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## Saudi Special Education Teachers' Perspectives on the Use of iPads to Enhance Communication Skills for Students with Autism

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Saudi Special Education Teachers' Perspectives on the Use of iPads  
to Enhance Communication Skills for Students with Autism

by

Adil Alghamdi

A dissertation submitted in partial fulfillment  
of the requirements for the degree of  
Doctor of Philosophy in Curriculum and Instruction  
with a Concentration in Special Education  
Department of Teaching and Learning  
College of Education  
University of South Florida

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## **Dedication**

This dissertation and the years of work behind it are dedicated to my parents, Abdullah Alghamdi and Hamsa Alghamdi, who hoped to see me graduate and have a doctorate degree, but passed away before that happened. Their unconditional love has sustained me through my life. They were incredible role models and taught me to work hard for the career and progress I aspired to achieve. To my lovely wife, Rana Alghamdi for her love, sacrifice, support, and encouragement. Her constant source of encouragement and support enabled me to overcome the key challenges of graduate school and life. I am truly thankful for having her in my life. To my children, Faris, Faisal, Sarah, and Reem, for being patient and understanding during my studies, and me being away from home as I pursued my doctorate. To my homeland, the Kingdom of Saudi Arabia, for allowing me to study abroad. The support I received in terms of financial, moral, and motivation, was been key the successful completion of this journey. I will be forever indebted to the continued support the Kingdom of Saudi Arabia has offered me and making my dreams of obtaining a doctorate a reality. To the United States for accepting and providing me with a memorable academic experience as an honored guest. When I return home, I have important personal and educational experiences that I will hold in my heart for the remainder of my life.

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## **Abstract**

Students with Autism often struggle with attention, focus, and communication that may negatively impact their learning. To overcome these challenges, researchers have noted that using digital technology devices such as iPads in the classroom might enhance teaching and learning for students with Autism. However, digital technology use in the classroom in the Kingdom of Saudi Arabia is still at its nascent stages and there is a paucity of existing studies that have examined how special education teachers perceive iPad usage to deliver instruction to students with Autism. The aim of this study was to explore Saudi teachers' perspectives concerning the use of iPads. A qualitative research method was used to investigate two research questions. Semi-structured interview questions were used to collect relevant data. Findings revealed that Saudi special education teachers express positive perceptions towards the use of iPads including the belief that iPad use improves communication skills, improves socialization, and facilitates interpersonal relations. Findings also revealed perceived barriers to implementing the use of iPads in the classrooms including insufficient knowledge on how to operate an iPad, insufficient funding and lack of teacher motivation, opposition from families of students who have Autism, lack of national education standards on the use of digital technology, inadequate professional development, and lack of educational applications in Arabic for iPads. Detailed findings from this study and aspects related to the teachers' individual and group perspectives are discussed in this paper, as well as implications and recommendations for future research.

## **Chapter 1: Introduction**

Autism spectrum disorder (ASD) is described as a composite neurological pathology marked by deficits in the development of skills for general behavior, communication, and social functioning (Hetzroni & Tannous, 2004). The principal effect of ASD on a child's development according to prevalent diagnostic criteria is centered on reduced social capability, difficulty with communication, and an inability to recognize and display emotions that meet with socially accepted norms of conduct (American Psychiatric Association, 2013). Too, children with ASD are likely to demonstrate behavior that is stereotypic and repetitive (American Psychiatric Association, 2013). Appearances of these behaviors associated with ASD noticeably vary among individual children, and within any one child, vary across age and developmental continuums. In order to learn and develop crucial skills and abilities, including social, communicative, adaptive, and cognitive, children experiencing ASD may benefit from explicit, direct instruction as a teaching and learning approach. Children with ASD generally experience difficulty in generalization, and may markedly struggle with transferring newly learned skills to other situations, locations, and/or individuals (National Research Council, 2001).

Moreover, some features of ASD have been seen to generate challenges in the context of schooling. Many children with ASD have been evidenced to struggle with attention and focus, which may be in part attributed to the regular changes, distractions, and daily interactions that take place in a majority of academic environments (Travers et al., 2011). This struggle can result

in disruptive behaviors when children try to evade or escape the demands of academia (Machalicek et al., 2007). Antisocial, self-destructive, and property-destructive behaviors such as physical aggression, tantrums, self-injury, and destruction of items, are disruptive to environments of learning and pose major barriers to educational development (Horner et al., 2002). Research suggests that children with ASD are likely to face academic challenges in math, reading, writing, and language (Silliman & Berninger, 2011). They are also likely to struggle with independent functioning (Hartnedy et al., 2005), which is essential for efficacious independent living (Hume et al., 2009).

Hetzroni and Tannous (2004) and Wetherby and Prizant (2000) found that children with Autism face major challenges every day. Among those major challenges is impaired communication. This impairment is often marked by delayed language development, speech repetition, language idiosyncrasies, and pronounced inability to start or continue meaningful dialogue (Tamm, 2014). These characteristics are seen as foundational disrupters to the development of language pragmatics, and use of functional communication (Adams et al., 2012; Hetzroni & Tannous, 2004). Many children with Autism therefore, experience problems in understanding concepts and assumptions, communicating that which they intend to communicate, and in developing representative thought processes (Silliman & Berninger, 2011).

These concomitant difficulties are consistent with several models, both in theory and in practice, as related to intervention pedagogy. One theoretical model that attempts to explain these difficulties, is Theory of Mind (ToM), as established by Baron-Cohen's seminal work (1988) and expounded upon by Li & Ye (2014), and Livingston and Colvert (2019). ToM is associated with a child's inability to understand, in an intuitive and automatic nature, things of the mind such as what others may be thinking, or what a person him or herself is thinking

(McCauley et al., 2019). The tenets of ToM include a child having concomitant difficulties involving comprehension, organization, and functional use of language. These difficulties can be seen in children with Autism whose speech is irrelevant to the topic at hand, and who experience both delayed and immediate echolalia (Hetzroni & Tannous, 2004). Theory of Mind is based on the notion that an individual with ASD may have an inability to understand the thoughts, feelings, and attitudes of others (Korkmaz, 2011). This theory has gained some significance in that it appears to reflect how a considerable number of students with Autism present to teachers and their peers. Kidd (2008) posits that ToM can adversely affect learning in the classroom, structural components of language, social interactions in the classroom, understanding deception, and impaired imagination.

Similarly, Frith (1989) developed a theory called Weak Central Coherence (WCC), also referred to in the literature as central coherence (CC). In his seminal work, Frith describes central coherence as the ability to understand context or to, “see the big picture.” (Tincani & Bondy, 2015). Frith believes that people with Autism usually think about objects in their smallest constituent parts, and understand details better than those without an ASD label. Roth (2010) indicates that detailed processing is an essential dogma of WCC, and evidence of central coherence issues in some individuals with Autism. WCC suggests that children with Autism may pervasively fail to put information together in order to see the, “big picture.” In other words, attention is on the smallest of details, in contrast to what may be deemed a typical perspective of attention in terms of the automatic recognition of overall context, meaning, and the big picture (Vermeulen, 2015).

Both ToM and WCC make reference to language and communication disruptions as a hallmark of ASD. Echolalia is described as sentence repetition, or repetition of a part of a

sentence (Sterponi & Shankey, 2014). A child with Autism may repeat a sentence instantly upon hearing it, or delay such repetition (Hetzroni & Tannous, 2004; Neely et al., 2016). Children with immediate and delayed echolalia usually speak using one-or-two-word utterances, while repeating the last word in the sentence spoken to them. They primarily respond to tangible reinforcements, including food and balloons and loud speech, but they do not typically make or retain eye-contact, and may point to items when asking for something, rather than making vocalizations (Sterponi & Shankey, 2014). Some children also manifest irrelevant speech (Hetzroni & Tannous, 2004). Researchers such as Gernsbacher et al. (2016) discuss echolalia as an aspect of typical language development, while other researchers (Oakley et al., 2011) discuss it as pathological and disruptive to the typical sequence of development of cognitive linguistics.

In early research regarding language development and disorders of development, Bloom & Lahey identified problematic language development among children with Autism as a pathology in either formation, usage, or content, or as an interface between them (1978). The researchers argued that in order for children to develop the ability to use language, it was necessary for them to comprehend the code of language, and acquire knowledge about environmental objects and events that enable them to participate in language usage as both speaker and listener (Iverson, 2010). By 1983, Prizant suggested that echolalia in fact obstructs the ability to acquire language functions and structure among children with Autism.

During what is considered to be the typical language development process, children utilize varying methods for acquiring language and communication skills (Bishop et al., 2017). It has been forwarded that if children with Autism are to experience advanced development of language and communication, they must be afforded opportunities for interaction in a learning environment that bears solid and structured instructional language use (Phillips & Beavan, 2012).



This might suggest that children with Autism should be in environments that are suitable for enhancing language development consistent with their needs (Keay-Bright & Howarth, 2012). During typical development of language, children use various strategies for learning language and communication (Bishop et al., 2017; Hetzroni & Tannous, 2004). Those strategies may need to be augmented for enhancing the development of functional language and communication of children with Autism. Opportunities to interact with language in an environment containing concrete and structured educational uses of language, can provide children with Autism appropriate settings for enhancing the development of language (O'Malley et al., 2014; Hetzroni & Tannous, 2004).

Generalization is one of the varying methods utilized by children with typically developing communication to develop linguistic abilities (Bishop et al., 2017). This ability has been noted to be impaired in children with Autism, particularly when they are required to transfer knowledge (Plaisted, 2015). Alcantara (1994) did some of the first investigations of the use of instruction by video in a structured learning environment, and found that when children with Autism received training, and were allowed to practice in meticulous learning environments, they performed well in natural environments.

In the Alcantara study, children with Autism in an elementary school were trained with the use of video tapes and then allowed to practice making purchases at a community grocery store (Yakubova & Taber-Doughty, 2013). Children in the study received training and practice in a controlled learning environment and were able to generalize and transfer the learning and performances in other settings. The use of video to instruct students with Autism for the successful generalization of communication and academic skills has been replicated and evidenced in Escobedo et al. (2012), and further substantiated by Hopkins et al. (2011). Findings

across content areas have demonstrated that video and computer methods of instruction can be remarkably effective in instructing children with Autism.

Evolving from video tapes, mobile technologies such as tablets have become essential in schools with regards to the educational support of children with Autism. According to Rodríguez et al. (2017), devices like the Apple companies iPad facilitates communication for some students with Autism by offering assistive formats. Likewise, Chambers et al. (2017) corroborate the benefits of using iPads in the instruction of students with Autism due to the capability iPads offer in the addition of applications (i.e., apps) in addressing different learning needs. Findings from a meta-study on the effectiveness of Apple iPads in particular (O'Malley et al., 2014) establishes the use of the iPad as an evidence-based practice in special education. iPads therefore, can be an effective instructional tool to improve various aspects of learning and encourage greater independence in communication for children with Autism.

The aforementioned study indicated that the use of the iPad provides six advantages: (a) a reduction in teacher-support and prompts; (b) easy modification to levels appropriate to the severity of learning disability in each child; (c) reduces passive and active non-compliant behaviors; (d) teachers perceive the iPad as an acceptable and effective instrument for classroom instruction; (e) teachers convey students' progression in learning objectives and goals that those students had not be able to achieve with the use of traditional strategies for instruction, become more achievable; and (f) teachers state the use of iPads improve their teaching skills, as well as increase student-interest in the content of lessons.

O'Malley et al. (2014) also indicated that the iPad has mammoth inferences for education in that it facilitates learning that is portable, mobile, and accessible. As opposed to other tablet devices similar in function but produced by different companies (such as the Samsung Galaxy

Tab), the iPad's specialized attributes give it the ability to be an appropriate instrument for classroom instruction and learning. For example, "its processor speed, storage capacity, mobility, physical size, WiFi connectivity, built in camera, and accessibility features provide opportunities for innovative instructional and learning interventions" (O'Malley et al., 2014, p. 90). Finding ways to use technology is important given we exist in a digital age and students are expected to know how to interact with digital products in daily life and in many forms of employment.

When a student has a developmental delay labeled as Autism, teachers must find additional ways to assist them by providing curricular, instructional, and technological supports (Hart & More, 2013). Blackwell et al. (2014) substantiate that benefits due to technology integration in early childhood include increases in learning, such as the recognition of phonics. The authors concede however, that benefits may come with associated costs, such as student engagement in anti-social behaviors (Blackwell et al., 2014). Thus, teachers are integral in the application of the most appropriate technological approaches for improving the educational progress of young learners with Autism (Shepley et al., 2016).

### **Significance of the Study**

Although researchers such as Hopkins et al. (2011) and Escobedo et al. (2012), have long found that the computer is an effective instructional device for children with Autism across varied instructional contexts, there was still a need to investigate whether Saudi Arabian children with Autism could learn specific language skills within a structured and a controlled environment, and then transfer those skills to a natural setting, with the use of technology. Although technological devices such as iPads carry a multiplicity of available applications (apps) that readily support Universal Design for Learning (UDL), a structure for improved curriculum

inclusivity, (O'Malley et al., 2014) increased emphasis on technologically assisted teaching and learning was still needed in the Kingdom of Saudi Arabia (KSA).

The KSA is populated by more than 28 million people, and ASD prevails by one in every 167 people (Alnemaary et al., 2017). This prevalence rate suggests that more than 167,000 people with Autism live in KSA (Aljarallah et al., 2007; Alnemaary et al., 2017). The number of children with Autism in Saudi Arabia is thought to be rapidly increasing. Al-Zahrani (2013) observed that 3.5 out of every 1,000 children aged 7–12 in the Taif district of Saudi Arabia were diagnosed with Autism. Anecdotal data indicates that many children with ASD may not have been identified in KSA, and there is a paucity of information on school-aged children with ASD in the KSA (Alnemaary et al., 2017).

Although iPads have been used as assistive technology for students with communication disorders (Flores et al., 2012; O'Malley et al., 2014) and vision impairments, (Mukaddes et al., 2007; O'Malley et al., 2014), there was little research available that investigated iPads as instructional tools in special education for children with moderate to severe developmental disabilities, including Autism (O'Malley et al., 2014). In KSA, no research has been done on Saudi teachers' perspectives on the use of iPads with students with Autism. Saudi teachers' perspectives may foster improvement of teacher education programs, and there is a possibility that this study could contribute to the building of more effective assistive technology curriculum, as well as inform professional development initiatives in assistive technology via iPads for children with Autism.

### **Purpose of the Study**

The purpose of this qualitative study was to better understand and explore Saudi teachers' perspectives concerning the use of digital tablets that may assist in the development of

communication, social, language, and overall academic skills of children with Autism. Dunn et al. (2009) articulate that effective research groups delving into the special education referral process should focus carefully on the integration of stakeholders' perspectives. Dunn et al. (2009) further suggests that teachers' perspectives allow teams to deliver high quality instruction in their classrooms on a consistent basis, while providing them with keen insights on making referrals to special education when regular instruction fails to improve students' outcomes.

O'Malley et. al (2014) suggest that interventions using the iPad were found to be practical and efficient for enhancing the knowledge, skills, abilities, and interests of students with ASD. These researchers indicated that findings from their study warranted investigation of integration of the iPad into the teaching and learning process. In O'Malley et al.'s (2014) study, teachers reported on the social validity of the intervention. These participant teachers perceived a positive impact on student-independence, engagement, and interest in lesson content. Teachers expressed strong interests in extended use of the iPad as an instructional classroom instrument (Xin & Leonard, 2014). Fuchs and Fuchs (2001) articulated that sustainability of an intervention relies not only upon how efficient and effective the intervention functions in the classroom, but also upon how efficient and effective the intervention is perceived by the teachers who must implement it.

Substantial research exists to corroborate the need for a study that focuses on teacher perspectives about children with Autism. For example, Hart and More (2013) reported that pre-service teachers with limited knowledge of Autism Spectrum Disorder and who were untrained in EBPs, reported they felt unable to deal effectively with students with ASD. Teachers' perspectives form a compelling rationale for the provision of professional development related to working with children with Autism. Specific training for teachers of students with ASD on

various interventions may be required if a teacher is being asked to implement an intervention with a student.

Too, as children with Autism are considered to be under the diagnostic umbrella of global developmental delay, teachers are often asked to spend a great deal of time planning communication lessons to expand language abilities in the classroom (Shepley et al., 2016). In last decade, applications available via digital devices have emerged as evidence-based interventions for students with ASD in language development, communication, and academics (Wang & Spillane, 2009). With the expectations for all teachers to find ways to improve students' abilities to perform in the classroom, regardless of an Autism label, understanding the resources available to do so is important to the task.

### **Research Questions**

It was important to capture and explore Saudi teachers' perspectives on the use of the iPad digital device (tablet), as an instructional tool to develop and enhance the communication skills of students with Autism, as technology and communication are often paired in contemporary educational interventions. Given, a qualitative in-depth interview approach was employed to investigate Saudi teachers' perspectives on the use of iPad to teach children with ASD and to address the following research questions:

1. What are the perspectives of Saudi male special education teachers in Jeddah city, on the use of iPads in their classrooms to teach students with characteristics of Autism?
2. In what ways do Saudi male special education teachers in Jeddah city discuss the use of iPads to enhance communication skills in students with characteristics of Autism?

## **Theoretical Framework**

Developed in 1985 by Fred Davis, the technology acceptance model (TAM) looks closely at perceived ease of technology usefulness as it pertains to external variables and system success indicators (Legris et al., 2003, p. 191). TAM helps users (like teachers) understand their intent for using computers in the classroom. Using the TAM approach has been linked to stronger understanding by teachers of what technology choices exist (Legris et al., 2003). Knowing the scope of what is available has been shown to assist educators who may feel confusion or anxiety over where to start in terms of marrying curriculum and instruction with technology (Legris et al., 2003).

Observing the tenets of TAM, one finds a great deal of flexibility in the model. Teachers are asked to rate perceived usefulness versus perceived ease of use, as a means of filtering teachers' expectations of what influence said technology will have on the measure they are trying to improve (Legris et al., 2003). Perceived usefulness is also a predictor of a user's intention to use the technology again in the future (Marangunić & Granić, 2015). Moreover, usefulness coupled with enjoyment, fully mediates effects, "on the use intentions of perceived output quality and perceived ease of use" (Legris et al., 2003, p. 200). Further, TAM can be used to consider technology options without much advance readiness, making it accessible to both experienced and novice users.

The goal of most TAM users is to apply the framework to situations where there is a pressing need. Even though we live in a digital age where technology applications grow and flourish, most classrooms evidence computer usage that is minimal and peripheral (Teo et al., 2007). Educators in today's classrooms continue to look for ways to integrate technology in effective manners. According to Teo et al. (2007), the successful integration of technology in any

classroom depends solely on the support and attitudes of the teachers. TAM not only uses perceived usefulness and perceived ease of use rating scales, it also employs the Theory of Reasoned Action (TRA) to explain choices. TRA posits that the attitude towards a behavior is constituted in part due to beliefs about the consequences of the behavior, along with affective evaluation of those consequences (Teo et al., 2007). In this way, TAM sheds some light on the attitudes and behaviors of users who are familiarizing themselves with new technology applications.

The technology acceptance model is a theoretical framework based on the notion that, “technology acceptance can be interpreted as the observable willingness to make use of information technology while working on the tasks to be accomplished” (Yucel & Gulbahar, 2013, p. 93). TAM is significant in that it reflects how and why teachers of students (including students labeled with Autism) may or may not be inclined to implement technology during lessons. Based on four central elements—innovation, communication channel, time, and social system—TAM can be easily applied to technology intended to be used in the classroom setting.

## **Definition of Terms**

### **Autism Spectrum Disorder (ASD)**

The Diagnostic and Statistical Manual of Mental Disorders describes Autism Spectrum Disorders (ASD) as a cluster of neurodevelopmental disorders in which children demonstrate “characteristic deficits of social communication” which are “accompanied by excessively repetitive behaviors [sic], restricted interests, and insistence on sameness” (American Psychiatric Association, 2013, p. 31). Criteria further states that children may have difficulty with interaction and communication; prefer avoiding social relations and play along; have problems with non-verbal and verbal communication; be confined to restricted interests; display abnormalities of



sensory functions; and have limited socioemotional skills (Malinverni et al., 2016; Goldsmith et al., 2004). The child with ASD could have no speech, limited speech, or be extremely verbal, but struggle with the ‘rules’ of conversation (Feinstein, 2011).

### **Assistive Technology Device**

The Individuals with Disabilities Act of 2004, (IDEA) defines assistive technology in school setting as “... any item, piece of equipment or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve the functional capabilities of children with disabilities” (Assistive Technology Act of 1988, “The Tech Act”).

### **Communication Skills**

The American Psychiatric Association (2013) articulates that children with ASD have impairments in social interaction skills, such as understanding emotions, initiating and maintaining conversations, sharing interests, and enjoying interactions with others. These children may also fail to develop nonverbal communication skills, such as making eye contact, using and understanding facial expressions and gestures, using atypical speech, such as fluctuations in volume, pitch, and intonation, and fail to coordinate between verbal and nonverbal communication skills (American Psychiatric Association, 2013).

### **Augmentative Alternative Communication Applications**

Augmentative alternative communication (AAC) are applications for use with electronic devices developed to meet the challenges of language deficiency and deficiency in communication skills development. These applications are used with computers and digital tablets such as iPads. The use of AAC with iPads may be superior to other methods, such as

manual signs and communication books, for acquiring the development of skills for communication (Lorah et al., 2014).

