SCHOOL-BASED SPEECH-LANGUAGE PATHOLOGISTS'

USE OF IPADS

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DISSERTATION

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN
THE GRADUATE SCHOOL OF EDUCATION
OF FORDHAM UNIVERSITY

NEW YORK
2017

ProQuest Number: 10601025

ProQuest 10601025

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ACKNOWLEDGMENTS

"Change will not come if we wait for some other person or some other time. We are the ones we've been waiting for. We are the change that we seek" (Obama, 2008).

I would like to thank my mentor, Dr. Rhonda Bondie, for her guidance and support during the writing of my dissertation. She has been a great resource and a true supporter throughout this entire process.

I would like to extend a special appreciation to my dissertation committee members—Dr. Chung Zhang, Dr. Akane Zusho, and Dr. Rachel Jean-Baptiste—for their unwavering support and encouragement throughout this process. Their great expertise and constant bouncing back and forth of ideas was much appreciated, helping me to springboard this great passion of mine to explore iPads in the speech and language classroom.

I wish to acknowledge all of the participating New York City Department of Education speech-language pathologists, speech supervisors, and central administration staff who took the time to offer me support and assistance, to complete the survey, and to provide valuable input into iPad use in their speech and language instruction.

I also thank my family—my mother, Marie, and my brothers, Dwight and Irvin—for their words of encouragement through the creation of this study and their constant checking in to make sure I was persistent in completing this project to the end.

Finally, I would like to give a special thank you to all of my current and past professors, friends, and colleagues for their continual support and advice during this process.

DEDICATION

I dedicate this work to my family, who have motivated me to follow my passion, and to

my beloved grandparents, Madeleine Jeanniton and Rodrigue Jeanniton, who have been the pillar

to the family that has allowed us to be where we are today.

Thank you all for your love and sacrifice!

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Abstract

SCHOOL-BASED SPEECH-LANGUAGE PATHOLOGISTS'

USE OF IPADS

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This study explored school-based speech-language pathologists' (SLPs') use of iPads and apps for speech and language instruction, specifically for articulation, language, and vocabulary goals. A mostly quantitative-based survey was administered to approximately 2,800 SLPs in a K–12 setting; the final sample consisted of 189 licensed SLPs. Overall, findings indicated that SLPs used iPads for an average of 20 minutes to meet a variety of speech and language goals. Specifically, the results demonstrated that SLPS were less likely to use iPads for articulation goals than for language and vocabulary goals. The app most commonly used for articulation goals was Articulation Station, and Super Duper was most commonly used for language and vocabulary goals. iPad use among the SLPs did not vary based on demographic characteristics, including gender, education, work setting, and borough location. Furthermore, the following relationships were noted: (a) a positive relationship between support and vocabulary goals and behavior rewards, and (b) a positive relationship between behavior rewards and training. SLPs with higher iPad efficacy were more likely to use the iPad to meet students' articulation and language goals. Responses to open-ended items in the survey revealed a number of changes to SLPs' practice and service delivery. Reportedly, iPad and educational apps helped to make instruction more dynamic and interactive.

CHAPTER I

THE PROBLEM

Like many educators, speech-language pathologists (SLPs) utilize innovative means to capture students' attention and motivate them to learn (Atticks, 2012). Touchscreen tablets, especially iPads, are gaining popularity in schools, and school-based SLPs are adopting this new technology in the classroom. While a growing body of research has focused on teachers' use of technologies in the classroom, few studies have examined how SLPs utilize them (Karsenti & Fievez, 2013; Wartella & Jennings, 2000). The speech-language classroom environment significantly differs from a standard teaching setting in terms of content, required interaction, and student population. For instance, the SLP aims to provide a rich language environment that supports students' speech and language needs, which may focus on accomplishing articulation sounds (i.e., how a student produces a sound by placing the articulators in a particular manner). Though SLPs function autonomously in providing speech-language pathology services, they are required in the school setting for students who are mandated for speech services as per their individualized education plan (American Speech-Language-Hearing Association [ASHA], 2014). This creates the need to examine how SLPs' use of technology tools in settings other than the general education classroom, particularly for students with disabilities who receive speech-language services. Thus, this study examined how SLPs used iPads and iPad applications (apps) in a K–12 urban school setting.

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Classroom Technology and the SLP

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iPads and Learning

The iPad is a portable tablet computer that Apple manufactures and markets. Apple builds the iPad's user interface around the device's multi-touch screen, which includes a virtual

keyboard. An iPad can shoot video, take photos, play music, and perform Internet functions, such as web browsing and e-mailing. The iPad's various connectivity options (Wi-Fi and cellular connectivity) enable the device to download and install a myriad of apps that are available for free or at a one-time (usually low) cost (Sydell, 2010). By late 2013, consumers had purchased 170 million iPads worldwide (Hughes, 2013), and 1.6 million apps were available for download as of July 2015 (Piejko, 2016).

