we can do the best for the children.

The speech therapist on the other hand elaborated on the systemic and technical challenges to face, particularly with the use of high-tech assistive technological devices.

Our challenges are not just the children's behavior in this class. The IT department is one of our biggest problems because they do not want to support apple products and they have a hard time managing the high tech I have been working trying to

have apps on it but it is slow process. I would have like to incorporate it in therapy and I have been waiting for the district to help me purchase apps so that we can use these tools, which is a great frustration for me…sometimes I bring my personal computer or ipad but I think it is not a good idea to give it to the children to use because I have a lot of personal information on it (Speech therapist).

She went on to add another dimension to the problem they face:

The behavior of the children escalates when you use a high-tech assistive technology because every child wants to have it as their personal property and to them it is like for them high-tech is for entertainment purposes. For example, for one girl the mom would like us to try high-tech she just swipe, swipe, swipe because she associates it with play. We locked it and it became non- functional. If we want to do communication then we have to use low tech which is picture schedule (Speech therapist).

The speech therapist thought that the current high-tech assistive technology is not an effective tool for teaching children communication and interactive skills. She claimed that the children only played games on it.

The children only watch videos, play, play and play and not interact with any of us…the voice output of the machine. But with the pictures they engage. We are struggling to get an appropriate device where the children wouldn't just play, play and play so that the parents will be happy that their children are learning something (Speech Therapist)

Apart from the teachers and the speech therapist's comments the paraprofessionals also enumerated many challenges in teaching children with disabilities using assistive technologies.

It is rigorous and tedious work in a sense because we have to be on top of the routine and cards. We have to make sure we are doing it systematically and following through…Using pictures continually to make sure we are covering the learning goals and using it well is big challenge. We have a student that prefers the real pictures as opposed to animated ones so every child is different…how to meet this differential challenges prove difficult sometimes.

The data shared by the participants demonstrate complex challenges to working with children with disabilities using assisting technologies. The next theme identifies some ways the professionals deal with these challenges.

Overcoming challenges.

The participants reported that they are able to deal with every day challenges in the following ways:

> I read a lot about assistive technology and how to incorporate it into teaching. Anytime there is a workshop I try to go 3 or 4 times a year think. I have a great advantage because I am working on my masters right now so I feel like I am up to date I guess… I'm the type who is always learning (Maggie).

Apart from personal commitment to learning which helps her meet the challenges of technology-enhanced teaching and learning, Jasmine benefits from journal articles on assistive technologies that are provided by her school district and workshops that are recommended by the school district.

> School district subscribes to articles different things we want to learn and I feel I am always in the know. Erm… not that the district organizes it but they are always looking for workshops for us to attend. As teachers we are always told our school

district and headquarters put up a lot of workshops and we are recommended to attend the ones they deem fit (Jasmine)

Maggie also reported that her continuous professional learning has contributed to her ability to respond well to the everyday challenges.

> Continuing education though reading research articles has helped a lot. The school district also provides workshop and that kind of thing. I do some online collaborative learning… there is this program that we do throughout the state and just talking with other teachers and making sure what you are doing is current research validated not from 20 years ago and stuff like that (Maggie).

Apart from personal learning the participants recommended that adequate provisions of resources be made to enable them reduce current challenges of shortage of assistive technology devices.

> The answer is always going to be more resources… if I have a big space that is great. More resources, more spaces will be good… the district has been able to give me a couple of things that I want to implement in the curriculum. They get me what I want but I still need more resources (Maggie).

They think that current skill levels do not match the rapid space of innovations in assistive technological devices hence; there is need for further training in assistive technology usage.

> Social emotional delay second step curriculum, that is, the teaching of social emotional skills requires high levels of skills from practitioners. I would like to see more training on assistive technology use for all staff. There is only one person on the staff that knows a little more but I would like to see that having the training for all special education teachers and support staff is implemented so as to which ones

and how to measure if they are a good fit for the kids. There is only one physical

therapist for the district and she is our only IT person. She helps   them to

physically access technology. I think a team approach is good instead of one

person. If the team can be given an in-depth training approach I think it can benefit

all students (Speech therapist).

Further discussions showed that the teachers would like to see that what their students are

learning at school is continued at home. They believe this will help increase children's cognitive

development and reduce some of the challenges encountered as a result of minimal competency

because of the little time spent at the school.

Another way to rein in success is to support children to use assistive technology at

home. As of now some do and some do not. There is a parent who came to say

never again I don't want to do this. Kids have them but parents are saying we don't

want to have them at home. Let's leave them to do it at school. (Jasmine)

For the paraprofessionals, if teachers, therapists and support staff are well organized this

can reduce some of the challenges they often encounter in the classroom when working with

assistive technology.