### **Saudi Arabia**

Saudi Arabia is an Arab Islamic country located in the center of the Middle Eastern and Islamic world. With its nearly 32 million people and 13 providences, it is known as the largest nation in the Arabian Peninsula (General Authority for Statistics Kingdom of Saudi Arabia, 2018). The capital city of Saudi Arabia is Riyadh, and the second largest city is Jeddah. The two Islamic holy cities are Mecca and Medina. The constitution is structured by the Holy Quran, and the Quran is embedded in the constitution, thereby marrying religious and legal authority. The culture is greatly impacted by religion. The national language is Arabic, although business is mainly done in English (Alrashidi & Phan, 2015).

### **iPad**

This is a digital tablet computer with a high degree of functionality. The user interfaces with the device's multi-touch screen. Most iPads have Wi-Fi capabilities, and some have cellular connectivity. Some of its popular functions include: shooting videos, taking photos, playing music, web browsing, games playing, GPS navigation, working within apps, and social networking.

### **Summary**

In the introduction to this study, teacher-perspective was established as critical to understanding the effects of implementing a technology such as the digital tablet with students with Autism. The perspectives of teachers can impede, promote, and/or expand the use of instructional tools. Saudi teachers' perspectives on the use of the iPad as an instructional tool to develop and enhance communication skills of children with ASD in their classrooms is a topic

with importance given the rising prevalence of ASD in the Kingdom. With an established deficit of teacher training in EBPs in SA, this study gained significance. This qualitative study explored KSA teacher-perspectives and hoped to result in a clearer understanding of Saudi teachers' perspectives concerning the iPad as a technological strategy that may assist in the development of communication and overall academic abilities of children with ASD.

The research questions asked were: what are the perspectives of Saudi male special education teachers in Jeddah city, on the use of iPads in their classrooms to teach students with characteristics of Autism? and, in what ways do Saudi male special education teachers in Jeddah city discuss the use of iPads to enhance communication skills in students with characteristics of Autism? These questions lead to the collection and analysis of data that may be useful to stakeholders in KSA as information to make better informed decisions about the enhancement of educational programs, curriculum, and professional development initiatives in assistive technology via iPads, for the development of communication skills for children with ASD in Saudi Arabian classrooms.

The iPad as intervention can certainly become a practical and efficient way for enhancing independence and academic ability via the development and improvement of communication skills of children with ASD. As little research has been done to investigate iPads as an instructional tool in special education, particularly for children with moderate to severe developmental disabilities stemming from Autism (O'Malley et al., 2014), this qualitative study addressed a gap and adds to the literature presented in chapter two, on special education in Saudi Arabia.

## **Reflection**

I was a general education middle school teacher for eight years in Saudi Arabia, and I am male, so all of my students were also male. While teaching at this level, I met a student labeled with Autism, and the experience profoundly impacted my thinking and professional goals. I observed that this young man did not get the appropriate instruction due him within in his class. I ascertained that since he was struggling in school, the teaching staff was unaware of how to find and implement appropriate strategies to meet his academic needs. My interest in seeing this young man grow and be successful in school has morphed into a passion to see teachers in KSA well equipped with the knowledge, skills, and abilities to meet the needs of students with Autism. My experiences have fueled this study and this young man in particular, is my why.

## **Chapter Two: Literature Review**

### **Autism**

The lineage of the literature on childhood Autism Spectrum Disorders (ASD) in the United States dates back to 1943, when Dr. Leo Kanner identified a unique neurodevelopmental issue relative to alterations in the environmental routines and interrelatedness of a set of children whose parents sought his help about (Kanner, 1943). Kanner eventually described this condition as infantile Autism (Allothman, 2002; Zager, 2005). In his descriptions, Kanner detailed characteristics such as repetitive behaviors, language and speech abnormalities, unusual sensitivities, and abnormal cognitive development (Allothman, 2002; Zager, 2005).

Following from that lineage and in 1979, Wing and Gould described Autism Spectrum Disorder (ASD) as a cluster of permanent neurodevelopmental maladies categorized by qualitative deficiencies in social communication and relations in the presence of constrained, repetitive, or stereotypical behavioral forms and interests (American Psychiatric Association, 2013). By 1978, Bloom and Lahey detected challenges in the language development of children with Autism as a language component disorder involving the form, use, or content of language, or as an interplay among the components (O'Malley et al., 2014).

At the same time, the American Psychological Associations (APA) diagnostic and statistical manual of mental disorders release three (DSM-III) was published in 1980, and “infantile Autism” was delineated for the first time as a stand-alone disorder (American Psychiatric Association, 1980). The criteria included: onset at or prior to 30 months of age, a

pervasive lack of response to people, gross deficits in language development, strange patterns of speech including and/or not limited to echolalia and bizarre responses to the environment (American Psychiatric Association, 1980). In 1987, infantile Autism was replaced in the revised third edition of the DSM by the term, “autistic disorder” (American Psychiatric Association, 1987). The criteria for making a diagnosis of autistic disorder was greatly expanded upon from the former edition of the DSM, and included 16 different areas. To make a clinical diagnosis of Autism a child had to meet eight of the 16 indicators in areas such as impaired communication, behaviors, and social interaction (American Psychiatric Association, 1987).

Between 1987 and 2012, there were two more updates to the DSM, the DSM-IV and the DSM-VTR. The terminology continued to change and went from, “autistic disorder,” to “Autism spectrum disorder,” which is where the acronym of ASD most likely originated. In 2013, the DSM-V was released and criteria changed again, with the introduction of a scale of severity (American Psychiatric Association, 2013) from level one to level three. A child diagnosed with ASD at a level one for instance, may be verbal and high functioning, but still require supports. A child diagnosed at a level three may be non-verbal and require significant supports for all activities of daily living, and may not be able to generalize from one situation to another (American Psychiatric Association, 2013). In the US, these levels are often associated with the type of educational supports a student can access, and there may be social services and per pupil funding differences attached. Children with more significant needs may require more intensive and costly supports, and vice versa.

Generalization has long stood as an identified as a challenge for children with ASD, and learning to transition from one place or function to another, is a task that requires the ability to generalize. Generalization has been described as the ability to transfer a learned behavior from

one trained situation to another (Su et al., 2019). In 1992, Goossens et al. suggested that providing instruction on functional communication in a naturalized setting would alleviate the challenges of transition. By 1995, Koegel and Koegel identified generalization as a challenging task for children with ASD, and by 1997 Glennen and DeCoste supported Koegel and Koegel's (1995) identification. Later in 1997, Mirenda endorsed Goossens et al.'s (1992) mode of teaching, which was described as providing instruction on functional communication in a naturalized setting.

In recent years, increased attention has been placed on ASD and by 2004, Hetzroni and Tannous began to describe communication issues with ASD as longitudinally developmental, in writing that children with ASD have difficulty with emergent and evolving language and communication skills. Yet, they evidenced when children with ASD were given opportunities to learn and practice meaningful communication skills, those children developed the ability to generalize. Hetzroni and Tannous (2004) examined outcomes of exposure of students with ASD to communication behaviors away from their natural areas of habitation, and did so in a structured and ordered method with the use of computers. Children were allowed to interact through play, eating, and hygiene behaviors (Hetzroni & Tannous, 2004). Following exposure to communication behaviors, n=5 children demonstrated decreased sentences with speech delay and speech irrelevance (Hetzroni & Tannous, 2004). Too, the majority of children in the study used a reduced number of sentences that involved immediate echolalia (Hetzroni & Tannous, 2004).

Echolalia is described as sentence repetition or repetition of a part of a sentence (Hetzroni & Tannous, 2004). A child may repeat a sentence instantly upon hearing it, or a child may have delayed repetition (Hetzroni & Tannous, 2004). If children with Autism display stereotypical speech that carries contextually irrelevant expressions, that speech becomes distorted and is

considered a distorted interaction between components of language (Mody & Belliveau, 2013). Such thought by Bloom and Lahey (1978) was subsequently defined as echolalia by Prizant and Duchan (1981), as well as Prizant and Rydell (1984). Thus, a distortion in the interaction between language components produces a form of speech that is immediate or delayed echolalia. The children in Hetzroni and Tannous's study (2004), also engaged in an increased amount of intent to communicate and relevant speech after intervention with increased practice opportunities. These results therefore suggest that with practice in a structured and well-ordered environment of learning, children with ASD may develop the ability to both learn and transfer that learning to their other environments (Hetzroni & Tannous, 2004).

By 2006, Tsao and Odom suggested that children with ASD suffer from deficiencies in multi-attention, and many of those children also face challenges with adaptive behaviors, including being safe, getting dressed, and daily personal hygiene. In addition to those challenges, the authors discussed ASD in terms of children experiencing difficulty in developing and sustaining social relationships. The difficulty in acquiring social competence may stem from delayed or limited language development, and social situations as multi-attentive situations (Tsao & Odom, 2006). In some cases, children with ASD avoid eye-to-eye contact, even when requesting a needed item, which can be perceived as socially unacceptable or abnormal by others (Brock et al., 2007). Findings from Bass and Mulick (2007) indicate that difficulties in acquiring social competence and multi-attention, precipitate problems in developing skills for social play. Skills for social play are deemed significant, especially in the development of social and cognitive skills (Bass & Mulick, 2007). Deficiency in developing skills for social play can negatively affect communication, imagination, and continual interactions in social settings (Gutstein & Whitney, 2002).



In 2014, the Centers for Disease Control and Prevention (CDC) indicated that ASD has a prevalence rate of 1 in 68 children in the United States, and is classified in public health settings as a complex developmental disorder. By 2013, and later in 2015, Höglund and Salazar et al. respectively, articulated that clinical appearances of ASD are remarkably heterogeneous because of the varied severity of nuclear autistic deficiencies involving development of cognitive and language abilities, and also due to the high presence of psychopathological deficiencies. These disorders associated with ASD include various yet persistent changes throughout the life of a child, and carry a substantial impairment in functions relative to their social, school, and family lives (McGovern & Sigman, 2005). These impairments demand substantial support to enable children with ASD to function in social, school, and family environments (Burgess et al., 2013).

Athbah (2015) supported Strain et al. (1995) in their findings that deficits in the development of social skills can be addressed with interventions that are early and intensive. Technology-based interventions come highly recommended, and the National Autism Center (2009) indicated that technology-based intervention is deemed a highly acceptable method, particularly because of its effective and beneficial outcomes when utilized children with ASD. Technology-based interventions includes computer-based technology where specific software is used on a computer, laptop, tablet, or smartphone (MacDonell & Prinz, 2017). Since 2003, Bosseler and Massaro articulated that teachers are increasingly using computers as an instructional device for children with ASD.

The use of computer assisted interventions carry with them the opportunity for increased motivation and attention. Athbah (2015) supported findings in Yaw et al. (2011) that when compared to personal instruction, computer-oriented instruction augmented motivation and diminished problem-behaviors in children with ASD deficiencies. Reichle (2011) suggests that

assistive technologies (AT) provide opportunities for the enhancement of communication and social skills in children with ASD. Sennott and Bowker (2009) articulate that lightweight and portable electronic devices, such as tablets and smartphones, are more user friendly to children with ASD, and usage is easier at home, in school, and throughout the day. These portable devices are highly compatible with many computer software programs, applications, and designs.

It is important to be reminded that children with ASD do not exist in a world by themselves, and therefore intervention cannot take place with them alone in sterile environments. It is certainly critical to involve significant others, such as parents and families, when interventions are being considered by teachers. Teacher-involvement is critical, and since 2003, Bosseler and Massaro articulated that teachers are increasingly using computers as instructional devices for children with ASD. Quite recently, O'Malley et al. (2014) conducted a study on the effectiveness of iPads and found benefits that involve teachers. Teachers indicate that iPads can reduce teachers' supports, enhance teachers' skills, and make progress through learning goals (O'Malley et al., 2014).

The National Research Council (2001) advises that the deficiency in joint attention skills, as well as the deficiency in the use of symbols, are the two major communication deficiencies in children with Autism Spectrum Disorder (ASD). Children with joint-attention ability can synchronize attention between people and objects (Charman, 2003). Some research indicates that children with ASD show underdeveloped or non-existent functionality in joint-attention (Segers, 2016). Children with ASD may also lack the ability to point to others, get the attention of other children, or include other people in their emotional moments (Smith, 2009).

When dealing with symbols, children who have a maturity of skill in this area usually use conventional meanings of words or gestures. Many children with ASD may assign unique

meaning and carry unique gesturing qualities about them (Tager-Flusberg et al., 2005). Likely to aid in helping children with ASD communicate with others, the NRC has been advocating for teaching and learning strategies that support social, language, adaptive, and communication skills. The NRC (2001) has therefore been advocating for teaching-learning goals that are aligned with student-centered needs specific to nonverbal communication, language development, and cognition.

In his study on the effects of using iPads to teach social communications skills to children with ASD, Alzrayer (2017) relied on Wallace and Rogers (2010) to articulate that for children with developmental disorders, such as ASD, effective interventions are typically marked by early age, intensive and durable introduction, individualized needs attention, and parental inclusion and training. This notion is consistent with Levy et al. (2006) who posit that “children with Autism appear to be more likely to benefit from interventions that are initiated at an early age, that are intensive and long lasting (at least one year), that target various developmental areas, and that include parents, who can facilitate the generalization process of learned skills” (pg.60). Developers of future ASD programs should therefore include these factors in their interventions.” As Goldstein and Naglieri (2014) see it, the necessity for early intervention amplifies because of the widening gap between accessible interventions and the age of ASD identification, and that despite the many interventions that are ASD effective, “challenges remain in the early intervention of ASD” (p. 60).

Effective interventions ought to be aligned with the specific challenges faced by children with ASD. Children carry the necessity for interventions that meet them at their needs, give attention to their weaknesses, and accentuate their strengths. Interventions ought to be implemented in children-centered environments, such as home, school, and other communal

areas (National Research Council, 2001). The NRC therefore advocates for early interventions, and consistent with such advocacy, McConkey et al. (2009) argue for intervention prior to formal diagnosis when ASD is suspect.

### **iPads and intervention with Autism**

Alzrayer (2017) has advocated for more studies in the field of assistive technology with digital devices, particularly because he found that participants with ASD and other neurodevelopmental deficiencies, between the ages of 7 and 10, and with no previous engagement with the iPad, were able to improve their communication skills. The Alzrayer intervention involved the use of “least-to-most” prompting, constant-time delay, error correction, and reinforcements in teaching the participants to request preferred items, say “thank you,” and answer personal questions using the iPad...” (2017, pg. 416).

Further results indicated a measure of successfulness in the teaching-learning process specific to communication skills, and in a form that is advanced in functionality and social orientation. Overall, the study indicated that children with ASD can develop the ability to use the iPad, and with the use of the iPad, develop skills that facilitate social communication as well as engagement in varying forms of intent to communicate (Alzrayer, 2017).

Even though the education system in Saudi Arabia has tried to improve special education for children with disabilities, older students still find it difficult to access quality instruction. For instance, some ASD students who struggle with communication abilities often babble, make indiscernible utterances, and show inappropriate behavior due to frustration (Shugdar, 2017, p. 6). Their communication skills in making eye contact, speaking, writing, and touching often are characteristics that can slow down students’ academic efforts. Moreover, Saudi parents tend not to pay a lot of attention to their children’s early schooling, and therefore may not understand the

trajectory of their young child as he moves through the school system with a special education label.

When working with students having Autism, it has been previously reported that Saudi teachers are finding the use of iPads beneficial, as compared to other instructional materials (Alotaibi et al., 2016). One reason for this may be that digital tablets are becoming more accepted and incorporated into mainstream life activities (Shugdar, 2017). Another reason for the popularity of iPads may also be that these devices can be linked to the internet, improving students' access to vocabulary and other forms of auditory/visual support (Schlosser et al., 2016). Moreover, the iPad may be viewed as relatively easy to use, require low preparation time, and have efficient storage capacity compared to picture cards and notebooks (Pegrum et al., 2013). iPads have been demonstrated to enrich lessons in which students build communication skills, such as reading, writing, speaking, and making eye contact (Liu, 2013).

The acceptance of iPads is growing as young students choose to use these devices for school and at home. The universality of the iPad may take less any stigma associated with the use of computerized devices as assistive technology. For instance, students may prefer an iPad over PECS, as they suggest that the iPad is fast and easy to use during communication (Ganz et al., 2013). Other benefits of iPad use include students' increased speech, easy preparation, straightforwardness of operations, less manipulation, and less extra materials during use (Parnell, 2018).

### **Special education in Saudi Arabia**

A large country, Saudi Arabia makes up four-fifths of the Arabian Peninsula. In Saudi Arabia, the economic system is dedicated to investing in education. Since the country is wealthy due to natural oil wealth, it can afford to invest a great deal of funds in education (Rabaah et

al.,2016). Saudi Arabia was among the nations and organizations that ratified the Salamanca Statement that constitutes inclusive education, and is a show of support for access to education for all children (UNESCO, 1994). Therefore, children with special needs are within the focus of the Ministry of Education (MoE) in Saudi. The MoE has embraced a number of policies relative to the education of children with special needs (Brown, 2014).

Consequently, the Saudi Disability Code of 2000 broadened the definition of special needs to include, not only individuals with cognitive, learning, hearing, vision, and motor skills deficiencies, but also deficiencies in speech and language, behavioral issues, and multi-challenges that are prevalent in in developmental delay, and other such impairments which need special care (AlSarheed, 2001). The Code established that individuals with these impairments were to obtain access to appropriate education at zero cost (AlSarheed, 2001). In addition, designated public agencies were required to deliver services that meet the emotional, communal, therapeutic, and recovery needs to those individuals (Prince Salman Centre for Disability Research, 2004).

In addition, the Saudi Arabian government appointed the Regulations of Special Education Programs and Institutes (RSEPI) in 2001, in collaboration with policies formulated by the United States (Alquraini, 2011). Such action is suggestive that all children experiencing impairments as mentioned earlier, were beneficiaries of RSEPI provisions concerning appropriate education at no cost in the Least Restricted Environment (LRE), and the provision of Individual Education Programs (IEP), Early Intervention Programs (EIP), and Transition Services (TS) (Weber, 2012).

Several pieces of legislation also stipulate the manner in which assessment for entitlement for special education services should be conducted (Aldabas, 2015). For example, the

2001 Rules and Regulations of Special Education Programs (RRSEP) delineate the guidelines regarding the civil liberties of students with impairments relative to accessing programs of special education (Almedlij & Rubinstein-Avila, 2018). The regulatory policies focus on the needs of students with varied impairments. Based on individual needs, the RRSEP determines student-eligibility for individualized or joint special education programs (MoE, 2002; Alquraini, 2010). The primary objective of the RRSEP was to ensure that students with impairments access the appropriate special education services consistent with individualized needs (Almedlij & Rubinstein, 2018).

It is interesting to note that Alquraini (2011) corroborates Al-Mousa, (2010) in the belief that although these regulatory policies were in place to assure equal rights for impaired children to access appropriate education, and to do so at zero cost, these policies were formulated more than a decade ago, and need review, and possibly revision. Alquraini refers to a significant gap between policy and practice with regards to students with impairments. Policy implementation could be considered ineffective to the grave extent that special education services were not available to the entitled students with impairments. In spite of noble intentions, Aldabas (2015) believes that RRSEP policy-implementation was ineffective. For example, there existed a scarcity of the needed experts to execute diagnostic evaluations, as well as a lack of effective assessment tools necessary to define highly appropriate educational environments for students with impairments based on their distinctive needs and location (Almedlij & Rubinstein, 2018).

Aldabas' research substantiates others' findings (Hadidi & Al Khateeb, 2015; Alquraini, 2011; AlThani, 2007) that are indicative of a system in which support personnel, including school psychologists, speech and language pathologists, sign language interpreters, and physical and occupational therapists were not adequately hired (2015). These inadequacies were reported

to be accompanied by the absence of delivery models in several special education services, including self-reliant classes, consultant and itinerant educators, and hospital homebound instruction (Hadidi & Al Khateeb, 2015).

Aldabas (2015) adds findings that special education and rehabilitation facilities in SA were clearly unsuitable, possessed restricted financial resources, carried a shortage of simple educational curricula and supporting materials, possessed inadequate IEP services, carried a social stigma, and carried a stark inaccessibility to inclusive settings, among other things (Alquraini, 2011; Wehbi, 2014). Al-Nahdi concurred and added in 2007 that while testing and assessment methods to decide if children qualify for distinct learning and specific facilities are commonly used when children enter school, and schools lacked the multidisciplinary teams or tests to effectively make the required assessments.

Currently in Saudi Arabia, students with intellectual impairments have a choice to attend specialized institutes that focus on specified conditions, or mainstream schools (Al-Mousa, 2010). In the specialized institutes, children with ASD are placed in special learning environments with other children with special needs. When parents or students themselves choose to attend mainstream school, students with special education needs (SEN) follow an individualized course of study, yet physically work alongside other students with no special educational needs (Al-Mousa, 2010).

The term, "mainstreaming suggests self-contained classroom programs, resource room programs, itinerant teacher programs, teacher-consultant programs, and follow-up programs" oriented towards children with special needs or disabilities in non-specialized schools (Al-Mousa, 2010, p. 17). There is also a resource area which refers to an educational setting outside the regular classroom in a mainstream school (MacBeath et al., 2006). In this resource area, there



are special education services, such as special classes or interventions that are available to the students with special educational needs (Al-Mousa, 2010). These findings are indicative of an education system that provides for needs of children with special educational, including children with ASD, in regular classrooms, side by side with students who do not have special education needs. However, students with special education may also go to some additional classes away from regular classrooms. These additional classes could be focused on interventions for social skills development, or for increased coaching based on student-individualized needs.