Proliferation of tablet use in education is even more recent than the iPad's entry into the consumer marketplace, but the iPad has already "made unprecedented inroads into elementary and high schools around the world" (Karsenti & Fievez, 2013, p. 2) in a relatively short time. More than 4.5 million users report using touchpad technology in U.S. classrooms (Etherington, 2013), partly because the iPad "has most of the capabilities of a desktop or laptop computer but with additional unique affordances, such as a multi-touch screen and a seemingly endless variety of applications that promote previously unseen possibilities for mobile learning" (Hutchinson, Beschorner, & Schmidt-Crawford, 2012, p. 15).

Current research has examined how the affordances of mobility and the wide variety of apps might be used to help students learn. With these capabilities, iPads and tablets present many opportunities to improve the learning environment for both educators and students through use of their features for speech and language instruction, and other educational areas.

Additional research indicates that iPads optimize learning (Blackwell, 2013; Brown & Harmon, 2013; Burden, Hopkins, Male, Martin, & Trala, 2012; McClanahan, Williams, Kennedy, & Tate, 2012; O'Malley et al., 2013). Burden et al. (2012) conducted a mixed-methods case study with iPads in eight Scotland schools, revealing that the iPad facilitated student achievement in many of the core elements required within the curriculum. Results

revealed that iPad significantly improved their access to and efficient use of technology through many attendant benefits, such as ability to manipulate learning stimuli according to their educational needs and responding well to their teachers' efforts to engage and encourage them to utilize apps inside and outside the classroom. Additionally, teachers could use iPads to explore alternative app activities with which to engage their students, and the students' personal ownership of the device empowered them to learn more from its apps (Burden et al., 2012).

While the iPad can increase interactivity in classrooms hindered by large student-to-educator ratios, the literature suggests that iPad and app use for education can also present challenges. Attard (2013) explained that technical barriers and management issues for iPad use can arise, citing such problems as equitably allocating a limited number of iPads among students. Furthermore, the iPad's entry into the classroom "does not necessarily make for a smooth transition" (Karsenti & Fievez, 2013, p. 1), so placing a new technological element into an already complex group dynamic may initially frustrate teachers. Wartella and Jennings (2000) further noted that teachers require training and familiarity with new tools intended for classroom use. Similarly, SLPs need support and training to successfully integrate the iPad into their educational strategies in order to guide their students toward meeting their speech and language goals.

Roles of SLPs

As communication disorder specialists, SLPs aim to facilitate communication and language growth through a variety of therapeutic and scientific means. SLPs work in various settings—such as hospitals, rehabilitation facilities, and nursing homes—but mostly in pre-K to 12th grade classrooms (ASHA, 2014). Here, SLPs support students in many areas, such as reading, writing, speech or articulation, stuttering, language (word meaning and vocabulary), and

pragmatics. According to the ASHA (2014), "90% [of] SLPs served students with articulation/ phonological disorders and language disorders (semantics, morphology, syntax)" (p. 1). This study focused on the most prevalent areas of speech services in schools: speech-sound (articulation) and spoken-language disorders, which are defined below.

Speech-sound/articulation disorders. ASHA (2015c) defined these disorders as "any combination of difficulties with perception, motor production, and/or the phonological representation of speech sounds and speech segments [including phonotactic rules that govern syllable shape, structure, and stress, as well as prosody] that impact speech intelligibility" (p. 1). SLPs use a variety of strategies to remediate speech-sound and articulation disorders. Historically, "some treatment approaches have traditionally focused on articulation production and others have been more phonological/language-based" (ASHA, 2015a, p. 1). One approach is cyclical, focusing on one or two sounds at a time; alternatively, an SLP may use traditional objects or stimuli to visually prompt or guide the student. More information on how SLPs use technology to execute these different strategies to achieve speech-sound/articulation disorder goals would support this study's focus.

Spoken-language disorders (or oral-language disorders). ASHA (2015c) defined this classification of disorders as "a significant impairment in the acquisition and use of language across modalities [speech, sign language, or both] due to deficits in comprehension and/or production across any of the five language domains [phonology, morphology, syntax, semantics, pragmatics]" (p. 1). Spoken-language disorders may be caused or accompanied by other conditions, such as autism spectrum disorder, Asperger's syndrome, intellectual disabilities, developmental disabilities, attention-deficit-hyperactivity disorder (ADHD), traumatic brain injury, psychological or emotional disorders, or hearing loss (ASHA, 2015c). Additionally,

children with spoken language problems frequently have difficulty learning to read and write: Children with reading and writing problems often struggle with spoken language, particularly relative to such higher order spoken language skills, such as expository discourse (Scott & Windsor, 2000).