I think being diligent and organized makes it easier to work with the children. All staff must be

diligent in using the technology and that it is what will make it easier for the children and staff.

You were here last year and you can attest this is more organized than previously so we have

fewer problems. If there is a way we can do better, it by being organized (Jasmine).

The next chapter provides a discussion of the results in light of the research questions.

The study was conducted to examine teachers' use of assistive technology to support and

enhance teaching and learning, and development of children with disabilities in a self-contained

special education preschool classroom. It explored the types of assistive technologies the teachers use and how paraprofessionals and therapists work with the classroom teachers to support the children's education. The overarching question that this study aimed to address was: What are the preschool staff's experiences in using assistive technology with young children with disabilities? Data from both the interviews and observations provided answers to this question. The results suggested that the preschool teachers, paraprofessionals and the speech therapist perceived assistive technology to be an effective tool for teaching and supporting children with disabilities to learn and develop appropriate skills. Results indicated that the participants preferred to use low-tech AT such as picture exchange communication system because they felt this helped the children worked collaboratively with their peers and teachers than when they used high-tech devices such as iPad and Tap it, which tended to isolate children in a sense even though there are benefits.

CHAPTER FIVE: DISCUSSION

When picture exchange communication systems (PECs),low tech assistive technologies were used, participants indicated it was effective for supporting communication and helping the children express their needs without unnecessary adult intervention. Communication and language is identified as a "highly personal and social process amongst human beings" (Vygotsky, 1978, p.126). Thus, the use of assistive technology, serves as a mediator in facilitating overall development of an individual, it enabled the children to use different forms, verbal, gestural and symbolic of language to communicate (Vygotsky, 1978). As children with disabilities use PECs to communicate ideas, needs and expectations, the different forms and uses of language as cultural tools come to life and enabled the children to think and share ideas that may not be possible without these meditating tools. Communication is important as it enables children to problem solve with members of their communities (Bodrova & Leong, 2007). In this way, using AT such as a PECs serves the function of communication, making children more effective problem solvers (Gray & McBlain, 2012).

The participants' strong beliefs in AT and passion for teaching students with disabilities, particularly those diagnosed with autism encouraged assistive technology use. The consistency of participants' reports of needing more training, experience and knowledge in assistive technology to fully use it, suggest some implications for quality in-service and pre-service preparation such as providing additional experiences on the use of AT. Overall, results indicated that the participants were satisfied with how low-tech AT was integrated throughout their programs to support children with non-verbal abilities communicate their needs, as well as interacted with their peers and teachers. The participants generally believed that AT instruction was important and that although they were not adequately prepared except the speech therapist,

they often engaged in self-professional learning through online courses and reading of academic journals to keep up with current AT devices.

Results further indicated that AT was used mainly as (1) a flexible teaching and learning tool for enhancing social competency development such as turn taking, communicating and expressing emotions and needs; and (2) a tool for engagement and collaboration in literacy, numeracy and science learning. Teachers' interviews and classroom observations showed that the participants used AT in varied ways and frequently in their teaching practices. Their uses of assistive technology ranged from extensive use of low-tech to minimal use of high-tech in different aspects of teaching and learning, to support children with disabilities because of insufficient resources and technical glitches that occurred in the classroom when they needed the high-tech devices. The ease of communication and flexibility of instructions facilitated by the use of assistive technology was found to be amongst the most valued capabilities of AT reported by the participants. The participants reported satisfying moments with the low-tech devices (PECs) because it enabled them to use and present a variety of learning materials at convenient times which encouraged collaborative learning among the children. Several areas that impacted AT use emerged from the results and will be elaborated in more detail including (a) Classroom climate; (b) collaboration with stakeholders; (c) and participants' perception of facilitators and barriers. In addition, major applications, limitations and recommendations are presented.

Classroom climate

The findings indicated that the teacher, paraprofessionals and the speech therapist used a wide range of AT in the preschool classroom Tap It, PECs, iPad and Dynavox in interactive ways. The overall classroom climate showed that the professionals work well with the children with disabilities although sometimes their emotions showed frustration and tiredness because of

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the numerous demands from the children that they have to meet. Although the teachers and paraprofessionals indicated they had some training in AT use, it appears that there is need for new knowledge to keep pace with the rapid changes in AT. The overall teaching climate showed that the teachers, paraprofessionals use PECs more than the high-tech AT. Their use of high-tech devices was hampered by their inability to download resources onto the devices. This means that children often missed the use of AT in the classroom although it is a legal mandate for every child who qualifies for AT services to have those available for use in the classroom (NYAEC, 2009). Generally, the preschool teachers acted as powerful resources in the implementation of effective early intervention, where AT was often deployed in the classroom (Mistrett, 2001). Although there were times they were handicapped because of lack of technical knowhow, they used low-tech devices such as PECs to keep the class running. This suggests implications regarding teacher preparation for AT (NYAEC, 2009).