Interestingly, Al-Ajmi (2006) indicates that even though SEN students receive some measure of support from facilities that offer special tutoring, particularly resource rooms, student achievement does not often not commensurate to students that do not have needs relative to special education. In SA, a large number of students with special needs lack the supports to pursue higher education. The disparity in the quality and measure of support they receive is evident. These students face limited options and avenues to higher education, with pathways being narrowed to vocational centers. There are several education facilities for the assistance of children with ASD, and particularly those with difficulties in social communication and other language difficulties, or deficits in fine or big muscle motor skills, in SA (Alotaibi et al., 2015).

It is incumbent upon educational programs to offer an all-encompassing curriculum, as well as engage in the professional development of teachers in a manner that allows teachers to grasp an understanding of a variety of pedagogical strategies that sustain learning and behavioral needs. The Ministry of Education (MoE) is expected to support the schools by sufficiently providing resources to make actionable the former. The RSEPI supplies assessment approaches to determine whether children qualify to receive special education services. Free education, individual education programs, early intervention programs, and other such services are provided

to children who meet the requirements to assist them in coping with ASD or intellectual disabilities (Alotaibi, 2016).

Alquraini (2011) studied the practicability and usefulness of services for children with special educational needs (including ASD in public schools), and determined that the easiest accessible services referred to transportation, psychological services, speech and language therapy, school counselling, and school health services. Whereas Hanafi (2008) found that health and medical services were readily available to children, rehabilitation services were not. Al-Otaibi and Al-Sartawi (2009) found that in Saudi Arabia, centers and institutes for special education delivered unacceptable public services with regards to physical therapy and other health and medical services. The Ministry of Education uses the Individual Education Program (IEP), to deliver and distribute services to the children who qualify. Alquraini (2011) conveyed information about the inadequacy of individualized services, and about the ineffective efforts of institutes, as well as private schools, to improve the communication and physical skills of children with special needs based on the absence of occupational therapists, physiotherapists, and speech and language diagnosticians (Alquraini, 2011).

In several schools, students with ASD are not in the same classrooms with students who do not have ASD. The separation of students with ASD may result in those students' difficulty in acquiring the necessary experience for adapting behaviors and social skills demanded by mainstream society. This separation is due in part to the difficulties experienced by Saudi public-school teachers, who lack the ability to deliver the needed individualized and focused-filled services to students with ASD (Al-Ahmadi, 2009). In spite of the contemplative efforts of the Ministry of Social Affairs in particular, for education that is inclusive, ineffective actions are overwhelming progress (Almasoud, 2011). In spite of government support with its large budgets

and several organized International Conferences relative to ASD, there is still growing public concern about the insufficient assistance for children with ASD and their families (Almasoud, 2011).

Almasoud (2011) reported 97% of families conveyed concern for a low degree of public awareness of ASD, and 99% of families conveyed concern for educators' lack of comprehension of how best to assist students with ASD in mainstream public schools. Public demand for suitable free education for children with ASD, along with exclusive facilities to assist in development without institutionalizing children or separating them from children without ASD, is growing. There are additional concerns in SA over the lack of distribution in financial aid to charitable and other organizations working with children experiencing ASD. The common belief in SA is that financial aid distribution does not allow for distribution in a manner that directly assists those in need. For instance, the schools that serve children with ASD are in need of direct funding so that administrators may fund professional development activities. Principals are not allowed to move funds to support the comprehension of pedagogical as well as social strategies to provide children with ASD with the education they need, and thus need new line items approved by the MoE in order to provide PD that they themselves cannot deliver.

### **Saudi Arabia and Autism Spectrum Disorders**

Established in 1953, the Saudi Arabian Ministry of Education (SAMOE of MoE) provides education that is free of cost to the citizenry. Special education was initiated soon after, and Al-Faiz (2006) “the commencement of special education in Saudi Arabia was initiated in the 1960s, and developed in stages parallel to those in the United States” (p.2). Special education has a place of priority and concern for in SA that is demonstrated by the Royal Decree of the Rights of Individuals with Disabilities (RDRID), which positions education in Saudi Arabia as not a

privilege, but a fundamental right of people with special needs (Al-Faiz, 2006; Alothman, 2002; Alqahtani, 2012; Alquraini, 2011).

Saudi Arabia is not singled out in global public health statistics for increasing prevalence of ASD, although its prevalence is slightly above that of other developing nations. In 2011, the estimated rate of prevalence was 18 in every 10,000 people (El-Ansary, & Al-Ayadhi, 2012). ASD has been noted to be found at a higher rate in males, than in females (Hussein et al., 2011) with a ratio of 4:1, compared to the ratio in the USA. Previous reports indicated that boys were four to five times more likely to be identified with ASD than girls in the US (Murshid, 2011). A non-governmental organization called the Saudi Autistic Society has generated the majority of prevalence reports in SA since its inauguration in 2003, producing flyers and brochures that transmit the data to the public (Murshid, 2011). Athbah (2015) relied on existing literature (Al-Salehi et al., 2009; Dababnah & Parish, 2013) to indicate that conversely to the USA, few reports have been done on the prevalence of ASD in the Middle East and Saudi Arabia.

In 2012, reports indicated that 925 students with ASD in Saudi Arabia between the ages 5 and 18 were beneficiaries of services provided by the MoE (Ministry of Education, 2012). Athbah (2015) relied on a plethora of data (Alqahtani, 2012; Al-Salehi et al., 2009) to suggest that although an estimated 42,500 persons have been diagnosed with ASD, there are still many who are undiagnosed, and many that do not attend school.

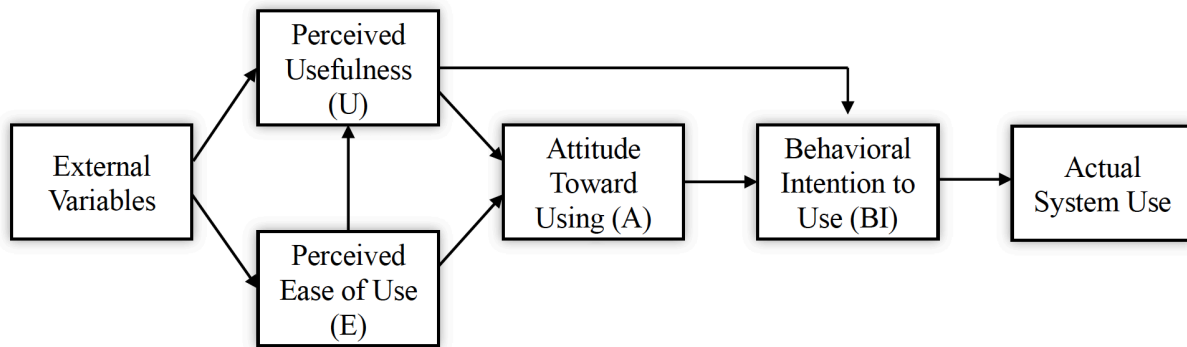
Although ASD is becoming more prevalent throughout the world over the last decade due to in part, improved diagnostic criteria (Al-Salehi et al., 2009), there is still a paucity of studies on ASD in the Middle East, particularly Saudi Arabia, (Al-Faiz, 2006; Al-Salehi & Ghaziuddin, 2009; Hussein et al., 2011). Publications focusing on ASD in the Arab world including Saudi

Arabia are under-represented (Al-Salehi & Ghaziuddin, 2009, p. 227; Hussein et al., 2011), and a majority of the studies on ASD in Saudi Arabia have carried a medical and clinical focus.

Therefore, a gap exists in the literature concerning ASD in general, and in technology assisted teaching for children with Autism, as well as teacher-perspectives on the use of technological devices, such as the iPad, as an instructional tool for children with ASD. Even though some studies have been done on inclusion, or on special educational services for students with ASD in Saudi Arabia, significant gaps in our knowledge persist around the development of communication skills with assistive digital devices as a method of instruction. Al-Faiz (2006, p. 5) emphasized that “it is important to conduct research to help improve the overall knowledge in Saudi Arabia about Autism and its educational needs.”

### **Technology Acceptance Model**

The Technology Acceptance Model (TAM) of 1989 was designed by Fred Davis to help theoretically explain human behavioral variables involved in the eventual use of new technology by an individual, an area of study sometimes referred to as user adoption behavior (Venkatesh & Davis, 2000). Within the model, multiple external variables of unknown type and quantity, play a role in the perceived usefulness and perceived ease of use, of technology (Davis, 1989). Those two perceptions influence a user’s intentions to adopt and implement a given technology (Venkatesh & Davis, 2000). The model is often applied in informational technology and business settings, however holds relevancy in educational settings and may be useful in helping to explain the behavior of teachers in schools involved in the adoption of technology. Davis posits that the easier something is to use (effort free), the more it will be used and thus, be useful (Venkatesh & Davis, 2000). Figure one below presents a visual of the TAM model:



**Figure 1.** Technology Acceptance Model (TAM) (Davis, Bagozzi, & Warshaw, 1989, p. 985).

Understanding the teacher adoption process in terms of modern classroom technology in teaching and learning is important, as it may impact students’ future employability in sectors that rely on employees skillful use of technology (Granić & Marangunić, 2019). Nam et al. (2013) found that the overriding variable impacting fidelity of implementation of assistive technology was perceived ease of use, with perceived ease of use, impacting perceived usefulness.

### **Technology-Based Interventions**

Gentry et al. (2010) have purported that studies on the effectiveness of Assistive Technology (AT) for people with ASD is in its infant stage, and that more study is needed. Knight et al. (2013) emphasized that there is critical need for research on the effectiveness of iPads, iPhones, and other smartphones and tablets for individuals with ASD. Despite Athbah’s (2015) research on parents’ attitudes toward the use of technology and portable devices with children with ASD in Saudi Arabia, research on this topic is limited and emergent.

Technology-based interventions can be deemed evidenced-based practice. According to Goldstein and Naglieri (2013) “the term, “assistive technology” appears in the Individuals with Disabilities Education Amendment (2004) and refers to, “any item, piece of equipment, or

product system that is used to increase, maintain, or improve the functional capability of an individual with special needs” (p.312). Electronic technology devices include, “computers, digital cameras, video cameras, and complex voice output devices,” (Cafiero, 2012, p. 312). Children with ASD often rely on external stimuli to initiate, sustain, or terminate behaviors (Alzrayer, 2017; Goldsmith & LeBlanc, 2004), and Mirenda, (2003) forwards devices as stimuli that may compensate for receptive, expressive, and written communication needs.

Further, and “specifically for individuals with ASD, handheld electronic devices offer a way to present information visually, in a predictable and sequential manner” (Knight et al., 2013, p. 646). Since 2004, Goldsmith and LeBlanc recognized that technology-based interventions were sometimes being used as provisional instructional aids. Whereas those assistive aids could be in place until the goal for behavioral change has been accomplished, other such technological devices can be indefinitely utilized as assistive instructional tools for a sustained evidenced-based practice.

It is certainly not surprising that Lancioni et al. (2014) support Goldsmith and LeBlanc (2004) in evidencing that technological interventions are beneficial to children with ASD challenges. Goldstein et al. (2013) also purport a high degree of compatibility between a chosen assistive technology and the learning style of children affected with ASD. The authors observed increased motivation with the use of technology, and believe that the use technology through handheld devices is likely to enhance learning agility in some children, compared to traditional instruction (Goldstein et al., 2013). In addition, Goldstein and Naglieri (2013) endorsed findings from Ennis-Cole and Smith (2011), as well as Goldsmith and LeBlanc (2004), suggesting that technologies facilitate enhancement in social, communication, and other skills for persons with ASD characteristics.

Ennis-Cole and Smith (2011) particularly observed that assistive technology has been used to increase teaching and learning opportunities for students with special needs, and suggest that it can be beneficial to children at all levels of the diagnosis, “because of diverse applications, ease-of-use, and ability to address multiple deficiency areas, particularly communication, social skills, and academics” (pg.88). Consistent with Francis et al. (2009) that there is an increase in and accessibility to, new visual assistive aids because of increased amounts of technology platforms, Lancioni et al. (2014) argue that children with ASD can attain self-determination by learning and actively engaging in assistive technologies that are appropriate for their needs. This belief is especially acceptable because these types of assistive aids allow greater accessibility to children’s everyday environments, such as school, extracurricular activities, and other events of choice, that hold significant implications for their personal and social developmental maturity.

### **Augmentative Alternative Communication (AAC)**

A core characteristic of children diagnosed with Autism spectrum disorder (ASD) is deficiency in social communication. This deficiency is likely to affect the ability of children to fully function, or function effectively, in their learning environments. Augmentative Alternative Communication (AAC) forms of technology, such as the iPad, have been efficaciously used as a speech generating device (SGD) with children experiencing developmental disabilities, particularly ASD (O’Malley et al., 2014). Conversely, the use of SGD is new relative to other applications, and yet it is the recipient of much attention in educational inquiry. Researchers (Alzrayer et al, 2014; Alzrayer, 2017; Ganz, et al., 2013; Kagohara et al., 2013; Lorah et al., 2014; O’Malley et al., 2014; Van der Meer & Rispoli, 2010) have advocated for increased empirical studies in SGDs because such studies are necessary for evaluation of the efficacy of



such devices in teaching skills social-communication to children with ASD in a multi-process manner.

Agencies such as the National Research Council (NRC) and various researchers (Hetzroni & Tannous, 2004; O'Malley et al., 2014; Yell, 2012) have conveyed dissimilar proportions concerning the prevalence of children with ASD who are nonverbal in their communication. However, NRC (2001) suggested that nearly a third to one half of all children with ASD experience failure in developing functional speech. Schroeder et al. (2014) suggest that development of those skills that are effective in communication is among the shared needs of children with ASD. Frost and Bondy (2002) believe that augmentative alternative communication (AAC) is the most effective approach to meeting the communication needs in children with ASD, and consequently aiding them to overcome deficiencies in development of language and communication.

Furthermore, social communication needs in ASD have brought about legislation in the US relative to special education in order to provide services to augment language skills (LaNear & Frattura, 2007). Students with complex communication needs (CCNs) are in need of supportive and related services to (a) overcome their struggles with communication; and (b) benefit from the instructions provided to the maximum extent possible. Therefore, IDEA included a section in the individualized education program that is related to the need for assistive technology, and which refers to any tool or device that could be used to increase and/or maintain the functional capabilities of individuals with disabilities (2004). There are different types of services under the umbrella of AT, such as aids for vision and hearing-impaired students, aids for daily living, computer access aids, and AAC aids (Arucevic, 2015).

Findings from Calculator and Black (2010) indicated that AAC methods have been helpful in establishing socially suitable methods of communicating. These methods denote devices that fill gaps in communication needs. Some of those needs include development and/or enhancement of appropriate receptive, expressive, and written behaviors (Mirenda, 2003). AAC can take several forms, and much of the literature delineates two types of ACC: unaided and aided (Light & Drager, 2007). Unaided forms allow for communication that utilizes manual signs and gestures, while aided forms requires the use of graphic symbols and external devices (Van der Meer et al., 2012). In a review of the literature (Ganz et al., 2011) revealed that AAC has been effectual in the development of social communication skills. A meta-analysis of AAC studies, the Ganz et al. (2011) review suggested that aided AAC has the ability to empower children with ASD to develop social communication skills.

In a study at Texas Technical University, Alzrayer (2017) concluded that AAC has at least three significant positive effects on communication skills in persons with ASD. They include: (a) showing positive results in generalizing the sequence in social-communication skills; (b) generalizing the natural speech production across new items; (c) successfully using ACC to perform multi step sequencing through both social and functional communication skills (Alazrayer, 2017). Schlosser and Wendt (2008) evidenced increased speech production in study participants with Autism, resulting from the use of both aided and unaided AAC forms. Speech-generating included in the Ganz et al. (2011) review suggest that AAC utilization in persons with ASD falls within a range from low to high “tech”. Low-technology devices may involve things like the use of hands in sign language, or rigid paper communication boards. High-technology devices most often involve computers and digital tablets. An amalgamation of the above studies suggests that manual signs, picture-communication system (PCS), and speech-generating devices

are the most widely used and deemed effective AAC methods with persons with ASD (Schlosser & Wendt, 2008).

Furthermore, research featuring speech generating devices has revealed optimistic findings for its effectiveness in enhancing communication skills in children with ASD (Sherer & Schreibman, 2005). It is reasonable to believe that this optimism springs from speech feedback from the SGD devices compared to feedback from other low-tech methods (King et al., 2014). Later model SGD hardware such as the Dynavox™, present users with certain snags that limit use and effectiveness (Williams, 2018). These snags include high cost, complexity of use, and social stigma (Williams, 2018). Fortunately, recent development of high-tech devices such as tablets, and specifically iPads, has been useful in overcoming the associated utilization challenges of traditional SGD devices. Handheld multipurpose devices have demonstrated superiority over traditional SGDs devices. This superiority is demonstrated in design and effectiveness.

For example, in a systematic review conducted by Lorah et al. (2014) it was found that utilization of tablets with AAC applications was superior to other methods. Some of these methods included manual signs and communication books for acquisition and enhancement of communication skills (Lorah et al., 2014). Kagohara et al. (2013) indicated that tablet devices are practical tools for the development of academic, vocational, functional, and leisure skills in persons with special educational needs. Despite these examples, studies that either support or refute, the efficacy in tablets as a communication device for persons with ASD are still in need of being conducted to establish a larger base of knowledge. Several reviews of the literature (Alzrayer et al., 2014; Kagohara et al., 2013; Lorah et al., 2014) have unambiguously revealed

the need for more empirical studies that would evaluate the effectiveness of tablets in the teaching-learning processes of social-communication skills in individuals with ASD deficiencies.

Research also indicates that most of the available studies on ACC have placed an emphasis on teaching single-step requesting, among other basic communication skills in persons with ASD, especially involving touching a distinct icon to obtain access to a preferred item or activity (Carmien, 2016). Knight et al. (2013) indicated that the literature demonstrated a scarcity in studies with an emphasis on teaching-learning processes involving increased complexity and advanced social-communication skills with tablet utilization for persons with ASD. Examples of research that would readily fill the gap in the literature would be those that focus on skills that are needed to combine three-to-four symbols to construct a sentence and navigate more than a three-page level for commenting, question-asking, and answering. Undoubtedly, a critical need for studies exists that investigate performing advanced social-communication skills with the use of tablets as SGD by children with ASD.

### **Evidence-Based Practice (EBP) and Augmentative Alternative Communication (AAC)**

Evidence-Based Practice was coined in the 1960s when evidence-based medicine emerged in England (Odom et al., 2010; Reichow et al., 2008). Overall, in special education, and specifically in the area of Autism Spectrum Disorders, interventions that are deemed evidence-based are marked by a multiplicity of definitions. This marking is due to the teaching-learning processes occurring in the regular, as well as special education class environments (Reichow et al., 2011). Basically, the difference in the two environments speaks to the varying approaches to teaching and learning experiences of students with ASD. However, the Missouri Autism Guidelines Initiative (2012) articulates, “evidence-based practice includes consideration of the best available research in the context of individual characteristics and professional expertise”

(pg.6). Alzrayer (2017) supports Odom et al. (2010, p. 275) in observing that “evidence-based practices (EBPs) are the basis on which teachers and other service providers are required to design educational programs for learners with Autism Spectrum Disorder (ASD),” and Odom et al. (2010) substantiate Cook et al. (2008) in observing that education programs are now marked by significant adoption of teaching-learning practices structured by objective standards of effectiveness and aligned with the needs of students in ASD classrooms.

The need to more deeply substantiate high tech AT as evidenced-based practice via empirical research is tied to the application of the technology and individual student needs. Special education legislation including IDEA of 2004 and the No Child Left Behind Act of 2001, require educators to use scientifically based instructional practices in teaching students with identified special needs (Individuals with Disabilities Education Improvement Act (IDEIA), 2004; No Child Left Behind Act of 2001). Spooner et al. (2012) emphasized a recommended ideal that practitioners implement evidence-based practice which involves technology-based intervention together with systematic instruction, when high tech is a part of a students’ programming. Sigafos et al. (2009) emphasized that instructional practices that are based on the principles of applied behavior analysis (ABA) have demonstrated effectiveness in teaching communication skills to persons with deficiencies. Some computer and tablet applications have been developed to mimic ABA structures and develop communication skills.

Integrating evidence-based AAC instructional procedures may benefit individuals with complex communication needs (CCNs). According to the National Autism Center (2009), combining operant instructional procedures with AAC intervention packages has increased the efficacy of AAC methods. Several researchers (Alzrayer et al., 2014; Miranda & Iacono, 2009) have revealed that systematic instruction is one of the most effective strategies to use to teach

individuals with CCNs to use AAC systems (Alzrayer et al., 2014; Mirenda & Iacono, 2009).

Based on the results of a recent systematic review (Kagohara et al., 2013), systematic instruction is one of the main components in the effective implementation of tablets as speech generating devices (SGDs). Additionally, researchers in several studies (Alzrayer, 2017; Rispoli et al., 2010; van der Meer & Rispoli, 2010) reported that differential reinforcement, such as AAC devices, is a successful strategy for the teaching-learning process involving children with ASD. That is, differential reinforcement may enable students with ASD to utilize handheld multipurpose devices with AAC applications to perform social-communication skills.

### **Evidence-Based Teaching Practices in Saudi Arabia**

There is inadequate knowledge surrounding the use and implementation of Evidence-Based Teaching Practices (EBTPs) in Saudi Arabia. According to a study by Alhossein (2016) in Saudi Arabia, it was established that the use of Evidence-Based Teaching Practices (EBTPs) for students with special needs was moderate, and the utilization of mediated learning strategies was low. Another study by Subihi (2013), found that very few (2.66%) of the participants fully understood the use of Augmentative and Alternative Communication (which are evidence-based strategies) in special education. In a study to assess teachers' knowledge base of Universal Design for Transition (UTD), consisting of evidenced-based principles used primarily with students with hearing impairments, Alzahrani (2018) found that teachers were not well-equipped to utilize the principles. Aldabas in 2015 noted while that Saudi Arabia has made great strides in improving special education, there is critical need for professional development programs to enlighten teachers on EBPs.