SLP intervention, assessment, and treatment. Table 1 categorizes the areas for which SLPs provide intervention, assessment, and treatment in school-based speech-language pathology. This study examined only a subsection of areas that iPads could treat: phonology (sound), morphology (grammar), and semantics (vocabulary), all marked with an asterisk.

Table 1

School-Based Speech Language Pathology Services

	Spoken Language		Written Language	
	Listening	Speaking	Reading	Writing
Phonology*	Ability to identify and distinguish phonemes while listening (i.e., phonological awareness)	Appropriate use of phonological patterns while speaking	Understanding of letter-sound associations while reading (i.e., phonics)	Accurate spelling of words while writing
Morphology*	Understanding morphemes when listening	Using morphemes correctly when speaking	Understanding grammar while reading	Appropriate use of grammar when writing
Syntax	Understanding sentence structure elements when listening	Using correct sentence structure elements when speaking	Understanding sentence structure while reading	Using correct sentence structure when writing
Semantics*	Listening vocabulary	Speaking vocabulary	Reading vocabulary	Writing vocabulary
Pragmatics (includes discourse)	Understanding of the social aspects of spoken language, including conversational exchanges	Social use of spoken language, including production of cohesive and relevant messages during conversations	Understanding point of view, needs of the audience	Conveying point of view, intended message

Note. Adapted from "Language in Brief," by American Speech-Language Hearing Association, 2015, p. 1.

SLPs also document the outcomes of their efforts in intervention, assessment, and treatment in school-based speech-language pathology (ASHA, 2001), which may hold implications for research as well as academic and therapeutic education. Additionally, practicing professionals are responsible for increasing their knowledge as their field continues to evolve: "Critical contributions of literacy competence to academic and social success and lifetime opportunities make it not only appropriate but essential that SLPs assume these roles and responsibilities" (ASHA, 2011, p. 4). As technology becomes central in education, SLPs' efforts are imperative in increasing their own knowledge base through training on technological resources to uphold the highest standards in both education and therapy.

SLPs and iPads

Though limited in scope, there has been some literature documenting SLPs' adoption of iPads. Some SLPs have successfully integrated iPads into their practices. The Pennsylvania Speech-Language-Hearing Association (2012) reported that most SLPs now use iPads with their students. Atticks (2012) referred to the iPad as a lightweight, user-friendly friendly device—a "valuable therapy tool" (p. 84).

Brown and Harmon (2013) found that the multitude of available apps promoted learning through educational games and other tutorial programs and indicated that, by collecting data, recording language samples, and motivating students, apps might be useful to SLPs who work with students on language acquisition, production, development, and use.

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Theoretical Framework

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Mobile Devices and Applications Framework

Muñoz, Hoffman, and Brimo (2013) developed a framework (see Figure 1) for mobile devices and app use to demonstrate proper decision making in mobile device and app selection,

emphasizing their use "as indirect support for existing communicative skills, as an instructional

tool, and to meet specific device-dependent communication goals" (Muñoz et al., 2013, p. 139).