Teachers' and paraprofessionals beliefs about assistive technology played a role in their classroom practice. For example, participant teachers and paraprofessionals who perceived themselves as facilitators were found to use AT tools (e.g. dynavox, ipad, Tap it and PECs) to encourage children to engage in relevant tasks. They also spent more time documenting children's learning progress and challenges which they discussed at meetings when the children had gone home. These mediated learning approaches (Vygotsky, 2004) enabled the children with disabilities to control impulse, to successfully take turns, negotiate, or bargain to resolve conflicts in the classroom. Some children who appeared to have acquired a few beginning social skills but not have the confidence in their mastery of these skills to use them successfully, were scaffold by the teachers, therapist and paraprofessionals. This does not mean all the children attained required competencies; some children were still dependent on teachers as evidenced by

their frequent requests to teachers and paraprofessionals for assistance which resulted in interruptions to their interactions with peers. This usually happened with children who have language difficulties.

Generally, the majority of children were very task-oriented, that is, they remained on task for the duration of the lesson when the AT they were using met their learning needs. This was attributed to the teacher's choice and use of appropriate AT and different teaching methods that demonstrate, model and scaffold activities (Holtan &Thomas, 2001). The most important finding regarding the teaching and learning climate in the classroom is that the process the teachers and paraprofessionals engaged in mirrors Vygotsky's notion of social interaction which led to knowledge acquisition. This theory provides further illumination of the findings. The first documented evidence is how the teachers often scaffold the children into different Zones of Proximal Development (ZPD). For example, in the everyday uses of AT in the classroom, children demonstrated small incremental gains in their behavior when supported by teachers, when they engage with assistive technology in play. Vygotsky (1978) asserted that play creates a ZPD for various areas of children's cognitive development. For instance, in play the children used PECs to make several hypothetical as well as authentic requests above their average age and beyond their disability labels (Vygotsky, 1978). In fact, it was the cognitive processes generated through engagement with the AT that lead these children into different ZPDs. In effect, the emergence of new ZPDs led to more sophisticated use of AT in further imaginary situation and roles (Bedrova & Leong, 2007; Gray & Macblain, 2012). This indicates that the way the teachers and paraprofessionals used play as a process of teaching and learning with AT is a beneficial experience for children with disabilities, as they were able to act at a more advanced level than they previously could without AT.

Another key finding regarding the classroom climate is how the teachers, paraprofessionals and the children worked together as a community; the exception being the speech therapist, who often pulled out children. This community of learning is consistent with Vygotsky's ideas that children's development takes place in social and cultural contexts through social interaction (Fleer, 2010).

The implication is that a collaborative approach to the use of AT would allow children with disabilities, particularly those diagnosed with autism to engage actively in their community of learning and enhance their social competency skills. For example, during interviews, the teachers talked about their identity as parents and how much they love children especially those on the spectrum. This passion drives their work with the children. Indeed, teacher happiness and willingness affect children and all their collaborators. If teachers and their support staff are happy this informs their interaction in the classroom and promotes positive learning community. Learning and cognition are cultural and socially mediated experiences (Bodrova & Leong, 2007; Rogoff, 2001; Vygotsky, 1978), requiring that teachers and children work together in an interactive fashion.

In addition, the results showed that there are a number of contextual factors that influenced AT integration in teaching. Teaching culture, personal philosophies and identity were among contextual factors that influenced teachers' options related to the use of AT. The teachers for example identified themselves not only as teachers but as mothers. The mothering identity to a great extent influenced their caring behaviour in the classroom. For example, one of the two teachers during interviews, talked about her identity as a parent and how much she loves children especially those on the autism spectrum. She talked a lot about her own children and that although her children did not have disabilities she finds so much joy in teaching children with

disabilities. Her expressions suggested that teacher happiness and passion for their job affects the overall classroom climate, children and other members of the school's community. Previous researchers found that teacher happiness makes interaction in the classroom cordial between peer to peer and teacher to other stakeholders, and this promotes effective learning (Dawson et al., 2010; Howlin, Magiati, & Charman, 2009). Perceptions of the usefulness of AT in the classroom among the professionals were intensely positive, suggesting that they identified with AT as an effective pedagogical tool.

Some teachers while showing a reasonable use of AT reported that the parents did not show sufficient support for their children to integrate AT further in their everyday uses at home. One paraprofessional and one teacher were found to be more proactive in using different tools of AT compared to the other teacher and the speech therapist who, only preferred to use PECs. This raises the question whether or not there is any agreement on the nature of AT integration into teaching and learning for children with disabilities. However, it can be problematic to make a generalization based on the nature of AT use due to the small number of participants as well as the potential influence of teaching philosophies, identity and previous experiences. Some of the participant teachers seemed to not have had extensive training on AT and the experiences reported in the study were not long enough to make these practitioners masters of their craft (Ashman, 2012b).