## **Assistive Technology and Teachers' Perspectives**

Ozonoff et al. (2007) indicated that students with ASD may lack fundamental communication skills, especially those that are necessary to school environments. Echolalia, delayed speech, and/or nonverbal behavior, may make interacting with teachers and peers in the classroom more difficult. Leonard (2013) suggests that whereas these deficits mediate reliance on prelinguistic skills that involve gestures, vocalizations, facial expression, and eye gaze to expressively indicate their desires and needs, some students with ASD also exhibit maladaptive behaviors, including aggression and self-injurious behaviors, to communicate with teachers and peers in the classroom.

Assistive Technology (AT) has been used to teach students with ASD for more than 35 years (Knight et al., 2013, p. 2629). However, Alzrayer (2017), Athbah (2015), and Lancioni et al. (2014) posit that paralleling effective interventions using technology is a new and an emerging field. Alzrayer (2017), Athbah (2015), Hetzroni and Tannous (2004) called for study in the field with an eye to effectiveness and teacher-participation. There is an increased prevalence of Autism Spectrum Disorder (ASD), and this increase speaks to the growing demand for teacher-involvement and training, so that teachers can effectively engage in the teaching-learning process (Hart & More, 2013). Since 2009, Loiacono and Feeley (2009) suggest dilemma in their observance that many teachers are not being fully prepared to meet instructional challenges. Scheuermann et al. (2003) observed that:

there is a large body of knowledge about the most effective curriculum and strategies for teaching these students. Unfortunately, relatively few teachers are aware of these strategies, and most have not mastered them. Teachers and others who work with these students need to be well trained and supported through a variety of resources (pg.198)

Although Loiacono and Valenti (2010) stressed the importance of professional learning and development for ASD educators, as such preparedness can positively impact their expectations, perceptions, understanding, and knowledge of students with ASD, Alzrayer (2017) suggests that only a few studies focus on teacher-perceptions, and the core of those perceptions.

Although technological devices such as iPads carry a multiplicity of available applications, and readily support Universal Design for Learning (UDL), a structure for improved curriculum inclusivity (O'Malley et al., 2014), increased emphasis on technological assisted teaching and learning is still needed in the Kingdom of Saudi Arabia. iPads have been used as assistive technology for students with communication disorders (Flores et al., 2012; O'Malley et al., 2014) and vision impairments (O'Malley et al., 2014), however little research has been done to investigate iPads as instructional tools in special education, particularly for children with moderate to severe developmental disabilities stemming from Autism (O'Malley et al., 2014). Moreover, no research has been done on Saudi teachers' perspectives on the use of iPads for students with Autism.

Although Dunn et al. (2009) argue that effective research groups delving into the special education referral process should focus carefully on the integration of stakeholders' perspectives, and although Dunn et al. (2009) argue that teachers' perspectives allow them to deliver high quality instruction in their classrooms on a consistent basis, while providing them with keen insights on making referrals to special education when their interventions fail to improve students' outcomes, there is still a gap in the literature concerning Saudi teacher-perspectives, perceptions, thought processes, and the relationship and impact on the learning processes of students experiencing ASD in Saudi Arabia.



O'Malley et al. (2014) advocated for interventions with the use of the iPad, as they were found it to be a practical and efficient academic strategy for enhancing the knowledge, skills, abilities, and interests of students with ASD. These researchers explained that findings from their study warranted investigation of the integration of the iPad into the teaching–learning process. In the O'Malley et al. (2014) study, teachers reported on the social validity of the intervention. These teacher participants perceived a positive impact on student independence, engagement, and interest in lesson content (O'Malley et al., 2014). The teachers further expressed a strong interest in extended use of the iPad as an instructional classroom instrument (O'Malley et al., 2014).

Prior to O'Malley et al. (2014), Hart and More (2013) performed a study in which pre-service teachers with limited knowledge of ASD reported perspectives of feeling untrained and unable to teach student with ASD effectively. The literature bears out the an imperative to instruct teachers on how to work with children experiencing ASD, and to do so, the development of technological interventions is often required. Because many children with ASD often face challenges of language delays, teachers must plan supportive communication lessons to expand language abilities in the classroom (Shepley et al., 2016).

Yet, the use of the iPad in a teaching-learning process with students experiencing ASD is not a guaranteed effective support, particularly because of the various considerations when seeking to integrate new technology devices (Malley et al., 2013). For this reason and others, teacher perspectives plays a vital role in determining which technology devices are best suited for the teaching-learning needs of each child (Mintz, 2013). It also important to note that children with ASD do not exist in a world of their own, and therefore interventions must include

those who participate with them in their world. It is certainly essential to include significant others, such as parents and teachers.

Because teacher involvement is crucial to successful iPad interventions, and since 2003, Bosseler and Massaro articulated that teachers are increasingly using computers as an instructional device for children with ASD, it is reasonable for the iPad intervention to be introduced into the Saudi classrooms. Saudi teachers should be involved in a training that teaches them how to work with iPads, and practice sessions with the iPads ought to be provided so that teachers in the KSA may continue to move forward with students with ASD. After such, studies regarding their feelings, perspectives, perceptions, thought processes, and willingness to use the iPad as an instructional tool for Saudi students with ASD, could be undertaken.

Not so long ago, in the O'Malley et al (2014) study on the effectiveness of iPads, findings underscored benefits that involve teachers, (a) it brought about a reduction in teacher support and prompts; (b) provided easy modification of the iPad appropriate to the severity of learning disability in each child; (c) reduction of passive non-compliant behavior and no active non-compliant behaviors; (d) teacher's perceived the iPad as an acceptable and effective instrument for classroom instruction to children with moderate or severe disabilities; (e) teachers conveyed students' progression in learning objectives and goals that those students had not be able to achieve with the use of traditional strategies for instruction; and (f) teachers shared that the use of iPads improved their teaching skills as well as student-interest in the content of lessons.

One of the most important considerations of implementing iPad as AT is teacher familiarity in using the iPad. Prior to O'Malley et al. (2014), findings from Malley et al. (2013) indicated that although teachers reported some negatives outcomes, they were still significantly receptive and strongly favorable of the beneficial outcomes in the use of iPads. They reported

strong interest in broadening the use of iPads as an instructional tool, and also reported a willingness to be trained, and a willingness to integrate technology devices into the teaching learning process, if it would improve student learning outcomes (O'Malley et al., 2013). With the willingness to use the iPad, teachers would come to know, or to acquire, a better and deeper understanding of why and when to use it (O'Malley et al., 2013). This is consistent with Loiacono and Feeley (2009) who purport that educators in special education classrooms ought to “carefully consider each mode of communication, *whether* verbal, gestural, and graphic, for each of their students with ASD and have an understanding that the use of one does not preclude the use of another” (pg.17).

Teacher perspective is critical to the meaningful use of the iPad. The perceptions of teachers can impede, or promote and expand, the use of the iPad as an instructional tool. It is important to obtain and explore Saudi teachers' perspectives on the use of iPad as an instructional tool to develop and enhance communication skills of children with ASD in their classrooms. A qualitative study will provide a deeper and wider exploration of teacher perspective, and permit a better and clearer understanding of Saudi teachers' perspectives concerning the iPad as a technological strategy that may assist in the development of social, language, and overall academic abilities of children with ASD in Saudi Arabia.

### **iPads use for Children with Autism**

Within the last decade, interactive technology devices have been developing and bringing changes to the home environment, as well as the classroom environment. These technology devices include interactive markers, multi-touch interfaces, and augmented reality applications. It is even reasonable to believe that interactive technological devices have transformed the manner in which our young children play, and especially learn, as well as behave in society, and

orient towards life in the future. More importantly, the extant and recently emerging technology devices have not only had a significant impact on education, but have also become an implementation challenge to the global educational sector (Ostaszewski & Reid, 2010).

Children between the ages of eight and nine are being deemed as technologically savvy (Buckingham, 2007). More interestingly, handheld devices such as the iPad have been the popular device among young children (Kabali et al., 2015). For example, school bags seem to be occupied with handheld devices rather than with traditional textbooks (Timmermann, 2010). This example is certainly consistent with O'Malley et al. (2014) finding that intervention with the use of the iPad was found to be a practical and efficient tool for enhancing the knowledge, skills, abilities, and interests of students with ASD deficiencies.

The potential benefits of educational technology are considered by most nations to be levers of educational reform (Timmermann, 2010). In some nations, like Saudi Arabia, some children with ASD are educated in mainstream environments, as parents and children can choose the teaching learning environments that they want. However, the focus of educational technology has been on the inclusion of technology into the mainstream educational system so as to support several educational objectives not directly related to children with special needs (Armstrong et al., 2011).

Since the emergence of technological devices as assistive learning methods, educational researchers, educational psychologists, and technology specialists have been debating the role of educational technology in the educational system. Education researchers have been advocating for an approach that integrates the curriculum into technology, and technology specialists have been advocating for technology to be integrated into the curriculum (Clements & Sarama, 2003). Some educational psychologists label educational technology as “agents of distraction” and

“time wastage” (Hussein, 2010), while others called it “supportive of learning” and “a must for instruction” (Earle, 2002). Accordingly, Davies & West (2014) advocated for a technology-based curriculum that would emphasize meeting the needs and fulfilling the expectations of the student and teacher. This advocacy seems appears logical, because the student and teacher could be considered the two most significant stakeholders in any educational system.

Dhir et al. (2013) believed that because of the prevalence of dissimilar conceptions and undependable information concerning the possible influence of educational technology devices on learning and classroom instruction, educational technology devices have experienced a relatively slow adoption into the mainstream educational systems, particularly in developing countries, such as India and Saudi Arabia. The prevalence of varying differing conceptions and misconceptions poses significant challenges against adoption and integration of technological devices that could be used for educational purposes. With the emergence of newer and higher technological devices, such as smart boards, touch-based instruction through touch table, and the iPad, education systems have experienced a new wave of tools to support the teaching and learning process.

Among high-tech devices, the iPad tablet, with its screen size, multimedia support, lightweight, and long battery life, has been noted as an ideal instrument with which learners can perform the differing required actions in the teaching and learning processes (Ostashewski & Reid, 2010; Churchill et al., 2012). Although the initial version of the Apple iPad emerged early in 2010, by mid-2012, varying types of iPads were already dominating educational environments (Falloon & Khoo, 2014). Notwithstanding this proliferation of the iPad, and the use of the iPad in educational environments, Hutchins (2012) stressed findings that iPads are relatively unexplored as tools for educational purposes, and Churchill et al. (2012) and Dhir et al. (2013)

emphasized the evident scarcity of empirical studies examining the use and integration of the iPad into the teaching-learning systems.

Although Valstad et al., (2010) suggest that the iPad can be quite a useful device, even for the novice educator, its incorporation into the educational system is not an easy task, because it necessitates adaptation of new and relevant instructional and teaching strategies. Not surprisingly, the use and integration of the iPad into learning environments are negatively impacted by some common misconceptions. Some boards of education believe the iPad is not useful for teaching objectives and learning goals, it is considered as “time wastage” and, “an entertainment tool with almost no role in learning” (Churchill et al., 2012). Considering the potential benefits of the iPad tablet for educational instruction, pedagogy, and learning, the iPad intervention can certainly become a practical and efficient way for enhancing independence and academic ability via development and improvement of communication skills of children with ASD and for their teachers in Saudi classrooms.

As the literature bears out, little research has been done to investigate iPads as an instructional tool in special education, particularly for children with moderate to severe developmental disabilities stemming from Autism (O’Malley et al., 2014). Given, this qualitative study is recommended by various researchers as continued investigation to better understand and widen the literature base, regarding teachers’ perspectives concerning technological strategies that may assist in the development of social, language, and overall academic abilities of children with Autism. Dunn et al. (2009) articulate that effective research groups delving into the special education referral process should focus carefully on the integration of stakeholders’ perspectives. Dunn et al. (2009) further suggest that teachers’ perspectives impact the delivery of high quality instruction in their classrooms on a consistent basis. This study is fills gaps and expands the

literature on the use of iPads with students with Autism Spectrum Disorder (ASD) in Saudi Arabia. The research questions are two-fold:

1. What are the perspectives of Saudi male special education teachers in Jeddah city, on the use of iPads in their classrooms to teach students with characteristics of Autism?
2. In what ways do Saudi male special education teachers in Jeddah city discuss the use of iPads to enhance communication skills in students with characteristics of Autism?

### **Summary**

The iPad is a popular handheld interactive multimedia device, and its growing popularity is found among both teachers and students. Although the above studies reveal that handheld digital technological devices carry the capability to support the teaching-learning process and educational literacy, studies with a focus on the iPad and its benefits in the teaching-learning process of students with Autism Spectrum Disorder (ASD) remain scarce. To situate this study in the literature, I accessed and reviewed the instructional benefits of using the iPad in educational environments, such as classrooms, by reviewing a vast body of empirical and theoretical findings reported in multidisciplinary literature on technology and children, iPad use in classrooms, and the impact of interactive technology on learning, instruction, as well as educational literature on children with Autism Spectrum Disorder (ASD).

## Chapter Three: Method

### Research Design

The purpose of qualitative research is to provide an in-depth description and “understanding of human experiences, emotions, and thoughts” (Lichtman, 2013, p.17). In this study I utilized the qualitative interview to understand and explore Saudi male special education teachers’ perspectives on the use of iPads to enhance teaching in general, and with more specificity, in developing or enabling, communication skills for students with Autism. The use of qualitative research has many benefits. Table 1 presents a visual alignment of the study design and interview questions, to that of the research questions.

**Table 1.** Study Alignment to Research Questions

Research Question	Study Alignment
1. What are the perspectives of Saudi male special education teachers in Jeddah city, on the use of iPads in their classrooms to teach students with characteristics of Autism?	Design: <ol style="list-style-type: none"><li>1. Purposeful sampling</li><li>2. Use of synchronous interviews to elicit teacher perspectives</li><li>3. Recording methods to preserve teacher responses as data for later analysis</li><li>4. Coding of data to discover themes</li></ol>



**Table 1.** (Continued)

	Protocol questions:
	<ol style="list-style-type: none"><li>1. Tell me about the use of iPads with students with ASD in your classroom?</li><li>2. Tell me about any professional preparation you have participated in, in order to use iPads in the classroom (i.e., teacher training, professional development).</li><li>3. Tell me about what you perceive as your students' reactions to and experiences with, the iPads.</li></ol>
<hr/>	
2. In what ways do Saudi male special education teachers in Jeddah city discuss the use of iPads to enhance communication skills in students with characteristics of Autism?	Design: <ol style="list-style-type: none"><li>1. Purposeful sampling</li><li>2. Use of synchronous interviews to elicit teacher perspectives</li><li>3. Recording methods to preserve teacher responses as data for later analysis</li><li>4. Coding of data to discover themes</li></ol>
	Protocol questions:
	<ol style="list-style-type: none"><li>1. What more can you tell specifically about your use of the iPad to with your students with ASD to support communication?</li></ol>
<hr/>	

First, due to the structure of qualitative research, detailed descriptions of participants' feelings, opinions, and experiences emerge as the researcher interprets the meanings of participants' actions (Creswell, 2003; Denzin & Lincoln, 2013). A qualitative research approach provided me with rich opportunities to understand each participant, and to gain more details connected to the topic (Creswell, 2012; Lichtman, 2013). A qualitative researcher also has the chance to look at a social phenomenon from a holistic viewpoint that takes the form of a

“complex, interactive, and encompassing narrative” (Creswell, 2003, p. 182), I definitely experienced this when interviewing the teachers in this study.

Second, I choose a qualitative method because it helped me to know more about Saudi special education teachers and their experience with the use of iPads to teach students with Autism. In this study I conducted in-depth interviews, which are a type of qualitative interviewing that emphasize conversation between researcher and the participant (Kvale & Brinkmann, 2009; Rubin & Rubin, 2012). Through in-depth interviewing, I explored the experiences and opinions of the participants deeply, and learned more about what the teachers were thinking and feeling (Rubin & Rubin, 2012; Lichtman, 2013). Moreover, the choice of in-depth interviewing was made as it helped me as researcher hear what participants wanted to say in their own words, in their own voices, and with their own languages (Lichtman, 2013). In addition, through conversation spurred by the interview approach, study participants provided deeper dimensions to the data with the addition of a deeper understanding of motive, attitude, and context, all aspects simple questionnaire data does not reveal (Lichtman, 2013). Thus, an interview research design was well aligned with my research questions to understand Saudi teachers’ perceptions of the use of iPads for teaching students with Autism.

### **Limitations**

Berg and Lune (2012) commented, “Qualitative research is a long hard road, with elusive data on one side and stringent requirements for analysis on the other” (p. 4). In conjunction with the data interpretation and analysis issues, Darlington and Scott (2002) suggest that making an undeveloped question researchable is very difficult. Thus, question refinement may be continuous throughout an entire study. In this study, the final research questions underwent several rounds of refinement before being entered into the approved design.

## **Participants**

I employed a purposeful sampling strategy to select participants for this study (Creswell, 2012). Patton (2002) indicates that there are no specific rules that require a specific number of participants that should be interviewed in a qualitative study. The aim of this study was to understand teacher's perspectives on the use of iPad from a knowledgeable number of teachers. Hence, data were collected from a select number of qualified teachers. In order to decide how many participants invited to the study, I referred to Creswell (2008) who mentions that qualitative studies commonly create focus by using a small, carefully selected group of participants. Therefore, the number of participants for this study was projected to be between five and seven, and ultimately the number of participants was five. Saudi male special education teachers who specialized in teaching students with Autism in Jeddah City made up the group from which participants were selected. The teachers worked at schools in Jeddah City, Saudi Arabia. The choice of this geographical area was made because I both lived and worked professionally as a public school teacher there for thirteen years, and had a working knowledge of the educational programs and region.

Participant selection occurred in phases. First, I selected teachers who taught in Jeddah City. Second, I selected at least five, but no more than seven (to account for possible attrition), special education teachers who specialized in teaching students with Autism. Third, I applied criteria that teachers must have had experience in teaching students with Autism for more than five years. Fourth, I applied criteria that teachers be familiar with using assistive technology. The following eligibility questions were crafted to guide my selection and were asked to the invited participants:

1. Are you currently teaching in a classroom with students labeled with Autism?
2. Do you use iPads in your classroom with students labeled with Autism on a regular basis?
3. Do you use iPads as assistive technology with your students in the area of communication?

These questions also appear in Appendix A. Once these initial questions were asked, I sought further study eligibility questions and asked interested teachers if they possessed the knowledge and experiences needed to respond to the research questions (i.e., at least five years teaching students with ASD).

## **Procedures**

In the end, I was able to recruit five Saudi male special education teachers. These five teachers were culled from the same school, an institute for students with Autism located in Jeddah city. Study recruitment strategies depended on my personal contacts from the time as a teacher in the same region. I obtained a permission letter from the department of education in Jeddah City to allow me to contact the institutes' principals, and to secure permission to interview the teachers. I emailed the principal of the institute and provided him with the documents related to my study (such as the purpose of my study, interview permission letter, USF IRB approval, and consent).

Next, I asked the principal to email the teachers who taught in this institute to invite them to participate in my study. The principal asked the teachers who might be willing to participate in my study to share their emails and phone numbers with me, so I could contact them and provide them some information regarding the procedure of the interviews, as well as informed consent.

Finally, after I obtained the teachers' emails and phone numbers, I contacted them to arrange the date, time, and place (on location or virtual, given the directives of both the US and Saudi Arabia relating to the global health pandemic starting March 2020) for conducting the interviews. Participants were given the questions two to three days ahead of the scheduled interview.

### **Interviews**

I interviewed five participants in this study who were all male special education teachers of students with Autism. The interviews consisted of in-depth, semi-structured open-ended questions in order to understand the teachers' perspectives on using iPads in their classrooms, and using iPads with children with Autism to support communication. According to Merriam (1998), interviews are the most common procedure for qualitative data collection. The interview is a method that allows researchers to have an open and honest conversation with participants to obtain data through communication (Cohen et al., 2003). There are different types of interviewing. Merriam (1998) indicates that interviews can be highly structured, very unstructured, or semi-structured.

For this study, I used semi-structured interviews with open-ended questions. In the semi-structured interview, the researcher prepares a list of questions in advance and asks follow-up questions (Rubin & Rubin, 2012). The open-ended questions allow the researcher to understand and capture the point of view of other people (Patton, 2002). Also, asking these types of questions allowed me to seek further clarification, examples, and explanations of certain topics at any time throughout the interview (Turner, 2010).

In this study, the interviews were conducted in one of two ways, which was dictated by the state of the travel and personal contact restrictions given the global pandemic of COVID-19,

which began impacting global travel and face-to-face contact in March of 2020. I traveled to Saudi Arabia in April of 2020 to conduct the interviews face-to-face, however by the time I had arrived in county, there was a national pandemic quarantine in effect. Face-to-face interviews were restricted. Therefore, I conducted synchronous live and real time interviews using a secure web-based platform that allowed me to see and hear the study participant. The interviews were audio-recorded.