The learning climate was also affected by the the reliability of the Tap it AT and time related challenges that were observed as well as reported by the participants to have hindered teachers' and paraprofessionals' use of AT. Teachers need AT to be truly assistive as opposed to creating potential frustrations for the teachers and students. This could be addresses through securing supportive resources and through additional training.

Based on the previous discussion, it can be concluded that teachers, paraprofessionals and the therapist's uses of AT in the preschool class have been driven by multiple factors. I would argue that at one level, there are the factors that directly related to practitioners' own philosophies of teaching children with disabilities and beliefs about the effectiveness of AT in teaching early intervention. On another level, there are factors related to resource issues and working together as a team. These factors play an important role in understanding the strengths and needs of these professionals as they seek to provide services that maximize the developmental progress of their students.

It is important to point out that AT was used by professionals as mediation technologies to support the children's learning and development, to facilitate their higher psychological functions enabling them to make requests and take turns, as tools that facilitate lower and higher mental functions and social interactions, and to facilitate social interaction among children, teachers, parents and therapists. The effective use of AT required adults and more competent peers to take on different roles. In addition, it was evidenced that AT was critical and needed to be embedded in play experiences to extend children's learning and development.

Collaboration with Stakeholders (Families, Therapists and Para-professionals)

The results generally indicated positive relationships between the paraprofessionals and the teachers but not at the same level with the speech therapist and parents. For parents, time constraint was the main setback for their effective collaboration with the teachers in addition to not reinforcing what children learn at school in their homes. For the speech therapist, it appeared that her lack of effective collaboration was due to an attitude of dominance, where she perceived herself as an expert and the teachers and paraprofessionals as non-experts. With this attitude, she gave orders rather than work with others to improve practice. Researchers argue that effective

learning for children happens during intense interactions, to listen and reply to one another's ideas, extend and develop their own understanding (Bodrova & Leong, 2007; Smidt, 2009; Tudge & Winterhoff, 1993; Rieber, 2004).

This is counter-productive to the use AT with children to enhance their learning. According to Vygotsky (2004) constructivist pedagogy requires collaboration and cooperation among learners as well as professionals. Positive collaboration among different professionals and parents provides opportunity for children to engage in co-operative learning to enhance their social and cognitive skills development (Pearce, 2009). Children often model their behavior on adults around them; hence, when professionals collaborate effectively and with parents they model appropriate behaviour for social learning activities for typically developing children to support one another (Ashman, 2012b). Effective collaboration is therefore important to minimize professional, family and child isolation and promote professional and peer assistance (Loreman, Deppeler & Harvey, 2010; Mahat, 2008; Pearce, 2009). According to Pugach and Johnson (2002)….in collaborative working environments, teachers have the potential to create the collective capacity for initiating and sustaining ongoing improvement in their professional practice so each student they serve can receive the highest quality of education possible (p. 6).

This means, professional collaboration is critical to improving professional practice in using AT to support children's learning (Brownell, Adams, Sindelar, Waldron & Vanhover, 2006).

Facilitators and Barriers to AT use participants' Perspectives

Facilitators. The participants reported several facilitators including monitoring children's progress and gathering personal data on a daily basis to inform planning and development of teaching goals. Keen observation and documentation served as facilitators of successful use of

AT. Documentation for example, enabled all the practitioners to monitor children's progress in the context where learning occurred. The teachers, therapist and paraprofessionals claimed that they documented every aspect of children's learning when they interacted with the AT. According to previous researchers, writing down details of how children with disabilities interact with AT, can enable practitioners to find out about how children are making meaning and how they come to understand what is going on around them (Bath, 2012: Dahlberg, Moss & Pence, 2006). In fact, documentation of children's work in a wide variety of settings as described by the participants provided compelling evidence of the intellectual capability and competence of young children with disabilities when supported with AT. Writing down what children are doing and using this to further reflective discussion with teams of practitioners is useful for uncovering the learning process as it highlights children's interests and relationships (Griffiths & Price, 2011).

An important implication of this finding is that data generated from observations, documentation and reflections are useful for continuous planning and possibilities of new options for AT enhanced learning. This is because, planning decisions can be made on the basis of what individual or groups of children have found interesting, stimulating, puzzling, or challenging (Stonehouse, 2004) as they engage with various AT. Another implication is that as teachers document and reflect on children's learning, their own understanding of children's development and insight into their learning with AT devices are deepened (Rinaldi, 2006). They would be placed in a better position to modify teaching strategies, and support each child's progress (Stonehouse & Gonzalez-Mena, 2004). Recording everyday experiences and activities of children as described by the participants, not only provided rich data on which to make informed decisions about appropriate ways to support each child's development and learning, it also

promoted a positive exchange of ideas with other paraprofessionals, therapist and parents (Edwards, Gandini, & Forman, 2012; Rinaldi, 2006).

In this study another factor that facilitated effective experiences in supporting children with disabilities to learn with AT come from collaboration with the paraprofessionals. The paraprofessionals described their collaboration with the teachers as highly positive. This finding reiterated what Griffiths and Price (2011) advocated that effective use of AT depends on the involvement of people from different backgrounds when choosing AT for an individual, and suggested that a collaborative framework is needed to assist decision-making. Collaborative approach to deciding and using AT is important in order to take into account all the factors which play a part in developing and deploying effective technological solutions for children with disabilities in preschool programs.

In cultural historical perspective, knowledge development is a socially mediated process which means, collaboration is a key tool that enables knowledge to be shared with other members of a given community (Rogoff, 2003; Smidt, 2009; Wertsch, 1985). Effective collaboration is key to successfully enabling children with disabilities to develop within their zones of proximal development. Each child with disabilities has an actual developmental level, which is what each child can do independently, but effective collaboration can help them perform functions that have not yet matured, but are in the process of developing (Vygotsky, 1978). The role of preschool teachers, therapists and paraprofessionals in early intervention are paramount to this process, hence the need for effective collaboration. It is argued that children with disabilities who receive effective support through the use of appropriate AT can move from ZPD to actual development. In other words, what a child with disability can do with the

assistance of therapists or teachers now will become what they can do in future without assistance (Vygotsky, 1978; Kravtsova, 2008).

Raskind (1994) pointed out that for AT to be effective it must be chosen relative to the individual child's needs and the context of learning. This means, there needs to be an understanding of the ecology of the learning environment, for example, specific needs of the user, the problem that needs to be overcome, and how the technology works. This is where teachers' knowledge in the use of the technology is crucially important.

Barriers. In spite of the facilitators, the findings revealed some barriers to effective use of AT in the case study classrooms. Some of the barriers mentioned included planning, time and money. The preschool teachers spoke at length about how they and support staff often spend considerable time developing teaching goals and activities to match up with the resources they have. In addition, they spent considerable time writing grant applications to acquire technology for use in the classroom. There were sentiments of frustration about how some children couldn't access technology because the devices were obsolete and limited to a few of the children. The limited number of the Tap it AT resource meant that only two people could use it at a time. It is argued that lack of appropriate resources for supporting all children, particularly those with disabilities can lead to inequality in a school and education (Allen & Cowdery, 2012; Carrington & Macarthur, 2012). Researchers argue that for children to learn effectively, there should be adequate resources for children to play with enabling them to take active role in their learning because by playing with resources, which serve as tools; children are able to take on roles and exploration of real life scenarios (Vygotsky, 2004). Vygotsky's cultural historical theory indicated that effective learning occurs when children interact with tools in their socio-cultural community. This means, limited resources often deny children of the opportunity to play for

learning in meaningful and authentic ways (Fleer, 2011) and express their inner thoughts and feelings (Dahlberg & Moss, 2005 (Vygotsky, 2004).

The participants in this research however expressed optimism that one day all children would have a form of technology appropriate to their needs for use in learning to reduce inequality induced by lack of adequate resources.

Concern was also expressed about the limited IT knowledge among staff in using some of the complicated resources or downloading resources on to the Ipad and other devices. This appeared to challenge the smooth running of the teaching programs especially when the IT person was busy solving problems with other teachers. Research indicated that professional knowledge informs how pedagogy is delivered (Purdue, Gordon-Burns, Gunn, Madden & Surtees 2009; Yeo, Neihart, Tang, Chong & Huan, 2011). Therefore, teachers who teach young children need to be knowledgeable in the tools they use in teaching (Fleer, Hedegaard, & Tudge, 2009) because teachers, their paraprofessionals and therapists cannot do more in teaching children with disabilities than what they know, and this calls for continuous professional development in AT pedagogy as well as technical knowledge (Fullan, 2003; Herrington et al., 2010; Kukulska-Hulme, 2012; Rhodes, Nevill, & Allan, 2004).

Implications, Limitations and Recommendations

The purpose of this study was to gain a deeper understanding of teachers, paraprofessionals and speech therapists' practical experiences in using AT to teaching young children with disabilities in a self-contained special education classroom learn skills. Indeed, my own story as a woman of color from a country where children with disabilities are not given the needed recognition and support has driven me to find out how children with varying degrees of disabilities in an a technologically advanced society like the US, are being supported with AT to

learn and to their fullest potential. Knowing the stories that form part of how AT influences the lives of children with disabilities is important for my own career development as well as disseminating the results to develop more expertise in enhancing the development and education of all children with disabilities. I started my career as a preschool teacher and later developed interest in children with disabilities and early intervention. I soon had been attracted by the increasing presence and discussions about AT in supporting the development and learning of children with disabilities when I moved to the United States to do my doctoral study. This influence of AT on my career trajectory is a result of the wider developments and use of assistive technological devices in early intervention in our current globalized world.