The interviews were recorded using a digital voice recorder. I arranged a time with the participant, and requested him to be in a quiet, distraction free space that is most comfortable and convenient to him for the duration of the interview. The interviews lasted between 60 and 90 minutes for each participant. The interviews consisted of open-ended questions, allowing for probing and follow-up. The first part of the interview focused on the teachers' background and experience. The remaining parts were designed to answer the two research questions. (See Appendix B for interview protocol). Participants were informed that the interviews would consist of responding to two different sets of questions, one regarding iPad use with students with ASD in general, and one regarding iPad use to develop communication skills in students with ASD.

### **Data Analysis**

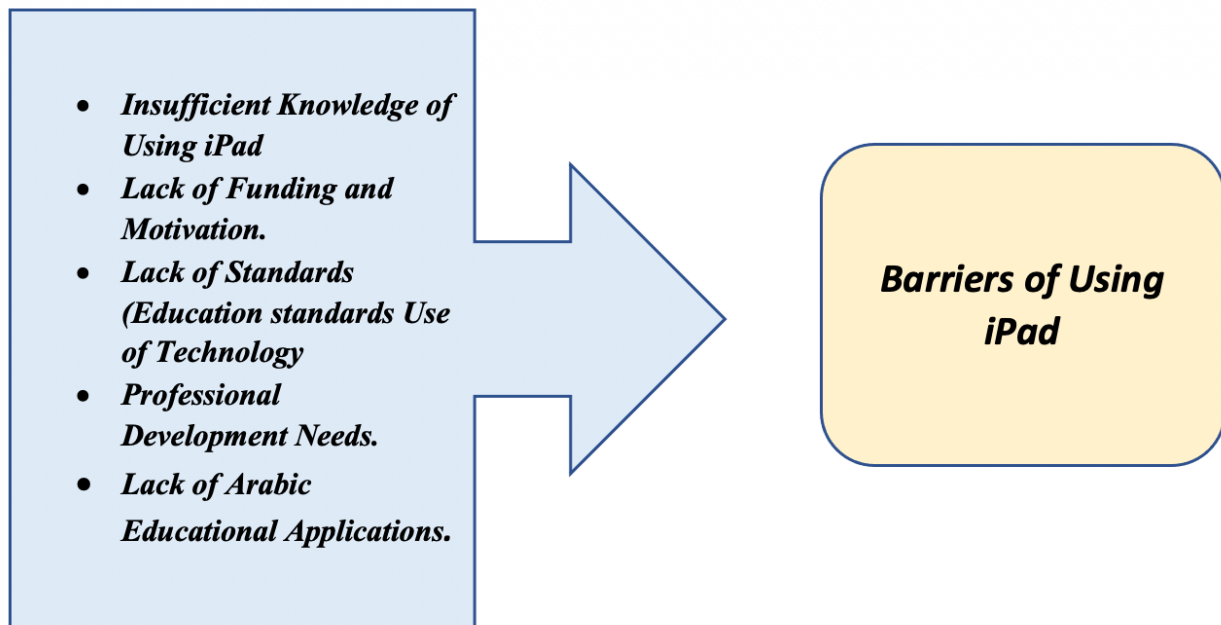
The data in this study were obtained through semi-structured, open-ended interview questions. The data were analyzed thematically. Guest et al. (2012) described thematic analysis as, "...moving beyond counting explicit words or phrases and focusing on identifying and describing both implicit and explicit ideas within the data, that is, themes. Codes are then typically developed to represent the identified themes and applied or linked to raw data" (p.10). A thematic analysis emphasizes identifying common themes within data. Themes are important to the description of the investigated topic when they are associated to research questions.

The analysis of the data set for this study began with a verbatim transcription of the interview, for which hired a transcription service, and double verified for accuracy by myself. The interviews were conducted in Arabic, and then translated to English. Following the transcription, I coded the responses to find connections between them and the research questions. For the first cycle of coding, I used a combination of two coding methods, “In Vivo Coding” and “Descriptive coding” (Saldaña, 2016). The In Vivo Coding method involved coding by using participant’s actual words and/or phrases. This coding approach was useful for this study as it prioritizes and honors the participant's voice (Saldaña, 2016). For the descriptive coding, I summarized the basic topic of the excerpt in a short phrase or a word (Saldana, 2016). Figure 2 provides an example of the first cycle of coding displaying both Arabic and English translation.

<i>In Vivo coding</i>	<i>Descriptive Coding</i>	<i>Text</i>
لا يوجد دعم مالي		<p>طبعاً التكنولوجيا عالم كبير ولكن حبيت اختصره في الأجهزة المحمولة. وترددت في اختيار الجهاز المناسب وكم تكلفته وهل طلابي عندهم القدرة في استخدامه او لا. وفي النهاية توصلت الى ان أفضل جهاز ممكن استخدامه هو الايباد. ومثل ما تعرف الايباد في تطبيقات كثيره ومميزه. ولكن في البداية كنت أفكر في التكلفة لأنه لا يوجد دعم مالي من وزارة التعليم مخصص لمثل هذي الأشياء. لذلك قررت اتحمل التكلفة واشترىها على حسابي الخاص.</p> <p><i>Of course, technology is a massive world. But I liked to I'd like to narrow it down to mobile devices. I hesitated to choose the appropriate device, how much it costs, and do my students have the ability to use it or not. In the end, I found that the best device to use is the iPad. And as you know the iPad has many and distinctive applications. But at the beginning I was thinking about the cost, because as you know, there is no financial support from the Ministry of Education for such things. So, I decided to bear the cost and buy it out of my own pocket</i></p>
No financial support	ندرة في التطبيقات التربوية العربية لأطفال التوحد	<p>راح أكون صادق معاك وأقول للأسف التطبيقات العربية المتخصصة في مجال التوحد وتحديدًا التي تركز على مهارات التواصل جدا قليلة وإن وجدت ممكن تكون بجودة رديئة. لذلك أحاول إنني استخدم بعض البرامج التي لا تركز على لغة معينة.</p> <p><i>I will be honest with you and unfortunately say the Arabic applications specialized in the field of autism specifically those that focus on communication skills are very few, and if found they may be of poor quality. Therefore, I try to use some programs that do not focus on a specific language.</i></p>
	Lack of Arabic Educational Applications	

Figure 2. First Cycle Coding

Figure 3 displays the process I undertook to move from codes to themes. In the second cycle of coding, I used the “Pattern Coding” method, which is an appropriate method to develop major themes from the data (Miles et al., 2014). The Pattern Coding method involves grouping codes from the first cycle coding into a smaller number of themes (Saldaña, 2016). I grouped the codes into different themes based on their similarities as shown in Figure 2 below.



**Figure 3.** Second Cycle Coding

Quality checks regarding my data analysis were undertaken using Dey’s (2003) approach to dealing with inherently uneven, qualitative data. I concur with Belotto (2018) that coding can be conceptualized as a decision-making process and is valid in qualitative research. I asked and answered the following data quality check questions: is any of my analyses a result of my own subjective observation (in the production and choice of codes for example), does any of the data bear out results similar to teacher perspectives studies on the use of iPads in special education?, what were my motivations during coding and synthesis of the data?, and what biases if any, may



have influenced the manner in which I analyzed the data (Dey, 2003). In the selection of codes, because I used participants direct quotations (voices) to produce the codes, any personal subjective bias on my part is thereby lessened. I also did not generate a possible codes list prior to analyzing the data. In terms of previous literature on the topic, the data bear out similar findings in terms of barriers, which include motivation. There is a natural bias inherent to scholarly work that dictates a level of commitment and interest in the subject matter that likely may produce hidden biases. However, through the use of consistent check backs to the participants voices, I believe I minimized inherent bias as much as possible.

In addition to the quality checks discussed previously, I verified that my translation from Arabic to English was correct through the use of a native English-speaking colleague. This helped with the accuracy of translation from Arabic to English through the iterative coding cycles.

### **Trustworthiness, credibility, and validity of the study**

To ensure trustworthiness and credibility, I used member checking for reducing errors and increasing credibility. According to Birt et al. (2016) member checking, also known as participant-validation, is a technique that researchers use to explore the credibility of results. Each participant in this study was provided a transcript of each interview to review, correct any mistakes, and provide comments and feedback to validate the accuracy of the information.

According to Noble & Smith (2015), validity in qualitative research has to do with how closely the findings align with study data. By coding directly from member-checked interview transcripts, the chances of making interpretation errors are lessened. The choice of coding approaches too, increases the validity of the data in that in-vivo methods use participants' actual

voice (spoken words to express meaning) to then extrapolate perspectives, differences, and commonalities among participants.

### **Ethical Considerations**

As the qualitative researcher for this study, I understand the need to attend to study ethics. As Sanjari et al. (2014) declared, “respect for privacy, establishment of honest and open interactions, and avoiding misrepresentations” are key issues of ethics that a qualitative researcher must maintain (p. 3). By meeting with the participants separately and according to their availability, by asking semi-structured, broadly worded and open-ended questions, and by accurately presenting the participants perspectives, I took the primary ethical issues into consideration.

A crucial factor of qualitative research delves into the consideration of respect and confidentiality for the study participants. Kvale and Brinkmann (2015) focus on three elements of ethical consideration: informed consent, confidentiality, and consequence.

#### **Informed Consent**

Prior to enrolling a participant in a study and thereafter, informed consent is essential. Accordingly, I gave participants information to use in their voluntary decision-making process that addressed if they wished to participate as research subjects (see appendix C for the approved IRB informed consent letter). The informed consent process took the form of a dialogue of the study’s purpose, duration, alternatives, risks, and benefits (Miles et. al., 2014). The ongoing process of consenting afforded participants the chance to “withdraw” or “opt-out” of the study at any time. I gave participants written copies of the informed consent in their first language of Arabic so that they could read and understand the document.

### **Confidentiality, Privacy and Anonymity**

To strengthen confidentiality, I took precautions in identifying participants. For example, I used pseudonyms for the participants' names (Schwandt et al., 2007). In addition, I kept participants' interview transcripts secure, not showing anyone the data except for the participants to review their interview transcripts for accuracy and validity. Also, I used a secure digital device to record the interview, and explained to the participants the confidentiality measure (Lichtman, 2013). I collected the data on a handheld digital recorder and did not share the recorded audio with other individuals. As per USF IRB guidelines, I gained permission to save study data secularly on an approved cloud storage site for five years. After five years, I will delete the data.

## Chapter Four: Findings

The purpose of this study was to explore Saudi teachers' perspectives concerning the use of digital tablets that may assist in the development of communication, social, language, and overall academic skills of children with Autism. In-depth qualitative interviewing was selected as the method and was guided by two research questions:

1. What are the perspectives of Saudi male special education teachers in Jeddah city, on the use of iPads in their classrooms to teach students with characteristics of Autism?
2. In what ways do Saudi male special education teachers in Jeddah city discuss the use of iPads to enhance communication skills in students with characteristics of Autism?

A qualitative method was selected for this study. The data were obtained through semi-structured, open-ended interview questions conducted via virtual meeting software. I began analyzing the data by addressing each question. I coded participant voices from direct excerpts of interview transcripts, which led to the revealed themes and subthemes.

Findings in this chapter are discussed and organized according to each research question. First, the overall data are reported with reference to the overall themes and subthemes obtained in the process of the interview analysis. Second, more detailed findings are discussed. The chapter concludes with a summary. Prior to shifting to the analysis of the findings, an overall picture of the data is presented.

To conduct the study, I contacted Saudi special education teachers who taught students with Autism in Jeddah city, Saudi Arabia. I sent them an email explaining the purpose of the

study, the study criteria, and a consent form in Arabic language. Five Saudi special education teachers agreed to participate and share their individual experiences with the use of iPads to teach students with Autism in their classrooms. All the participants taught in the same school. It may be helpful for the international reader to know that special education schools are often referred to as institutes in Saudi Arabia. I asked the teachers involved in the study to choose a preferred pseudonym to maintain their respective confidentiality. They chose the names: Ahmad, Rami, Majed, Fahad, and Sami.

### **Getting to Know the Participants**

#### **Ahmad (Pseudonym)**

Ahmad has been teaching students with Autism for nine years. He graduated with a bachelor's degree in 2011. He also obtained his master's degree in special education with an emphasis in applied behavior analysis in 2019. He has taught elementary, middle, and high school in different cities in Saudi Arabia. He chose to teach all levels to improve himself and to be exposed to a diverse range of student abilities and needs. At the time of his interview, he taught fifth grade students in a self-contained setting and had seven students with cognitive classifications of mild to moderate cognitive impairment in his classroom. The ages of his students were between 12 and 15 years old.

#### **Rami (Pseudonym)**

Rami has been teaching students with Autism for nine years. He graduated with a bachelor's degree in special education in 2011. He has experience in teaching students with Autism at different ages, levels, and intellectual functioning criteria. The youngest student he has taught was six years old, and the oldest student was 24 years old. Rami has worked in different schools and institutes. At the time of the interview for this study, Rami had been teaching at the

institute with the other participants for five years. Rami taught first grade and had three students in his classroom. Their ages were six, seven, and ten with cognitive classifications of mildly cognitively impaired, to moderate.

**Majed (Pseudonym)**

Majed has been teaching students with Autism for 11 years. He graduated with a bachelor's degree in Autism and Behavior modification in 2011. He obtained his master's degree in Autism Spectrum Disorder in 2018. Majed is also certified with a behavior analyst license from the United States that he earned in 2019. Majed has experience in teaching students in elementary and middle school. Majed has been teaching in the institute where the study was conducted for five years, and he works with second grade. His students' ages are eight and nine years old, and their identified disability is mildly cognitively impaired.

**Fahad (Pseudonym)**

Fahad has been teaching students with Autism for ten years. He graduated with a bachelor's degree in behavioral disorders and Autism in 2010. He will start his master's degree in 2021. Besides his teaching job, Fahad works as an author. He has written for newspapers, and he published his first book in 2016 about Autism. Fahad has taught in different cities in Saudi Arabia and worked in elementary and middle schools. He moved to Jeddah city in 2013, and he has been teaching in his current institute since 2015. Fahad teaches fourth grade and at the time of this study had five students in his classroom. His students ages were between ten and 13, and their identified disability is mildly cognitively impaired.

**Sami (Pseudonym)**

Sami has been teaching students with Autism for 12 years. He graduated with a bachelor's degree in Autism and Behavior modification in 2007. He received his master's degree

in special education with an emphasis in applied behavior analysis in 2017. He first started teaching in a private school in 2008, and did so for two years. The age of his students at that time was between 21 to 40 years. The purpose of that school was to prepare students with Autism to work and to gain independence. Sami moved to be able to teach in public schools, and has been doing so for the past three years, in two different cities. At the time of this study, Sami taught sixth grade and he had four students in his classroom. His students ages were between 14 and 16, and with cognitive classifications of mildly cognitively impaired.

### **Research questions and code generated themes**

In analyzing the data surrounding the research questions regarding the perspectives of Saudi male special education teachers in Jeddah city, on the use of iPads in their classrooms to teach students with characteristics of Autism and the ways Saudi male special education teachers in Jeddah city discuss the use of iPads to enhance communication skills in students with characteristics of Autism, the participants expressed myriad viewpoints, attitudes, and feelings. The aim of the first question was to better understand Saudi special education teachers' perspectives on the use of iPads to teach students with Autism, and what if any, differences in perspectives existed surrounding the use of iPads. Two major themes emerged related to research question one, positive attitudes toward the use of the iPads, and barriers to the use of the iPads. The themes connected to the second research question appear after this discussion in this chapter.

#### **Theme one: Positive Attitudes toward using iPads**

Four of the five teachers who participated in this study expressed the importance and benefits of using the iPad in their teaching. Two of the teacher's responses showed how using iPads helped to improve students' verbal communication skills and cognition, mediated by communication applications installed on the iPad devices:

*“I do not exaggerate when I tell you that there are students who seem to be developmentally more sophisticated when using the iPad, and I notice improvement in terms of verbal communication and eye contact as time progresses compared to using traditional methods of teaching. And I suspect the main reason is their love for smart devices. So, I found that the difference between teaching with the iPad versus traditional methods, is in the extent of students’ interactions, they are better with the iPad” (Rami).*

*“Let me tell you at the beginning that I am passionate about using technology in teaching, and since I started in this field I have relied entirely on technology in general. In my second year of teaching, I bought computers, a smart blackboard, and a projector at my own expense. The reason is that the technique is very useful for both the teacher and the student. As I mentioned earlier, I wanted to keep up with the pace of developments and use the iPad to teach my students to improve their communication skills. I was really excited about the idea because I was sure that the applications available on the iPad would facilitate the process of communication between me and the students, and would be an attraction for them to learn and develop their skills in general” (Majed).*

Majed also commented that students with Autism interacted and showed signs of enthusiasm during the use of some application in the iPad. He also mentioned how technology, in his professional opinion, can act as a tool to aid in modifying behavior (students are motivated to comply in order to access the iPad device), and reduce what he referred to as the “hyper” movements of students in the classroom.

*“As for reactions, they vary from one child to another, but in general there is a noticeable benefit. For example, there are students who have hyperactivity and very weak*



*reflexes. And when I used some of the applications on the iPad, I gained interaction from them that I did not get before. I'll give you an example, there is an application that after achieving its goal by the student, the application mentions the name of the student and applauds him, thus you find the student focusing more with the application and showing signs of satisfaction and enthusiasm. Therefore, this application on the iPad becomes a beautiful contributing factor in modifying behavior, reducing the hyper movement of the student in the classroom, as well as developing the thinking skills of students” (Majed).*

Rami and Sami noticed students with Autism having fun while using the iPad in the classroom. They also mentioned how this generation seem attracted by using the iPad's applications.

### **Theme Two: Barriers to using iPads**

Interviews with five teachers in Saudi Arabia detected six major barriers associated with using iPads in a classroom for students with Autism. As reported by the participants, these barriers included but may not be limited to: insufficient knowledge of iPad use, insufficient funding, a lack of teacher motivation, weak family involvement, a lack of standards (national or education standards on the use of technology), professional development needs, and a lack of Arabic educational applications (apps). Each barrier presents an opportunity to understand the teachers' perspectives in more detail.

***Insufficient Knowledge of Using iPad.*** Three out of five Saudi special education teachers stated that they had insufficient knowledge of using iPad to teach their students with Autism. One of the teachers mentioned that he relied on traditional methods, rather than the use of technology.

*“In the beginning, in general, I did not use technology, or rather I did not rely on the use of technology and iPads to be more precise, I relied on the traditional method of teaching my students because I do not have sufficient experience. I think that the main reason that teachers are not qualified is because of the lack of specialized study materials in this field, which in turn prepares teachers before the job on how to deal with and benefit from technology during the lesson. And this problem I am sure you will find in most of the teachers” (Rami).*

Majed and Fahad pointed out that they found difficulty in using iPads because they did not implement them to actually teach students in the classroom.

*“To be honest with you I often found it difficult for several reasons including insufficient knowledge of using the iPad, how to use applications, and how to use them to teach my students. Knowing that as I mentioned earlier, I have a passion for using technology during teaching because I want to change from the mainstream way of teaching using traditional methods and replace it with technology, which in turn may be attracting to the learning” (Majed).*

*“As for the use of the iPad, I have quite frankly used it, but do not rely heavily on it in the sense that I use it at varying times. The reason is because I rely on the traditional method of teaching, as well as my lack of experience and lack of knowledge in what suits the abilities of my students, in addition to the lack of sufficient skills to help me use it in teaching my students” (Fahad).*

**Lack of Funding and Motivation.** Ahmad, Rami, and Fahad stated that there is a lack of funding from the Ministry of Education in Saudi Arabia. They believe that the cost of buying iPads and subsequent applications to teach students will cost a lot of money, that not all teachers can bear if mandated for teachers to personally provide.

*“In addition, some programs are limited, and in order to obtain the program's services you must pay money and sometimes they are expensive. As you know the Ministry of Education does not provide additional funds for the teacher to buy educational programs, so I preferred to use only one program because it is in Arabic and has all I need to teach my students” (Ahmad).*

*“...at the beginning I was thinking about the cost, because as you know, there is no financial support from the Ministry of Education for such things. So, I decided to bear the cost and buy it out of my own pocket” (Rami).*

*“The other reason even if it is available, it is expensive. I might be able to buy it, but can other teachers do that as well? Most teachers have passion and enthusiasm but are less motivated when we talk about the expensive costs. Frankly, the Ministry of Education does not provide such tools” (Fahad).*

Some teachers pointed out that there is a lack of motivation for the use of iPads in classrooms. Teachers need more support from the supervisors who visit their classrooms.

*“The reason may be the lack of encouragement from the supervisors during their visit to me in the classroom, so I often apply what is required of me in the traditional way in teaching my students that is far from the use of technology in general and the iPad in particular” (Rami).*

*“At first, there is no incentive for the teacher in terms financially, as the hard-working teacher does not get a financial reward, so some teachers get frustrated and have less motivation and desire to develop new skills. Therefore, in order for the teacher to reach the stage of creativity, he must have rewarding incentives. Secondly, the high financial cost, because the devices are expensive, and the teacher bears the cost” (Majed).*

**Family Involvement.** One of the barriers that teachers expressed they faced in using iPads to teach their students is family involvement. Some parents believe that digital devices are harmful, so they do not allow their kids to use iPads and download any educational apps.