Summary of Key Findings

This study has been driven by one main question and three sub questions aimed at understanding AT use in a preschool early intervention classroom in the Pacific Northwest, USA. The study participants included two preschool teachers, two paraprofessionals and one speech therapist. The study aimed at giving a snapshot on how AT is used to support children's learning and development with the intention of building on and extending the understanding of teaching practices in AT environments in the context of early intervention within preschool contexts. It tried to extend such understanding through 1) observing teaching practices in the particular context of preschool class that enrolled children with a range of disabilities; and 2) interviewing teachers and support staff about their work in relation to the use of assistive technology and theorizing their work through Vygotsky's cultural historical perspective.

The findings suggested that in spite of the lack of resources to meet each child's needs and the breakdown of the main computer frame because its obsolete nature, the teachers' experiences were generally positive. It was noted by all the participants that they like the Tap it

and iPad because of their interactive nature; yet, they felt that those same high-tech devices sometimes isolated children. One important finding reported by the participants was their overwhelming quest for knowledge, by studying on their own to meet the everyday challenges. It is also surprising to note that although the professionals have difficulty collaborating with some parents this does not gravely affect their experiences and use of assistive technology with the children. The participants in this research can be deemed to have demonstrated a strong philosophy and identity as teachers who love teaching children with disabilities. Their passion is motherhood as well as professionals who want to make a difference in the children's lives. Finally, this study found that the teachers do not approve of all children with disabilities being sent to inclusive schools for fear that some would not make progress there. The practitioners' revelation that they lack IT technical knowledge is a needed area to address in addition to resource issues.

The findings of this study have demonstrated that the use of assistive technology enables children with disabilities to shift from dependence on others to become competent individuals (Minick, 2005). A child's transition to independence and social competence brings into focus the concept of higher mental functions. It is reiterated by Vygotsky's theorization that psychological tools combine with physical tools to help the individual develop beyond lower/elementary/primitive (Vygotsky, 4.83) to higher mental functions (Davydov, 1982; Gray & McBlain; Smidt, 2009); thus, AT integrated into a well-balanced program is indeed, timely. From this perspective it can be argued that AT served as mediation tools in helping children think logically, engaged in mediated perception and deliberate learning (Kozulin, 1998; Wertsch, 1985). In this way, it is important that teachers acquire expert knowledge in AT use so that they can fully lead children into higher mental functions as this state of knowledge development is

stimulated by factors, including language, tools, signs and symbols (Daniels, 2005; Smidt, 2009; Kravtsov & Kravtsova, 2009; Wertsch, 1985). By using AT effectively, teachers can help serve children's needs adequately. As children reach higher mental functions their actions will move from involuntary to purposeful and deliberate (Vygotsky, 1997) that would benefit the children and society at large. Higher psychological functions through the use of AT can enable individual children with disabilities to master their own natural behavioural and psychological process (Kozulin, 1998). Therefore, it is imperative that AT is integrated into children's learning in a carefully planned manner, and must take place in social interaction (Rogoff, 2003) because children are able to attain higher mental functions through mediated and socially cooperative experiences (Gray & Macblain, 2012; Smidt, 2009; Vygotsky, 1978; 1997).

Limitations of Study

This study adopted a qualitative case study approach, involving the use of observation and semi-structured interview as the methods of data collection. It involved a preliminary descriptive examination of the perceptions and experiences of participants in the use of AT

There have long been discussions and debate regarding the case study approach and its reliability and application for research in education. The research literature pointed to some traditional prejudices that have been directed against the case study method; for example, it does not follow any systematic procedures which may lead to possible biases during data collection and interpretation (Creswell, 2012). Others have argued that the research findings may be influenced by equivocal evidence and tend to draw definite cause-effect conclusions (Creswell, 2008; Yin, 2003). Case studies have also been critiqued for lacking scientific rigor and limited in scope as such, they cannot be generalizable in terms of small sample sizes. Yet, case studies can be generalized to propositions of theory and not to a population as in quantitative research

(Creswell, 2012). However, this study has used the cultural historical theory to justify some propositions. It also showed how data was handled in a systematic manner.

The first limitation is related to the generalizability of the study. Since the participants were limited to one intervention preschool classroom, the results are only limited to the setting where this study was conducted. The second limitation is that parents were not involved in this study. Interviewing parents would have added another rich dimension to explore their perspectives of how AT has been useful for their children's education. Despite these limitations, the study gave a snapshot of the usefulness of AT in early intervention and pointed to some professional needs of teachers to better enhance AT use with children with disabilities.

As this study covered only a small preschool intervention class, it is recommended that future research consider a larger group of teachers and children. In addition, future research could look at parents' perspectives regarding AT use in both school and home settings. A large scale study could also be conducted using a mixed method approach to evaluate current practices of AT across various early intervention settings exploring inclusive classrooms and birth-to-three programs. Such studies are critical for informing improvements to practices, pre-service and in-service training, and for making policy decisions.

Recommendations

First, based on the findings of this research, it is recommended that the most appropriate approach to using AT should be based on the specific context of use, and the needs of the children involved. It is important to have adequate devices which are designed for as many child users as possible to enable them interact with peers and adults, and learn social skills. The most important is to have options for customization to support children with particular needs (Keates, 2002).

Second, as it was found that children with disabilities have multiple needs to be met to enable them experience inclusive school, choice and use of AT should be informed by its potential to enable the capabilities of children to move from lower to higher order functional cognitive abilities (Vygotsky, 1976). To this end, the design and use of AT should be informed by the principles of Universal Design for Learning. According to technology researchers (Maor et al., 2011; Alper & Raharinirina, 2006), universal design approach is the act of developing technologies which are suitable for all users in a long process.

Assistive technology is therefore vital to provide support and to help children with disabilities build understanding of their learning environment which is needed in order to discover the world around them. This is in line with Abbott's (2007), proposition that AT use should enable training or rehearsing, assist learning, and enable learning. Therefore, the ultimate goal in the provision and use of AT may be to compensate for a disability in order to move towards equality with other learners (Edyburn, 2006; Phillips & Zhao, 1993) and lead to learning gains (Higgins & Raskind, 2005).

This study found that the teachers and paraprofessionals have limited knowledge on the use of AT devices and often rely on the IT person most of the time. It is therefore, recommended that targeted professional learning on AT be provided to all professionals working with children with disabilities. Training should focus on building the professionals' capacity to understand the type of approaches that is likely to be effective for compensatory activities including detailed knowledge of the needs and abilities of users with a particular disability. All teachers, paraprofessionals and therapists should be trained both at the pre-service and in-service levels to understand, not just think about the functional aspects of AT, but also have deeper understanding of the social implications of using particular AT (Shinohara & Wobbrock, 2011).

It should be recognized that working with children with disabilities in early intervention requires that teachers and children take on different positions in interaction. Kravtsova (2008) pointed out that professionals and children can take on different positions as 'independent', 'equal', 'under', 'up' and 'primodal we'. Teachers and children can take independent positions if children with disabilities can do some things without or with minimal assistance from others. But in cases where tasks set for children are too difficult to operationalize, then the learner and adult or a more competent peer can take the *equal* position within the ZPD where children with disabilities are provided with some examples and motivated to repeat the adults or the more competent peer's words till they succeed in the task. If this fails, they can move to the '*under*' position in the ZPD where the children are asked series of questions to prompt their thinking. Again, should the learner fail the task performance, the teachers would move to the *up* position in the ZPD, where the learner is shown how the task is performed. Kravtsova (2008), indicated that teachers can move to the 'primodial we' level in the ZPD if the first –four stages do not work which is working together as equals in dialogic encounter. This is where teachers, paraprofessionals and therapist become a part of the children's thinking through shared interaction (Bodrova & Leong, 2007; Santrock, 2007).

Another important recommendation to consider when thinking of the needs of children with disabilities is the level of access to and provision of AT that they have available to them. As AT is rapidly emerging and changing, it would be useful to move from obsolete devices to current devices to avoid a situation of underserving children with disabilities in the realm of AT (Hoppestad, 2007). Critical attention should be paid to not only the needs of children with disabilities but to also consider what the children are able to do, enabling the children, and what would make the experience more enjoyable (Frauenberger et al., 2012).

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A plethora of well-known researchers and practitioners in the AT field (e.g., Bausch & Hasselbring, 2004; Edyburn, 2004; Judge & Simms, 2009; Parette, Peterson-Karlan, & Wojcik, 2005; Parette, Peterson-Karlan, Smith, Gray, & Silver-Pacuilla, 2006; Silver-Pacuilla, 2006) have recommended integrating AT into teacher education programs. The Individuals with Disabilities Education Act (IDEA, 1997) and its amendments [Individuals with Disabilities Education Improvement Act (IDEIA, 2004)] require that all educational teams serving students with Individualized Educational Programs (IEPs) consider various ATs and identify services to support their implementation [20 U.S.C. 1401 § 614(B)(v)]. This means that teacher preparation to support the use AT is critically important to avoid children being left behind. Faculty who train teachers need to understand the ways current generations acquire information. This would assist them to training competent teachers for AT use with children with disabilities. Teachers who are knowledgeable in assistive technology use are those who are able to embed AT in their instructions in ways that support children' collaboration, build their knowledge and give them more options and autonomy over their learning (Bonk, Lee, Kim, & Lin, 2010).Teacher education courses and in-service providers must design courses where teacher trainees learn collaborative skills which they can later translate into their teaching when working with young children with disabilities.