*“Regarding student interaction it varies, but to be honest with you most students when I use the iPad, I notice they get preoccupied with entertainment programs such as YouTube and try not to be preoccupied with educational applications. It may be because parents do not download educational apps for their children at home so that they can learn, so most of my students are not enthusiastic about the use of iPads. This may be one of the barriers that I suffer from and I am not motivated to use it compared to other educational tools. So, as I mentioned, I rely heavily on traditional teaching methods” (Ahmad).*

*“Parents’ lack of acceptance of the idea of using the iPad is also a hindrance to most teachers. The reason is that some parents have a belief that one of the reasons for Autism is the use of technology, especially mobile devices, including the iPad” (Fahad).*

*“There are also some students who have a love of learning and I notice it in their eyes or through their enthusiasm when holding the iPad, but I am having difficulty training them because of their lack of knowledge and familiarity of the iPad. The reason may be that parents reject the idea of the iPad, or lack enough knowledge about programs for children with Autism and have a general idea that this device is harmful and may increase the condition of his child with Autism, and this is of course a wrong idea” (Sami).*

Rami stated that some parents do not know how to use iPad applications to teach their children at home.

*“But on the opposite side, I noticed that some students were not receptive of the iPad. The reason, frankly, may be because they don't know how to use it” (Rami).*

***Lack of standards (National Standards on the Use of Technology).*** One barrier that a number of teachers mentioned during the interview is the lack of standards that integrate the use of technology such as the iPad, in teaching. Sixty percent of teachers pointed out that the curriculum they use did not include and encourage the use of iPad.

*“iPad use is not mandatory. There is no standard or objective in the curriculum for the use of technology in general and the iPad in particular. However, if the teacher wants to use the iPad to teach students with Autism, it is important that it is not a conflict with the study plans and curriculum set by the ministry, and herein lies the problem. Thus, comes the role of the teacher in adapting the iPad to the curriculum” (Rami).*

Fahad indicated that he started adapting the curriculum and adding the necessary goals, strategies, and tools in order to be able to teach his students using technology and the iPad.

*“One of the most important challenges that faces me, and I am sure that faces any teacher is that the current curriculum, whether for ordinary students or students with special needs, does not include nor address the use of technology in general during the lesson. Therefore, I make a greater effort to be able to adapt the use of iPad to the curricula presented in the time being. So, I create lessons using the iPad” (Fahad).*

Ahmad mentioned that he could not adapt the curriculum or create lessons, because he has seven students and each one differs from other.

*“Frankly, I use the iPad but at very different time periods, the reason for that is because our curricula does not contain any goals or standards related to the integration of technology or iPads in particular. I try to use it, but I also find it difficult because I have seven students and that number is large for students with Autism in one class. The number is usually*

*not more than five students in one class. Currently in my class the ages vary between 13 and 15 years old and the individual differences of course differ from one student to another” (Ahmad).*

***Professional Development Needs.*** 80% of teachers in this study reported that there is a need for training courses that focus on the use of the iPad to teach students with Autism. The lack of professional training related to the use of iPads for students with Autism emerged as a significant both concern and barrier to implementation. Majed and Fahad confirmed that they would attend such classes if there were to be any created.

*“For training courses, I have received several training courses on integrating technology with education but frankly I have not attended any training course focused on the use of iPad in teaching students. I wish to attend training courses like this even if it I have pay for it because it is useful and as a teacher it will help me develop myself in this field because as I mentioned earlier, I am passionate about integrating technology into learning” (Majed).*

*“I have about 260 hours of training, but they are not all focused on the iPad, but are in several areas of teaching. For example, I took courses in classroom management, in the art of dealing with problems, in teaching methods and learning styles, as well as in psychoanalysis, behavioral disorders and behavior modification. But there are courses I've taken in using technology in general. I think I would focus more on using the iPad if there were intensive courses, or at least their main focus is on technology. I hope that such courses will be available in the near future so that we can benefit” (Fahad).*

*“In addition to the lack of specialized courses and training in this field, there are some specialized courses, but they are considered rather expensive, and no teacher can take these courses, knowing that they develop teachers 'skills in using technology in the field of teaching and development in skills” (Fahad).*

*“For courses, I have attended several courses, all of which cater to students with Autism. With regard to iPads I took a course in 2015 called "Technology and Special Education Teachers", which was a week long, and the last day focused on the use of iPad in education, constituent of its advantages and disadvantages” (Sami).*

***Lack of Arabic Educational Apps.*** 100% of those involved in this study stated that there is a need for educational applications to be created in the Arabic language. They all shared similar issues on how they face difficulties on finding Arabic educational apps for students with Autism.

*“Frankly, I use several programs and have had several problems that I encountered with each program, but the real issue I face with most programs is that they are in the English. Even the numbers and letters are in English, so I had difficulty applying them to my students as my students do not speak English” (Ahmad).*

*“I will be honest with you and unfortunately say the Arabic applications specialized in the field of Autism specifically those that focus on communication skills are very few, and if found they may be of poor quality. Therefore, I try to use some programs that do not focus on a specific language” (Ahmad).*

*“There is also another application called (Autism iHelp) and I used it multiple times and it has images that simulate students, but I found it difficult to use. The reason is that the application is only in the English language and there is no Arabic version. As you know, my students speak Arabic, so I preferred not to use it” (Rami).*

*“The second challenge is the lack of applications in Arabic and their lack of diversity. I search for applications, I find them available, but in other languages” (Rami).*

*“Also, among the obstacles is the scarcity of applications dedicated to the Arabic language compared to applications programmed in English. As the options are minimal when searching for a dedicated application in Arabic, and I do not know the reason for the scarcity. If we explore applications dedicated to the English language, there are several options but unfortunately, I cannot apply them to my students because they do not understand the English language” (Sami).*

Ahmed expressed how when he finds a worthwhile application which develops vocabulary using images, he uses the pictures and silences the English words.

*“I see the most important obstacle we face as teachers of students with Autism is that some of the applications that I benefit from are not specified for children with Autism, but because they are useful, I have to use part of the application instead of using the entire application. For example, there is an excellent application but it is in English, therefore I don’t need the vocabulary nor the stories that are in it, and I only benefit from the pictures, so it will be excellent and useful if the words, stories and pictures are all in Arabic. Thus, I will summarize for you the problem is that there is a lack of Arabic applications specialized in developing the skills of students with Autism in general and developing communication skills in particular” (Ahmad).*

In analyzing the data surrounding research question two: In what ways do Saudi male special education teachers in Jeddah city discuss the use of iPads to enhance communication skills in students with characteristics of Autism? a third overall theme emerged around the enhancement of communication skills for student’s with Autism.



### **Theme Three: iPad Intervention to Enhance Communication Skills**

Ahmad stated that the use of applications on iPads promotes the positive engagement of students with Autism in learning, and aids in creating a positive attitude toward the teacher.

*“those who have difficulty speaking try to speak and I see signs of satisfaction in their eyes and they are laughing if they hear their voice in the application”* (Ahmad).

Ahmed also stated that the use of iPads can help break students’ fear barrier related to interpersonal communication with adults.

*“Of course, this student I had noticed that he did not speak a lot and had felt frightened somewhat when I spoke to him, so I thought about a way to break his fear barrier and help him develop skills in communication and speech”* (Ahmad).

*“what helped me was that the student could record his voice and there were some games that were compatible with the nature of the child with Autism”* (Ahmad).

Rami reported on positive aspects of using iPads in communication promotion through the use of applications which initiate speaking through the images students already know, motivating them to talk. Rami pointed out that the iPad can help students when they cannot recollect words.

*“This app helped me, and I rely on it greatly to communicate with my students. The reason is that the teacher can add words, pictures and symbols that the student can use when needed. Such as going to the bathroom, or if the student wants to drink water, speak, and communicate other commands.”* (Rami).

Moreover, Fahad stated that students can use pictures to indicate if they want something but cannot pronounce the words. Students can choose a picture to show what they want, and so communication takes place even if a student cannot or does not want to speak.

*“So, I had the idea of applying this program through the iPad, it creates image files and each image simulates a specific thing. For example (pictures of water, food, toilet, and so on) and then I trained my students to access files and choose the appropriate image that simulates his desire. If the student wants to drink water, he chooses the image of water, and if he wants to go to the toilet, he chooses the image that simulates the toilet, and so on. The idea of using the iPad was a nice and easy idea and only cost me some effort and time and without financial costs and I found its usefulness to the students.” (Fahad).*

Ahmed, Fahad, and Majed shared that communication between a teacher and a student with Autism can take several forms. The use of pictures and audio on iPads can promote communication, as students with Autism do not only see the images, but hear their pronunciation, which may initiate cognition to aid in students verbalizing those same words.

*“For example, a program specializing in repeating words (audio) the name of the program is (My Tom), and I found interaction from some students. The evidence is that some students are enthusiastic, especially those who have difficulty speaking, trying to speak, and I see signs of satisfaction in their eyes and they are laughing if they hear their voice in the application. Therefore, as a teacher I see that this program helped me a lot with the students” (Ahmad).*

*“Thankfully at the end of the year the child had the ability to pronounce some words like I want to play, I want to drink water, I am hungry and I want to eat, I want to go to the bathroom and also pronounce his full name. Consequently, there has become a noticeable development as the child came to me when he could not speak and did not know letters and numbers, and after a period of time he started to utter and had the ability to verbally communicate” (Fahad).*

*“I'm basically focusing on my students' weaknesses and trying to gradually develop them because children with Autism often have problems with visual and verbal communication as well as social interaction. So, one way I feel it has contributed to the development and support of communication skills is to use uncomplicated programs that are easy to use, and it is important not to rush the results” (Majed).*

In addition, Majed believes that iPads enable the use of graphic communication as one of the common forms of communication the children with Autism in his class prefer.

*“As for my focus on communication skills, it was really a primary goal in my use of the iPad. Currently, the child with Autism prefers (graphic communication), meaning if you say to the student hello, he may not pay you any attention, but in some iPad applications, programs focus on these skills so that there is a picture of a person with a raised hand sign and greets the student, the student interacts with him better. Therefore, this response is considered a success and achieved the desired goal from the student, because there is a response and an excitement that stimulated the students with Autism” (Majed).*

## **Conclusion**

The chapter focused on the findings obtained from the interviews with five Saudi male teachers working with children with Autism. Qualitative interview data were analyzed using a coding strategy. The findings in this chapter were arranged around the two research questions of this study: (a) What are the perspectives of Saudi male special education teachers in Jeddah city, on the use of iPads in their classrooms to teach students with characteristics of Autism? and (b) In what ways do Saudi male special education teachers in Jeddah city discuss the use of iPads to enhance communication skills in students with characteristics of Autism?

Addressing the first research question, the responses obtained from the interviews support in general, a positive attitude towards the use of technology with children with Autism. The responses given by the participants confirmed that the use of the iPad during classes with children with Autism can help teachers to add fun, increase engagement, and stimulates students' development.

Although there were positive attitudes toward using iPads to teach student with Autism, teachers stated six major barriers as well. The themes raised in this section were as follows: insufficient knowledge of the operation of the iPad, insufficient funding and teacher motivation, weak family involvement, lack of standards (national education standards on the use of technology), professional development needs, and lack of Arabic educational applications. These statements are supported by the responses of the male teachers and are justified with direct quotes from each of the interviews. Each of the barriers identified emerged from the participants perspectives.

Addressing the second research question, the research findings focused on the teachers' discussion of the ways communication skills in students with Autism can be improved through the use of iPads in the classroom. The findings of the current study point to the personal nature of the experience of teachers working with students with Autism, and how each may have similar yet distinct experiences. Four out of five teachers pointed out that iPads can enhance the communication skills for students with Autism. An interpretation of the findings of this study will be analyzed in the next section.

## **Chapter 5: Discussion of the Findings**

The purpose of this study was to investigate Saudi teachers' perspectives concerning the use of iPads that may assist in the development of communication, social, language, and overall academic skills of children labeled with Autism. Two research questions were formulated to guide this study:

1. What are the perspectives of Saudi male special education teachers in Jeddah city, on the use of iPads in their classrooms to teach students with characteristics of Autism?
2. In what ways do Saudi male special education teachers in Jeddah city discuss the use of iPads to enhance communication skills in students with characteristics of Autism?

The information in this chapter includes the discussion and interpretation of study findings, possible limitations of the study, conclusions, possible implications for practice, recommendations for future research, and a researcher reflection. The major finding of this study was that for the teachers involved, despite general positive feelings about digital device technology, non-student related barriers to implementation were many and significant. These barriers thereby limited potential benefits for both teacher and student and resulted in inconsistent, low, and no usage.

### **Teacher perspectives related to usefulness**

Research question one was formulated to explore perspectives of Saudi male special education teachers in Jeddah city, on the use of iPads in their classrooms to teach students with characteristics of Autism. Findings from the participant responses revealed that teachers

generally expressed a positive attitude towards the idea of the use of iPads and the actual use of iPads, when delivering instruction to children with Autism. Specifically, teachers elaborated that using iPads in the classroom enables them to enhance student engagement, stimulate the development of targeted skills in children, and add fun to the learning experience. Insights shared by teachers echo past study findings cited in prior literature wherein researchers and practitioners have also expressed strong positive attitudes towards the use of iPad to enhance the teaching of children with Autism (Chambers et al.,2017; Cumming & Rodriguez, 2013; O'Malley, Lewis, Donehower, & Stone, 2014).

Teachers' positive approach and support for iPad use may be understood in light of the technology acceptance model (TAM). According to Davis (1989), the degree of perceived usefulness of a technology influences an individual's motivation to implement it in their practice and daily use. As applied to the Saudi teachers in this study, the TAM model corroborates that a positive disposition enhances the use of the iPad as technology and will enhance their job performance, productivity, and aid them to accomplish teaching tasks easily. Also, due to its perceived ease of use, teachers are more inclined to use iPads consistently in their classrooms.

Similar observations made in a single-subject design study by O'Malley et al. (2014) examined the impact of using iPads to teach basic math skills to children with Autism. Findings from the study showed that a major advantage of using iPads in teaching was their ease of being modified to meet the individual needs of children with Autism, and in improving task completion (O'Malley et al., 2014). These insights parallel similar observations made during this study wherein Saudi teachers who noted that unlike traditional teaching methods, using iPads provided a flexible approach to the delivery of instruction. Besides enhancing task completion, teachers in

this study elaborated that using iPads facilitates social cognition and verbal communication skills, via supportive communication apps that are installed on iPads.

The central role iPads play in promoting academic engagement was reported by Cumming and Rodriguez (2013) in their research on how iPad use shapes language learning among students with Autism. Similar to the Saudi teachers who participated in this study, Cumming and Rodriguez (2013) reported high levels of US teacher satisfaction with iPad use because the iPad gave some measure of assurance that learners could work independently. These findings align with observations by O'Malley et al. (2014) in that using iPads gives students familiarity and independence when learning. Again, the perceived ease of use and usefulness of technology as noted in the TAM framework helps understand why teachers support the use of iPads in the classrooms (Davis, 1989). The acquired independence in iPad use, according to O'Malley et al. (2014) creates confidence that is key to generate interest among students to continue learning and improving on their skills. In line with the TAM proposed by Davis (1989), it may be argued that when iPads are perceived to provide essential support in creating a positive engagement between a student and learning materials, teachers also tend to express their willingness to use the technology to facilitate learning.

Further, when iPads aid in creating a positive engagement between a student and learning materials, teachers extend their willingness to use the technology to facilitate learning. Teachers in this study corroborated prior findings regarding increased opportunities for independence amongst their students given the iPad as a learning device.

Using iPads to support the learning of students with complex needs was supported by the Saudi teachers who took part in this study. Specifically, students' love for the devices was noted to have improved eye contact and increased verbal communication during class. A study by

Chambers et al. (2017) on iPad use in k-12 schools in the UK, Australia, Canada, and the US arrived at a similar conclusion. That is, iPad use has positive impacts on the learning of children with Autism, especially in meeting a range of special needs such as communication, learning, functional, and social interaction in class (Chambers et al., 2017). The potential positive impact of technology use in the classroom motivated some Saudi teachers to entirely rely on iPads, citing their usefulness for both teachers and students. According to Sulaimani (2017) technology use has positive impacts on increasing learning, ensuring assignment completion, and maintaining student focus on assigned reading and writing tasks. As a result, these positive outcomes may have attributed to perceived usefulness of the digital technology according to the TAM theory (Davis, 1989), and may help explain why Saudi teachers reported developing a reliance on iPads to teach students with Autism.

Saudi teachers' uptake of iPad technology in the classroom has been informed by the need to meet the unique and complex needs of each student. Different from using one size fits all learning in the classrooms, iPads enable teachers to develop tailored learning. As such, teachers consider iPads an essential technology use in their teaching jobs, in addition to enhancing and easing their job, thereby in part possibly explaining their support for iPads (Davis, 1989). Fernández-López et al. (2013) observed similar circumstances where technology use enabled teachers to work towards improving the special educational needs of learners who have diverse learning needs. Fernández-López et al. (2013) reported that the use of electronic devices provides unlimited options in terms of available multimedia content. Such diversity of learning content implies that Saudi teachers have innumerable teaching methods to enable them to increase attention and learning among students who have complex needs. Sulaimani (2017) also confirmed that iPads are flexible and provide different learning methods key to motivating



student engagement and efficiency. These findings align with the TAM theory by Davis (1989) emphasizing that Saudi teachers are likely to show a positive attitude towards the use of iPads when teaching children with Autism strongly due in part to the positive impacts of technology in facilitating teaching and learning.

### **Teacher perspectives related to ease of use**

Despite the positive attitudes that Saudi teachers have towards the use of iPad technology in teaching students with Autism, interview responses also revealed teachers encountered significant barriers when using them. These barriers included insufficient knowledge of the operation of the iPad, insufficient funding and teacher motivation, weak family involvement, lack of national education standards on the use of technology, unavailable professional development needs, and lack of Arabic educational applications. The next section of this discussion focuses on these barriers as the primary outcome of this study and is organized using subsections to further detail these barriers based on participant responses and past literature studies on the topic.

#### **Insufficient Knowledge of Using the iPad**

Three of the five Saudi teachers who participated in this study expressed concerns that they possessed inadequate knowledge of using iPads in the classroom. As a result, these teachers experienced barriers to effective instruction delivery using iPad technology, prompting one teacher to continue using traditional teaching methods. Concerns about teacher competency in technology use as a barrier to effective teaching of children with Autism in Saudi Arabia has also been reported by past researchers. For example, Alkahtani (2013) examined teachers' knowledge in using assistive technology for students with special educational needs. Results revealed that teachers lack adequate levels of skills and knowledge using assistive technology (Alkahtani,

2013). Insufficient teacher knowledge on assistive technology has been attributed to a lack of teaching programs for pre-service and in-service teachers on emerging technology needs in special learning.

TAM theory holds that perceived ease of use is a key factor informing the uptake of new digital technology (Davis, 1989). On the contrary, teachers who lack knowledge of iPad use are less likely to implement them in the classroom. That is, TAM theory posits that (Davis, 1989) some teachers may find it difficult to use iPads, and this in turn informs their choice not to adopt this technology. According to Saudi teachers, lack of knowledge in assistive technology is also exacerbated by inadequate study materials. As such, most teachers start their teaching careers without relevant know-how in technology use, including how to harness the benefits of technology during their lessons, especially when teaching students who have special needs. Similar concerns were shared by researchers such as Alfaraj and Kuyini (2014) and Almethen (2017) when they examined teachers' knowledge of the technology used to support the learning of children with special needs in Saudi Arabia. Findings from these past studies further corroborated the current study findings where lack of assistive technology skills is a major barrier to uptake and implementation of iPad usage in classrooms. The TAM framework predicts this behavior (1989).

Alabbas and Miller (2019) also found that Saudi caregivers had negative feelings about the technology used to provide care to children with Autism spectrum disorders. Like the findings of this study, Alabbas and Miller (2019) observed that a significant majority of Saudi care providers felt they lacked competency in using assistive technology. Considering limitations in training and knowledge on using technology, Alabbas and Miller (2019) and Almethen (2017) recommended the need to provide relevant skills training to ensure effective use of technology

among teachers and care providers who work with learners with Autism spectrum disorders. The required training and skills development need to be championed by school leaders to ensure teachers have the knowledge needed to use iPads in the classroom.

Importantly, despite a lack of knowledge and competency in the use of assistive technology in the classroom, Saudi teachers expressed strong interest in using iPads and showed a positive attitude in participating in training programs to improve their competency. Al-Moghyrah (2017) also reported that although teachers in Riyadh, Saudi Arabia, lacked essential skills to use technology, the majority supported any training efforts available to them to learn using technology in class when teaching students with special needs. Almethen (2017) also shared that although Saudi teachers lacked knowledge about technology from their pre-service training or during their in-service years, they were in support of additional training to acquire skills competency and professional development needed to use assistive technology in teaching children with Autism. Providing training will support Saudi teachers, and possibly help them to maintain their passion for teaching via using technology during teaching, as teachers who participated in this study shared that they aspired to evolve in their teaching using traditional methods, and replace them with approaches combined with technology to enhance student achievement and performance.

### **Lack of Funding and Teacher Motivation**

Lack of teacher motivation and funding were also identified as potential barriers to iPad use among Saudi teachers. In elaboration, three teachers shared that lack of financial support from the Saudi Ministry of Education was a major hindrance to technology adoption and implementation in the classroom. Specifically, teachers expressed concerns that purchasing and implementing technology is associated with high costs that teachers are not able to implement at

a personal level. Similar concerns have been raised by Alanazi (2019) on technology implementation among special education teachers' attitudes concerning the use of assistive technology in classrooms for students with an Autism spectrum disorder in Saudi Arabia. According to Alanazi (2019), although teachers express a positive attitude to technology implementation, lack of funding support demotivates their desire to use iPads in the classroom due to their high costs. Thus, it may be noted that the lack of both funding support and teacher motivation remains a major hindrance in technology use among special education teachers, especially in classrooms with students with Autism in Saudi Arabia.

Lack of funding and motivation presents a potential barrier to iPad use. As stated by Davis (1989) in the TAM framework, perceived ease of use and technology burden could influence how teachers consider and then use iPads in their classrooms. Saudi teachers expressed concerns that a potential barrier to the use of iPads (the lack of funding and the high cost of iPads) would result in a lack of digital technology usage in the classroom. Saudi teachers who participated in this study expressed that some iPad applications or services are not free, and they require subscriptions. Since the Ministry of Education does not allocate funds for such purchases, teachers are limited to using free applications or consider subscribing to a single program that meets most of their teaching needs. Alotaibi and Almalki (2016) also found that lack of funds hinders teachers in accessing relevant technology resources to meet the changing and dynamic learning goals of students with special needs. Further participant feedback showed that Saudi teachers lack motivation for the use of iPads in classrooms. Saeed (2013) shared that special education teachers not only require resource support in terms of funding but also essential support from school leadership and educational supervisors who visit their classrooms. Financial

and other incentives may ensure uptake and implementation of technology, ensuring teachers and students have the opportunity to optimize the advantages of technology use in the classrooms.

Past studies using an extended TAM framework (Davis, 1989) show that technology support at the organizational level is a critical factor for use acceptance and implementation (Saeed, 2013). Moreover, this finding may be explained in the context of this study because presently, Saudi special schools and the education ministry do not provide any formal or dedicated support for iPad devices in the special education curriculum. As iterated by the TAM framework (Davis, 1989), lack of enterprise-wide solutions in the education sector for managing and implementing the use of iPads by special education teachers hinders the uptake of technology.

### **Family Involvement**

Family involvement in the learning process has been noted to be central to the successful use and uptake of technology in the classroom (Chambers et al., 2017; Shugdar, 2017). In the current study, however, family involvement was reported as one of the main hindrances to technology implementation in the classroom. Specifically, Saudi teachers who participated in this study shared that some parents have a negative perception towards iPad use, terming it as harmful. As a result, such families remained cautious that iPad use could pose negative learning outcomes for their children. Chambers et al. (2017) observed that preconceived notions and lack of insights about technology in school, especially in a conservative society, is a major impediment when adopting new learning tools.

In line with the TAM framework (Davis, 1989), parental influence and impact on iPad use may be explained by the fact that opposition from parents negatively affects and demotivates teachers about the perceived usefulness of iPads. Thus, teachers' intent to use (or acceptance of

iPad technology) and usage behavior (actual use) of digital technology in the classroom is impacted by external influence such as lack of parental support who might question its usefulness in aiding their children to learn.

Similar challenges were shared by one of the teachers who noted that possible family opposition to the usage of iPads may be attributed to fears that children might spend a lot of time watching entertainment programs instead of learning. These claims align with observations by Shugdar (2017) that some Saudi families who have learners with disabilities may restrict technology use for fears of harmful use in accessing inappropriate content.

Moreover, special education teachers also shared that parents may not be aware of educational applications, and this means they do not download them at home for their children (Chambers et al., 2017; Shugdar, 2017). Due to the resulting lack of support from families, some teachers added that they remained demotivated to use iPads in the classrooms, and considered using alternative educational tools. Leonard (2013) recommended that teachers need to consider meeting with the families of each student and encouraging them to acquire and use iPads for improved communication and support for technology.

Similar to the challenge of a lack of knowledge or training among teachers, some Saudi teachers also shared that parents may lack relevant information about technology use in the classroom. Athbah (2015) also noted that the lack of relevant information about portable technology further contributes to negative perceptions among parents about iPad use in learning, either in school or at home. In some cases, teachers added that some students are not receptive to technology largely because they lack knowledge of how to use it in learning. Fernández-López et al. (2013) shared that the effective use of mobile devices in support of children with special needs requires awareness creation among teachers, family, and students.

According to Shugdar (2017) involving families is a major approach to address slow technology adoption in the classroom. Initial research by Dixon et al. (2015) confirmed these findings, noting that access to relevant information and training ensures families are receptive and supportive about technology use in the classroom. These trends may be understood in light of the TAM framework which suggests that perceptions of usefulness and ease of technology use are mediated by *external variables* including social influence, individual differences, and lack of facilitating conditions (Davis, 1989), such as lack of parental support and students being less receptive of digital technology.

### **Lack of National Standards on the Use of Technology**

Lack of standards in technology use within the classroom in Saudi Arabia was another barrier identified to hinder iPad use by special education teachers. In relation to TAM, this aspect can be characterized as a negative influence on behavioral intentions of teachers to use technology (Davis, 1989). Specifically, teachers shared that there is no framework on how to integrate technology use such as iPads when teaching children who have Autism. Barri (2014) shared that one of the factors hindering special education teachers from technology use is the lack of education guidelines on concepts relevant to student needs. Specifically, pedagogy and curriculum instruction on special needs learning are focused on traditional approaches making it difficult for teachers to embrace technology in classroom instruction (Barri, 2014). These findings align with the TAM framework (Davis, 1989) and views by Saudi teachers. Lack of facilitating conditions such as existing curriculum not incorporating nor encouraging the use of iPads when teaching children with Autism, hinders the uptake of digital technology in schools.

According to teachers' responses, the fact that iPad use in class is not mandatory means that there is no learning objective or teacher commitment to using it when delivering curriculum

content. Instead, teachers who use iPad in the classroom must ensure that it does not conflict with approved learning outcomes and curriculum needs of students in line with the Ministry of Education. Abu Alghayth (2019) noted that the current curriculum seeks to emphasize examination scores as a measure of academic performance, placing limited emphasis on technology use to facilitate learning. To avoid potential complications between technology use and meeting curriculum requirements, Saudi teachers shared that they ensure they include necessary strategies, tools, and goals when using technology such as iPad to educate their students.

Despite the efforts that teachers place on technology use, other special teachers noted that lack of national standards means they have to use similar teaching approaches even when teaching learners who have different needs from each other. According to Davis (1989), successful uptake of technology is influenced by intervening support systems which in turn affect how individual access and implement the actual system. In this study, support systems include having National Standards on the Use of Technology in place. Barri (2014) noted that integrating learning goals to meet the diverse needs of students is a major setback when focusing on meeting the diverse needs of learners with learning disabilities such as Autism spectrum disorders. Specifically, teachers noted that since the Saudi curriculum lacks specific goals or standards related to technologies such as iPad use, they limit its usage to different periods. Therefore, there is a lack of consistency in iPad adoption and use in Saudi classrooms partially due to a lack of needed curriculum goals in support of assistive technologies.

### **Professional Development Needs**

Considering that lack of knowledge and skills on iPad use was one of the major issues experienced by Saudi teachers, there is a need for training courses to ensure professional



development on how to use iPads to teach students with Autism. Therefore, the lack of professional training remains a barrier to the uptake and implementation of technology by some of the teachers involved in this study. Barri (2014) shared that with changing technology needs, schools need to provide regular training opportunities to teachers to equip them with relevant skills. Davis (1989) added that having relevant skills about a technology informs its perceived ease of use and its usefulness. In this study, the TAM framework emphasizes that such skills are key to ensuring high self-efficacy among educators, further motivating them to use technology to enhance learning in the classroom.

Providing professional development opportunities for teachers through interventions such as training workshops is likely to succeed in most schools. For example, teachers who shared that they lack knowledge of iPad use were supportive of any measures in place to advance their skills. Specifically, teachers confirmed that they would attend classes meant to educate them about technology use and implementation. In his TAM model, Davis (1989) observed that perceived usefulness of technology would influence motivate users to embrace measures, such as going for training, to become competent in its use. These findings echo observations by Al-Moghyrah (2017) in that despite a lack of skills in technology use, most special education teachers in Saudi Arabia express a positive attitude to advancing their skills and subsequently implementing the use of iPads in their teaching lessons.

Alabbas and Miller (2019) observed that a key approach to teaching the use of technology is availing training courses to educators on how to integrate technology in the classroom. However, the lack of professional training workshops or conferences in technology integration continues to limit teachers not only to traditional teaching methods, but also to obsolete learning content (Alabbas & Miller, 2019). According to some Saudi teachers, they

remained enthusiastic that since technology such as iPads are helpful, and they were willing to pay for training courses to acquire relevant professional knowledge on how best to meet the learning needs of their students. Moreover, teachers emphasized the need to have training on technology use in the future, to ensure they take advantage of the benefits and values that the use of iPads brings to special education classrooms.

### **Lack of Arabic Educational Apps**

The final barrier identified by Saudi special education teachers on technology use in the classroom is related to the lack of Arabic education applications. All teachers were in consensus that there is a need for the development of relevant educational apps that incorporate the Arabic language. Lack of suitable applications points to external challenges and essential facilitators to digital technology use (Davis, 1989). Also, the TAM framework (Davis, 1989) elaborates that teacher behavior is informed by available support that influences perceptions about perceived ease of use (readily available applications), perceived usefulness (access to Arabic apps that meet needs of students), and the attitude toward using iPads in terms of improving productivity, performance, and accomplishing tasks quickly. As such, developing relevant educational applications in Arabic would be key to facilitating their instructional approach when teaching children with Autism. Similar concerns have been reported in the literature by Lyan et al. (2015) who observed that the usability available applications in iPad for children is limited, prompting the need to develop apps that have tutorials to enable students to learn about their functionality.

Moreover, teachers shared that most applications in the iPad are in English, including letters and numbers, making it difficult to apply them to non-English speaking learners in his class. Saleh (2017) reported that when developing applications for children with Autism more focus should be based on assessing their usability such as ensuring the language used aligns with

those of students. Teachers noted that available applications focused on enhancing communication skills are still few, and those available are of poor quality. A review on the applicability of iPad use by Boyd et al. (2015) revealed that some teachers had to create applications to facilitate teaching because products were so new that relevant teaching contents were not yet available.

Considering these limitations, Lyan et al. (2015) noted that teachers are likely to be less supportive of technology use in the classrooms. For example, one of the teachers in this study noted that he found just one application that was useful in terms of relevant images, but was difficult to use because it was only available in the English language. Since most students in his class spoke Arabic, he opted not to continue using the application. According to Alghayth (2019), positive support and use of applications in the classroom is influenced by their usability and relevance in meeting students' needs. In the case of Arabic applications, the lack of diversity in available applications means that teachers have to adopt new approaches to enhance learning. For example, when teachers find relevant non-Arabic applications designed to develop vocabulary using images, they mute the English words and use the pictures. These challenges further highlight a knowledge gap that needs to be filled in terms of availing relevant applications designed in the Arabic language for children with Autism, in efforts to harness the benefits of technology use in the classroom.

### **iPad Intervention to Enhance Communication Skills**

Research question two was formulated to investigate ways in which Saudi male special education teachers discuss the use of iPads to enhance communication skills among students with Autism. Responses from participants confirmed that the use of iPad in the classroom plays an important role in enhancing the communication of students. Special education teachers who

participated in the study confirmed that after using iPads in class, they observed positive student engagement and collaboration in learning, in addition to developing a positive attitude towards teachers. Similar observations have been reported in the literature by Boyd et al. (2015) and by Leonard (2013) who observed improved engagement among students with Autism resulting from technology use in the classroom. This support for iPad usage to improve engagement and learning may be explained in part by the TAM framework, where perceived usefulness of iPads in achieving learning goals informs teachers to support its use (Davis, 1989).

Further, teachers felt that technology use in the classroom played an important role in breaking communication barriers and solving interpersonal engagement challenges. As a result, students' fears in expressing themselves were decreased with the increased use of iPad to facilitate learning. O'Malley et al. (2014) shared that one of the main learning difficulties among children with Autism relates to problems with speech and social communication. In line with the TAM framework (Davis, 1989) it became clear that Saudi teachers had positive perceptions in that the uptake of technology such as iPads for improving communication because of enhanced the outcome of social skill development. A review by Sulaimani (2017) showed that in the recent past, teachers have examined the use of iPads in helping learners. Specifically, studies that have compared various assistive technology that use pictures to communicate, have indicated that students with Autism communicated better when using iPads as the access to pictures was exponentially higher than with other non-digital AT (Sulaimani, 2017). These findings support results from this study wherein teachers described that the use of iPads may break the fear barrier of student to student communication, due to increased interpersonal communication with teachers.

Using technology also helps integrate new communications knowledge, and in the process, motivates them to talk (Hew & Brush, 2007). Saudi teachers shared that iPad usage serves to assist students when they are unable to remember words. Xin and Leonard (2014) investigated the impact of iPad use in the classroom to assist facilitation of the development of communication skills among students with Autism. The researchers designed a multiple baseline experiment using intervention groups. Assessment of student performance after six weeks of teaching using iPads showed that all students increased responding to questions and making social comments in both recess and class settings (Xin & Leonard, 2014). Saudi teachers expressed similar observations where iPad use became a central tool for improved communication with their students, further confirming the TAM framework (Davis, 1989) wherein teachers perceive iPad technology to provide flexible learning solutions such as easiness to add pictures, words, and symbols easier to motivate student interaction and response.

Teachers also shared that using iPads in class helped students improve initiating requests, thereby enhancing two-way communication between teachers and students. As postulated by Davis (1989) in the TAM framework, perceived usefulness of iPads motivated teachers to continue using the technology in their classrooms. In elaboration, Saudi teachers believed that the use of pictures in iPad applications ensured students could easily indicate what they wanted when they faced challenges pronouncing words. Xin and Leonard (2014) reported a similar impact where learners exposed to technology evidenced enhanced communication in terms of initiating requests. Boyd et al. (2015) noted too, that even if students experience challenges in verbal communication, or when they do not want to speak, using a device such as the iPad eliminates these barriers by using pictures to illustrate the intended message.

Communication between students and teachers may take different forms. For example, using audio and pictures on an iPad, was noted to help facilitate communication because students with Autism both saw the image and heard its pronunciation. Teachers felt that this set up encouraged cognitive processing and assisted learners in verbalizing the same words. Similar observations have also been made in the literature by Leonard (2013), who indicated that using iPads helped enhance communication in children with low functioning Autism by coordinating photos with pronunciations. Cumming and Rodriguez (2013) further reported that integrating iPad technology in the classroom helped enhance the development of communication and social skills, because photos are easy and engaging for learners. Based on the teacher responses and past literature studies on the topic, it may be concluded that iPad implementation in the classroom is an essential tool for enhancing the communication skills of students with Autism.

### **Limitations**

There are potential limitations associated with the current study. First, a qualitative research method formed the basis of the current research design. According to Cobern and Adams (2020), qualitative research enables researchers to collect non-numerical data implying that it is difficult to identify key trends and statistics on the topic. Also, qualitative research is limited since the researcher cannot examine relationships between variables, nor establish causality. Second, semi-structured interviews were the primary source of data for this study. As a result, there was no data triangulation in terms of information sources. Thus, obtained results from a single source of data may lead to a lack of internal validity. Lemon and Hayes (2020) observed that triangulating data sources helps ensure the confirmability and transferability of the findings.

In addition, the data was collected from special education teachers alone, contributing to possible sampling bias as other stakeholders (such as family, school leaders, students) were not included in the study. The study interviewed male teachers only, presenting probable bias in participant sampling and representation. The inclusion of female teachers could have yielded additional insights on the topic. Finally, the interview was conducted in only one city in Saudi Arabia, further limiting the scope of the results to special education teachers in Jeddah. It may be possible that teachers from different Saudi cities experience different challenges in digital technology use in the classroom depending on available school facilities, resources, or funding, further making it difficult to generalize teachers' experience in Jeddah city to other Saudi cities.

## **Conclusion**

This study focused on exploring Saudi teachers' perspectives on the use of iPads to assist in the development of communication, language, social, and academic skills of children with Autism. Special education teachers' voices may play a central role in providing insights for professionals and education leaders to better develop suitable teaching methods for optimal learning outcomes among learners with special needs. Drawing from the obtained responses from five special education teachers, it was found that while teachers have a generally positive attitude towards the use of digital technology such as iPads when teaching children with Autism, the barriers to usage are substantial. Results associated with a positive attitude from the study participants indicated that using iPads in the classroom helped teachers engage children with Autism, add fun through photos, stimulate cognitive development, improve social engagement, and initiate requests. The obtained results are consistent with past studies where teachers showed a positive attitude toward technology adoption due to its associated enhancement of the learning

outcomes among students with Autism (Chambers et al., 2017; Cumming & Rodriguez, 2013; O'Malley et al., 2014).

Yet, despite positive attitude teachers have towards digital technology use in the classroom, there were six chief barriers that limited the implementation of iPads in classrooms. Some teachers shared they were not tech-savvy, and this hindered their active use of digital technology. Besides, teachers shared that insufficient funding by the government limited their access to essential technology resources needed to use iPads. Lack of motivation from school leadership or supervisors further discouraged teachers from using iPads. These challenges were further exacerbated by opposition by some families towards using technology to teach children with Autism. Lack of national education standards and curriculum dedicated to guiding teachers on technology use further discouraged teachers who limited their focus on delivering instructions to meet curriculum guidelines by the Ministry of Education, instead of facilitating tailored learning to meet the unique or special needs of each student with Autism. The lack of curriculum compounded with lack of Arabic educational iPad applications also remained additional hindrances to digital technology use by special education teachers in Saudi Arabia. Similar challenges of technology adoption in Saudi Arabia have also been reported by a number of researchers (Alkahtani, 2013; Alabbas & Miller, 2019; Almethen, 2017; Barri, 2014; Saleh, 2017).

According to the responses by the special education teachers in this study, if these barriers are addressed, it may be possible to implement the use of digital technology in Saudi classrooms to meet the special needs of various students. When considering children with Autism, effective technology design, facilitation, and implementation, largely contribute to better learning outcomes and academic improvement among students. A key learning outcome of using



iPads in the classroom among students with Autism is improved communication and social interaction. Students get to match photos and relate them to word pronunciation, further contributing to cognitive development. When students are not able to pronounce or recall words, the use of illustrations such as photos enhances their memory and provokes requests. Further, the use of iPads improves communication since students develop enthusiasm towards technology, in some cases more than what is shown through traditional teaching methods, further sustaining teacher and student commitment to learning. Findings on the positive impact of iPad use in improving communication have also been supported by past studies such as Boyd et al. (2015) and Xin and Leonard (2014), further emphasizing the need by the Saudi education system to address barriers to technology implementation in classrooms with students who have been diagnosed with Autism.

### **Implication for Practice**

The outcomes of the current study have important implications for practice in terms of positive change regarding digital technology use in special education settings to enhance the learning of children with Autism. Specific implications for practice could be realized on the levels of teaching, school leadership, and technological research. At the teaching level, the findings from this study point to various ways of improving iPad use. For example, there is a need for urgent professional development in technology use where training should be provided to ensure teachers have relevant skills or knowledge on digital technology use. Moreover, teachers need to be motivated and encouraged by school leadership and by their classroom supervisors on the need to adapt and implement digital technology in their classrooms. Alabbas and Miller (2019) and Almethen (2017) recommended that schools need to provide essential support and motivation for teachers to attend training courses, thereby generating relevant interest in

technology use among special education teachers in their lessons. Acquiring knowledge through professional development programs will also ensure teachers include relevant curriculum content while delivering instruction to children with Autism.

At the administration level, findings from this study emphasize needed changes at the Ministry of Education, special education training institutes, and school leadership and districts. On their part, the Ministry of Education needs to embrace curriculum and pedagogy change by creating strategies teachers need to integrate digital technology into the classroom. Insights from this study showed that lack of National Standards on the use of digital technology meant that teachers lacked a standard framework on how to integrate iPad use when teaching children with Autism. With regard to the special education training institutes, teacher training programs need to consider incorporating technology-based instructions and course programs for pre-service teachers. Also, training institutes need to provide experience for pre-service users on digital technology use before they start their teaching careers. Training institutes may also consider creating new courses and programs focused on professional development and career advancement of in-service special education teachers. School administrators and districts also need to source additional funding for digital technology acquisition and its implementation in special schools, in addition to designing programs to motivate teachers to embrace the new changes in technology use in the classroom.

In terms of technological research, teachers shared that iPads lack suitable applications to facilitate the teaching of students with Autism in the Arabic speaking nation of Saudi Arabia. For example, the few applications available on iPads are largely in the English language, and there is a lack of Arabic educational apps. As such, future practice in this sector may consider the need among educators to collaborate in creating Arabic educational applications tied to curriculum

development. Educators and application developers need to explore tools and resources relevant to app development to ensure the generated educational content contributes to enhanced learning and communication of students with Autism who speak Arabic.

### **Recommendations for Future Research**

Recommendations for future research are based on the limitations identified in this study. Researchers may consider triangulating the sources of information and data collection methods to achieve internal consistency and reduce sampling bias. For example, collecting data through survey questionnaires, focus group discussions, field note observations, and archival data such as minutes of school board meetings would help collect comprehensive information on the current research topic. Besides, opinions from female special education teachers, education policymakers, school leaders, students, and families may help enrich the findings of the current study in the future. Future studies should also consider including special education teachers from other cities outside Jeddah to enable cross-comparison of teacher experience when using digital technology in different Saudi cities. Such an approach would help determine whether special education teachers in different cities experience similar or different challenges when using digital education to facilitate the learning of children with Autism.

Considering the shortcomings in the professional development of teachers in special education institutes regarding digital technology use, further research may be conducted in these institutions to examine the reasons for the shortage of these professional skills. Moreover, the current approach and perceptions among teacher trainers regarding iPad use to facilitate the learning of students with special needs may be explored and challenges identified to inform education policy change. Saudi teachers also shared various barriers that limit their iPad use including lack of funding, teacher motivation, lack of Arabic educational applications,

insufficient knowledge, and curriculum-based challenges. Exploring school administrators' views on these issues may improve the current understanding of these issues, thereby creating new insights from the perspective of school administrators.