The results of this study revealed that the teachers found it difficult sometimes to collaborate and work with parents. This also was the case between the speech therapist and the teachers. There is need to bridge professional boundaries especially the notion of expert and non-expert sentiments expressed by the speech therapist. Comments made by the speech therapist indicated that she dictates to the teachers what to do instead of working collaboratively with them. It is argued that no single professional is able to understand all the needs of children and

how to fully support those needs (Judge & Simms, 2009; Parette, Peterson-Karlan, & Wojcik, 2005). Therefore, there is urgent need for inter-professional learning to help teachers and therapists break down professional barriers. Inter-professional learning is about different professionals learning from, with and about each other's work and needs. In the same way professionals can learn with, about and from parents to avoid blaming each other. Positive relationship between professionals and parents is important for their engagement and participation in early intervention work.

Conclusion

Historically, research related to the use of AT for children with a disabilities neglected to involve the true voice of the teachers and their support staff who utilise these resources to support the children.Using interview and observation as a method of data collection in this study served as a powerful tool in my view. It helped me gain unique understanding into the teacher's and the support staff's world, listening to them when they told their stories as well as having observed their enacted practices. To me the voices represent emotions and passion that these professionals pour out. I remember very well how one teacher broke down in tears when she talked passionately about how she loved the children and her job. This, I find very powerful and that speaks a lot to trustworthiness for me especially coming from a place where adults would not break down in front of children and for someone to shed tears means, they are very emotional about what they are saying. This happened when I asked the question: What do all these mean to you?

The field of AT is changing with fast and frequent innovations. This means, teachers, training institutions and children who use these devices have to keep pace with the rapidly evolving latest AT which continuous learning can provide. AT integration can lead to teaching

innovation and learning transformation for children with disabilities. Integrating assistive technology in young children with disabilities' learning is in no way an easy pedagogical task and needs more sophisticated understanding of how and why AT is used in different activities and settings (Bonk et al., 2010).

As it has been found in this study the paraprofessionals and teachers are not well trained in high-tech AT, there is need for tailored and timely professional development for teachers and paraprofessionals. Professional development should also be extended to university or college staff who train teachers for schools in pedagogically-informed use of AT. Herrington et al. (2010) argued strongly that teachers are "unlikely to perceive the opportunities for pedagogical innovation without substantial development support" (p. 12).

Teachers and paraprofessionals need technical, conceptual and pedagogical knowledge regarding the use of AT in teaching and learning support for young children with disabilities. When professionals gain substantial understanding of the use of assistive technology their pedagogical beliefs and attitudes toward the use of AT will be positive and their practices enhanced. The integration of assistive technology for young children with disabilities should not be seen as solving problems alone but as a tool for teachers' own pedagogical knowledge improvement (Kukulska-Hulme, 2012).

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APPENDIX

A. Observational Protocol

Date:

Time:

Duration:

Context:

Observation	Descriptive Notes	Reflective Notes
Frequency of AT use		
Types of AT being used		
Collaboration among Professionals		
Class interactions		
Available resources		
Wellbeing		
Other questions not covered		

B. Interview Protocol

Teacher Interviews

1. Tell me about yourself

2. How long have you been teaching for, and what is your qualification?

3. What is your teaching philosophy of AT use?

4. What kinds of at do you use and why?

5. How do you use AT to support children with disabilities?

6. How would you determine if the AT is making contribution to the child' learning and development or not?

7. What are some challenges you face regarding the use of AT?

8. What are your successes in using AT when facilitating learning for children with disabilities?

9. How do you ensure your teaching skills and early intervention practices are up to date?

10. What issues arise for you as a teacher when using AT?

11. Describe how you measure children's progress

12. Which areas of disability do you find most interesting to work with and why?

13. Is there anything else you would like to add?

Stakeholder Interviews

1. Tell me about yourself.

2. How are you involved in the children's education?

3. What is your view on the use of AT for children with disability?

4. How would describe your relationship with the preschool teacher?

5. What AT have you used with the children

6. What are the issues for you as far as the use of AT in the classroom is concerned?

7. How do you know if children are making developmental or learning progress?

8. Do children use AT when they are home?

9. Professional development?

10. Is there anything you would like to add?