Similarly, a larger quantitative study done with teachers across Saudi Arabia using the existing or a modified version of the Technology Acceptance Model survey, may aid stakeholders in further understanding technology use with students with Autism in Saudi classrooms. Interpretation of data sets from such a study may reveal detailed information relevant to improving the situation of Saudi special education teachers when it comes to implementing iPad and other instructional technology into the classroom. Several versions of the TAM survey can be found in the literature, meaning researchers would have an established starting point for the creation of a survey modified to the cultural context of Saudi Arabia.

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## Appendices

## **Appendix A: Asynchronous study eligibility survey questions**

1. Are you currently teaching in a classroom with students labeled with Autism? (if YES, question 2 appears, if NO, respondent is not eligible for study and is directed to the thank you screen).

2. Do you use iPads in your classroom with students labeled with Autism on a regular basis? (several times weekly or daily) (If YES, question 3 appears, if NO, respondent is not eligible for study and is directed to the thank you screen).

3. Do you use iPads as assistive technology with your students in the area of communication? (If YES, respondent is eligible for interview and next steps screen appears, if NO, respondent is not eligible for study and is directed to the thank you screen).



## **Appendix B: synchronous virtual, semi-structured interview protocol**

### **Part A: Demographic and Credentialing Information gathering:**

1. What is your professional background in teaching (i.e, how long have you been teaching, at what grade levels)?
2. What type of degree do you hold?
3. Which college or university did you attend?
4. What is your professional experience in teaching students labeled with Autism? (how long, at what grade levels?)
5. What are your students' ages, characteristics, and ASD levels etc.)?

### **Part B: Perspectives on the use of iPads to teach students with Autism:**

1. Tell me about the use of iPads with students with ASD in your classroom?
  - a. prompt for more information to be used at researcher discretion: what more can you tell me?
2. Could you have the optional to use iPad in your classroom to teach your students?
  - a. prompt for more information to be used at researcher discretion: Is it a mandatory practice required by the school or school district?
3. Tell me about any professional preparation you have participated in, in order to use iPads in the classroom (i.e., teacher training, professional development).
4. Tell me about what you perceive as your students' reactions to and experiences with, the iPads.
  - a. (prompt if needed) Tell me about the emotional responses you see in your students when they are interacting with iPads?

- b. (prompt if needed) Tell me about the differences in your students' engagement between using the iPads and other types of instruction?

**Part C: Teachers' perspectives on the use of iPads and communication skills in students labeled with ASD**

2. Tell me about your use of the iPad with your students with ASD to develop communication skills?
  - a. (prompt if needed) In what ways do you feel iPads develop and/or support communication skills in your students with ASD?
2. Tell me about how your students' communication skills are impacted by the use of iPads.
3. Tell me about any challenges you may have faced or currently face, in using iPads to develop communication skills in your students with ASD.
4. Please share with me a story of what you think is one of your greatest success stories in terms of using iPads to develop the communication skills of your students.

**Part D: closing**

1. If you could provide recommendations to teachers for the use of iPads with students labeled with Autism, what would those recommendations be?
2. Would you like to share anything that was not covered in this interview?

## Appendix C: Letter of Invitation

### Recruitment Email

Pro # 001041

Greetings.

My name is Adil A. Alghamdi, and I am a doctoral student at The University of South Florida in Tampa, Florida. I'm currently preparing my dissertation in the topic area of (Saudi Special Education Teachers' Perspectives on the Use of iPads to Enhance Communication Skills for Students with Autism).

I am emailing to ask if you would like to allow me to do interviews with five Saudi special education teachers who teach the students with autism. I'm looking for the teachers who have experience in teaching students with Autism for more than five years, and familiar with using assistive technology, particularly iPad. These interviews will help me to collect the data for this research project. Participation is voluntary, and all answers will be anonymous. The purpose of this study is to understand and explore Saudi teachers' perspectives concerning the use of digital tablets that may assist in the development of communication, social, language, and overall academic skills of children with Autism. The interview will be conducted by using a virtual meeting software. The platform that I'm going to use is Zoom. I will arrange a time with the participant, and request him to be in a quiet, distraction free space that is most comfortable and convenient to them for the duration of the interview. The interview is expected to last between 45 and 60 minutes. Interviews will be audio-recorded and transcribed.

If you have any questions, please do not hesitate to contact me on my email: [aaalghamdi@usf.edu](mailto:aaalghamdi@usf.edu) or call me on: +966 505 622 868

Thank you in advance and your assistance is always appreciated.

Best regards,

Adil A. Alghamdi  
Ph.D. Student  
Special Education Program  
Department of Teaching & Learning  
College of Education  
University of South Florida  
Email: [aaalghamdi@usf.edu](mailto:aaalghamdi@usf.edu)  
Phone: +966 505 622 868  
Pro # 001041

## Appendix D: Informed Consent Form in Egnlish



### **Informed Consent to Participate in Research Involving Minimal Risk and Authorization to Collect, Use and Share Your Health Information**

Information to Consider Before Taking Part in this Research Study

**Title: Saudi Special Education Teachers' Perspectives on the Use of iPads to Enhance Communication Skills for Students with Autism**

**Study # 001041**

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**Overview:** You are being asked to take part in a research study. The information in this document should help you to decide if you would like to participate. The sections in this Overview provide the basic information about the study. More detailed information is provided in the remainder of the document.

Study Staff: This study is being led by Adil Alghamdi who is a Principle Investigator at The University of South Florida. This person is called the Principal Investigator. He is being guided in this research by Dr. Phyllis Jones. Other approved research staff may act on behalf of the Principal Investigator.

Study Details: This study is being conducted at The Institute of Intellectual Education in Jeddah City, Saudi Arabia. The purpose of the study is to understand and explore Saudi teachers' perspectives concerning the use of digital tablets that may assist in the development of communication, social, language, and overall academic skills of children with Autism. I will use a qualitative interview study, and each interview will be lasted for one 45 to 60 minutes.

Subjects: You are being asked to take part because you are a Saudi special education teacher who teach students with autism in Saudi Arabia.

Voluntary Participation: Your participation is voluntary. You do not have to participate and may stop your participation at any time. There will be no penalties or loss of benefits or opportunities if you do not participate or decide to stop once you start. Your decision to participate or not to participate will not affect your job status, employment record, employee evaluations, or advancement opportunities.

Benefits, Compensation, and Risk: We do not know if you will receive any benefit from your participation. There is no cost to participate. You will not be compensated for your participation. This research is considered minimal risk. Minimal risk means that study risks are the same as the risks you face in daily life.

Confidentiality: Even if we publish the findings from this study, we will keep your study information private and confidential. Anyone with the authority to look at your records must keep them confidential.

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### **Why are you being asked to take part?**

You are being asked to take part because you are a Saudi special education teacher who teach students with autism in Saudi Arabia.

## **Study Procedures:**

At each visit, you will be asked to:

- Participate in a virtual interview conducted by the researcher. This interview will be audio recorded for later analysis. I will arrange a time with the you, and request him to be in a quiet, distraction free space that is most comfortable and convenient to them for the duration of the interview. The interview is expected to last between 45 and 60 minutes.
- The interview will consist of three distinct parts each one focused on each research question. They will be comprised of open-ended questions, allowing for probing and follow-up. The first part of the interview will focus on the teachers' background and experience. The remaining parts will be designed to answer the two research questions.
- You will be informed that the interview will consist of responding to two different sets of questions, one regarding iPad use with students with ASD in general, and one regarding iPad use to develop communication skills in students with ASD.
- Your participation in this research must be completely voluntary. If you do decide to participate, you may withdraw at any time without any consequences or explanations necessary. If you do withdraw from the study your data will not be used in the analysis. In terms of protecting your anonymity, your name will not appear on any part of the data, the research results, or in any written or oral discussions of the study.
- If completing the study online, it is possible, although unlikely, that unauthorized individuals could gain access to your responses. Confidentiality will be maintained to the degree permitted by the technology used. No guarantees can be made regarding the interception of information sent via the Internet. However, your participation in this study involves risks similar to a person's everyday use of the Internet.
- I will save the data securely in a file on my personal laptop for five years. Then, I will delete all the data.

## **Total Number of Subjects**

Between five and seven Saudi special education teachers will take part in this study at Institute of Intellectual Education in Jeddah city, Saudi Arabia. The interview will be conducted by using a virtual meeting software. I will arrange a time with you, and request him to be in a quiet, distraction free space that is most comfortable and convenient to them for the duration of the interview.

## **Alternatives / Voluntary Participation / Withdrawal**

You should only take part in this study if you want to volunteer. You should not feel that there is any pressure to take part in the study. You are free to participate in this research or withdraw at any time. There will be no penalty or loss of benefits you are entitled to receive if you stop taking part in this study.

### **Benefits**

You will receive no benefit(s) by participating in this research study. However, this work may add to the knowledge of the field and support teachers in enhancing their practices to better serve the needs of their children development.

### **Risks or Discomfort**

This research is considered to be minimal risk. That means that the risks associated with this study are the same as what you face every day. There are no known additional risks to those who take part in this study.

### **Compensation**

You will receive no payment or other compensation for taking part in this study.

### **Costs**

It will not cost you anything to take part in the study.

### **Conflict of Interest Statement**

There is no conflict of interest.

### **Privacy and Confidentiality**

The researcher will keep your study records private and confidential as possible. Certain people may need to see your study records. However, anyone who wants to look at your records, must keep them completely confidential. These individuals include:

- The research team, including the Principal Investigator, study coordinator, research nurses, and all other research staff.
- Certain government and university people who need to know more about the study. For example, individuals who provide oversight on this study may need to look at your records. This is done to make sure that we are doing the study in the right way. They also need to make sure that we are protecting your rights and your safety.
- The USF Institutional Review Board (IRB) and its related staff who have oversight responsibilities for this study, and staff in USF Research Integrity and Compliance.

We may publish what we learn from this study. If we do, we will not include your name. We will not publish anything that would let people know who you are.

### **You can get the answers to your questions, concerns, or complaints.**

If you have any questions, concerns or complaints about this study, call Adil Alghamdi at + (966) 505-622-868 or contact by email at [aaalghamdi@usf.edu](mailto:aaalghamdi@usf.edu).

If you have questions about your rights, complaints, or issues as a person taking part in this study, call the USF IRB at (813) 974-5638 or contact by email at [RSCH-IRB@usf.edu](mailto:RSCH-IRB@usf.edu).

Obtaining Informed Consent

## Appendix E: Informed Consent Form in Arabic



إقرار بالموافقة على المشاركة في بحث تربوي  
معلومات يجب مراعاتها قبل البدء بالمشاركة في هذه الدراسة

عنوان البحث: وجهات نظر معلمي التربية الخاصة السعوديين في استخدام أجهزة الايباد لتعزيز مهارات التواصل لدى الطلاب التوحدين.

مقترح # ٠١٠٤١

**نظرة عامة:** يطلب منك المشاركة في هذه الرسالة البحثية. سوف تساعدك المعلومات المرفقة أدناه في هذا المستند بإخذ القرار إما بالمشاركة في هذا البحث العلمي أو الانسحاب. تشمل النظرة العامة معلومات تفصيلية عن طبيعة الدراسة المرفقة أدناه.

**فريق البحث:** الشخص المسؤول عن هذه الدراسة البحثية هو عادل الغامدي. ويسمى بالباحث الرئيسي. كذلك قد يكون هناك بعض الباحثين الآخرين ممن يمكنهم أن يتصرفوا نيابة عن الشخص المسؤول. كما انه يقوم بهذا البحث تحت إشراف الدكتورة دكتور فيليس جونز. بروفيسور في جامعة جنوب فلوريدا والمتخصصة في التربية الخاصة.

**تفصيل الدراسة:** سوف يتم إجراء هذه الدراسة في معهد التربية الفكرية التابعة بمحافظة جدة في المملكة العربية السعودية. الغرض من الدراسة هو فهم واستكشاف وجهات نظر المعلمين السعوديين فيما يتعلق باستخدام الأجهزة اللوحية الرقمية (الايباد) التي قد تساعد في تطوير مهارات التواصل الاجتماعي واللغوي والمهارات الأكاديمية للأطفال التوحدين. سوف يقوم الباحث بإجراء مقابلة شخصية مع المعلمين المشاركين، وسوف تستغرق كل مقابلة لمدة ٤٥ إلى ٦٠ دقيقة.

**المشاركين:** جميع المشاركون حاصلون على درجة البكالوريوس في التربية الخاصة. تخصص توحيد وأيضاً لديهم سنوات خبرة في مجال تدريس الطلاب التوحدين.

**المشاركة الطوعية:** مشاركتك في هذه الدراسة طوعية بالكامل. لديك الحرية في المشاركة وتستطيع الانسحاب في أي وقت. لن يكون هناك أي عقوبة أو فقدان لفوائد مستحقة لك في حال توقفك عن المشاركة في هذه الدراسة. وقرار عدم مشاركتك لن يؤثر على سجلك أو تقييمك الوظيفي.

**الفوائد، التعويضات، والمخاطر:** ليس هناك أي فوائد مباشرة تعود عليك من هذه الدراسة. ايضاً ليس هناك أي اجر أو تعويض جراء مشاركتك. هذا يعني ان المخاطر المرتبطة بهذه الدراسة هي نفسها التي قد تواجهها كل يوم.

**السرية:** ربما نقوم بنشر نتائج هذه الدراسة. إذا قمنا بذلك، كل معلومات الدراسة سحفظ بشكل سري وخاص. أي شخص لديه الأحقية للنظر في معلوماتك سوف يبقيها سرية.

### لماذا نطلب منك المشاركة؟

لأنك معلم حاصل على شهادة البكالوريوس في التربية الخاصة – توحيد ولديك خبرة في مجال تدريس الطلاب التوحدين في المملكة العربية السعودية.

## إجراءات الدراسة:

في كل زيارة سيطلب منك ما يلي:

- المشاركة في مقابلة افتراضية أجراها الباحث. سيتم تسجيل هذه المقابلة الصوتية لتحليلها لاحقًا. سيقوم الباحث بترتيب موعد مع المشارك ويطلب منه أن يكون في مكان هادئ وخالي من التشتيت ويكون أكثر راحة طوال مدة المقابلة. من المتوقع أن تستمر المقابلة ما بين ٤٥ و ٦٠ دقيقة.
- تتكون المقابلة من ثلاثة أجزاء. يركز كل منها على كل سؤال بحثي. وستكون من أسئلة عامة، تسمح بالتحقيق والمتابعة. سيركز الجزء الأول من المقابلة على خلفية المعلمين وخبرتهم. سيتم تصميم الأجزاء المتبقية للإجابة على أسئلة البحث.
- سيتم إبلاغك بأن المقابلة ستتكون من الإجابة على مجموعتين مختلفتين من الأسئلة، المجموعة الأولى تتعلق باستخدام أجهزة (الايباد) مع الطلاب التوحيديين بشكل عام والأخرى تتعلق باستخدامات أجهزة (الايباد) لتطوير مهارة التواصل لدى الطلاب التوحيديين.
- يجب أن تكون مشاركتك في هذا البحث تطوعية تمامًا. إذا قررت المشاركة، يمكنك الانسحاب في أي وقت دون أي تبعات أو مبررات ضرورية. إذا انسحبت من الدراسة فلن يتم استخدام بياناتك في التحليل. فيما يتعلق بحماية هويتك، لن يظهر اسمك في أي جزء من البيانات أو نتائج البحث أو في أي مناقشات مكتوبة أو شفوية للدراسة.
- سيتم حماية سرية البيانات عن طريق تخزينها في ملف على جهاز الكمبيوتر المحمول الخاص بي ويمكن الوصول إليها فقط من قبل الباحث. ومع ذلك، فإن سرية هويتك الكاملة مضمونة بالكامل.
- سأقوم بحفظ البيانات بأمان في ملف على جهاز الكمبيوتر المحمول الشخصي لمدة خمس سنوات. ثم سأقوم بحذف جميع البيانات لاحقًا.

## العدد الكلي للمشاركين

سيشارك ما بين خمسة إلى سبعة معلمين سعوديين في مجال التربية الخاصة- توحيد في هذه الدراسة. وهم من معلمي معهد التربية الفكرية بمدينة جدة بالمملكة العربية السعودية. سيتم إجراء المقابلة باستخدام برنامج اجتماع افتراضي. سيقوم الباحث بترتيب موعد مع المشارك ويطلب منه أن يكون في مكان هادئ وخالي من التشتيت. كذلك يجب أن يكون المكان مريح طوال مدة المقابلة.

## البدائل/ المشاركة الطوعية/ الانسحاب

المشاركة في هذه الدراسة تطوعية بالكامل. لا ينبغي ان تشعرى بأن هناك أي ضغط عليك للمشاركة في الدراسة. لديك الحرية في المشاركة في هذا البحث او الانسحاب في أي وقت. لن يكون هناك أي عقوبة او فقدان لفوائد مستحقة لك في حال توقفك عن المشاركة في هذه الدراسة. وقرار عدم المشاركة لن يؤثر على حالتك كمعلم.



## الفوائد

ليس هناك أي فوائد مباشرة تعود عليك من هذه الدراسة. لكن تكمن أهمية هذا البحث بأنه سيساهم في إثراء المعرفة لدى المعلمين وإلى دعمهم في تحسين ممارساتهم لخدمة احتياجات الطلاب ذوي التوحد.

## المخاطر أو عدم الشعور بالراحة

هذا البحث لا يحمل أية مخاطر. هذا يعني أن المخاطر المرتبطة بهذه الدراسة هي نفسها التي تواجهها كل يوم. لا توجد أي مخاطر إضافية معروفة قد يواجهها المعلم المشارك في هذه الدراسة.

## التعويضات

ليس هناك أي أجر أو تعويض جراء المشاركة في هذه الدراسة.

## التكاليف

لن تكلفك المشاركة في هذه الدراسة بأي شيء إطلاقاً.

## تضارب المصالح

لا يوجد أي تضارب في المصالح.

## الخصوصية والسرية

- سيبقي الباحث سجلات الدراسة الخاصة والسرية قدر الإمكان. قد يحتاج بعض الأشخاص إلى الاطلاع على سجلات الدراسة الخاصة بك. ومع ذلك، يجب على أي شخص يرغب في الاطلاع على سجلاتك أن يبقيها سرية تمامًا. يشمل هؤلاء الأفراد:
  - فريق البحث، بما في ذلك الباحث الرئيسي ومنسق الدراسة والمرضات البحثية وجميع موظفي البحث الآخرين
  - بعض أفراد الحكومة والجامعات الذين يحتاجون إلى معرفة المزيد عن الدراسة. على سبيل المثال، قد يحتاج الأفراد الذين يقدمون الإشراف على هذه الدراسة إلى النظر في سجلاتك. يتم ذلك للتأكد من أننا نقوم بالدراسة بالطريقة الصحيحة. كما أنهم بحاجة للتأكد من أننا نحمي حقوقك وسلامتك.
  - الموظفين المسؤولين في لجنة (مجلس المراجعة المؤسسية) التابع لجامعة جنوب فلوريدا والذين لديهم مسؤوليات الإشراف على هذه الدراسة من حيث النزاهة وسلامة وصحة البيانات.
  - قد يتم نشر نتائج هذا البحث ومع ذلك، فلن نقوم بوضع اسمك ولن نسمح للقراري بمعرفة هويتك أو أي معلومة عنك.

## يمكنك الحصول على إجابات لأسئلتك، أو في حال وجود مخاوف أو شكاوى من خلال

إذا كان لديك أي أسئلة أو مخاوف أو واجهت أي مشكلة غير متوقعة، اتصل بالأستاذ/ عادل الغامدي على الهاتف الجوال رقم ٥٠٥٦٢٢٨٦٨ (+٩٦٦) إذا كان لديك أسئلة حول حقوقك كمشارك في هذه الدراسة، أو مخاوف أو اهتمامات ترغب في مناقشتها مع شخص من خارج إطار البحث، اتصل على الموظفين المسؤولين في لجنة (مجلس المراجعة المؤسسية) التابع لجامعة جنوب فلوريدا على الهاتف: ٥٦٣٨ ٩٧٤ ٨١٣ (٠١)

## Appendix F: Institutional Review Board Approval



### EXEMPT DETERMINATION

July 16, 2020

Adil Alghamdi  
20617 Whitewood Way  
Tampa, FL 33647

Dear Mr. Adil Alghamdi:

On 7/16/2020, the IRB reviewed and approved the following protocol:

Application Type:	Initial Study
IRB ID:	STUDY001041
Review Type:	Exempt 2
Title:	Saudi Special Education Teachers' Perspectives on the Use of iPads to Enhance Communication Skills for Students with Autism
Protocol:	• Study protocol.docx;

The IRB determined that this protocol meets the criteria for exemption from IRB review.

In conducting this protocol, you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

Please note, as per USF policy, once the exempt determination is made, the application is closed in BullsIRB. This does not limit your ability to conduct the research. Any proposed or anticipated change to the study design that was previously declared exempt from IRB oversight must be submitted to the IRB as a new study prior to initiation of the change. However, administrative changes, including changes in research personnel, do not warrant a modification or new application.

Ongoing IRB review and approval by this organization is not required. This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these activities impact the exempt determination, please submit a new request to the IRB for a determination.

Sincerely,

Jennifer Walker  
IRB Research Compliance Administrator

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**Institutional Review Boards / Research Integrity & Compliance**

FWA No. 00001669

University of South Florida / 3702 Spectrum Blvd., Suite 165 / Tampa, FL 33612 / 813-974-5638

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**Appendix G: Institutional Review Board Certificate**