This framework can greatly aid SLPs in their treatment process.
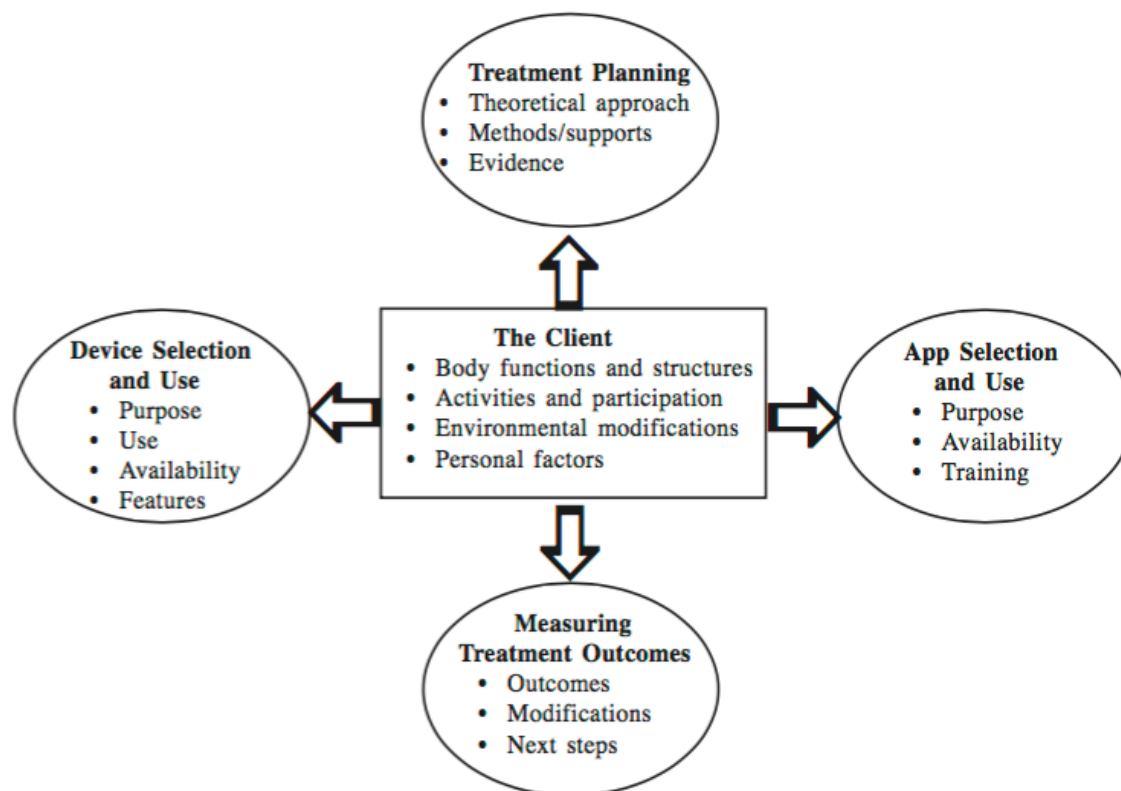
Figure 1. Mobile device application in clinical practice. Muñoz et al. (2013) developed a framework for utilization of mobile devices and applications. Reprinted with permission (see Appendix A).

However, SLPs must use sound judgment in their decision to use a device or apps. This

framework provides five elements for evidenced-based practice: (a) the client, (b) treatment

planning, (c) device selection and use, (d) app selection and use, and (e) measuring treatment

outcomes (Muñoz et al., 2013, p. 139). Consideration of these elements enables SLPs to select

appropriate devices and apps that accurately meet client and students' needs and facilitate

treatment objectives (Muñoz et al., 2013). Figure 1 provides a schematic view of the elements

and decision-making processes SLPs could use to determine how technological devices such as the iPad can be used to provide services.

Statement of the Problem

In the time since its invention, the iPad has influenced techniques and practices in the speech pathology field. Although scholarly interest in classroom technology has flourished in recent years (Blackwell, 2013; Burden et al., 2012; Cohen, Hadley, & Frank, 2012; McClanahan et al., 2012), little is known about how SLPs' use of iPads to serve students with spoken-language disabilities or to provide speech and language services. Thus, this study examined iPad use as reported by SLPs who served K–12 students with such disabilities.

Research Questions

The study was guided by two main research questions to investigate how SLPs use iPads for speech and language instruction, specifically for articulation, language, and vocabulary goals.

Research Question 1 (RQ1): How Are SLPs Using iPads?

- How much time do SLPs report using iPads for articulation goals (speech-sound disorders), language goals (grammar: verb–tense agreement, pronoun usage), and vocabulary goals (meaning of words)?

- What kinds of iPad apps do SLPs report using for articulation goals (speech-sound disorders), language goals (grammar: verb–tense agreement, pronoun usage), and vocabulary goals (meaning of words)?

Research Question 2 (RQ2): What Factors Relate to SLPs' Use of iPads?

- Does a relationship between iPad use and the SLP's demographic characteristics (years of experience, gender, education, work setting, and borough location) exist?

- Does a relationship between iPad use and school-based support, professional development, and technical barriers exist?

- Does a relationship between technology efficacy and frequency of use exist?

Significance of the Study

This research emphasized SLPs' use of iPads to facilitate speech-sound/articulation disorders and child language disorders in the area of grammar and semantics among children with speech and language needs in the classroom setting. While SLPs work comprehensively in all aspects of speech-language pathology, limiting this study to these two areas allowed an in-depth examination of the barriers and implications of iPads for speech and language instruction. Findings from this research are crucial to filling gaps in the literature and to stimulating scholarly interest in this new education trend. This study was intended to unveil the purposes and means in which SLPs used iPads.

CHAPTER II

REVIEW OF RELATED LITERATURE

This chapter examines relevant research on iPad use in the educational environment to illustrate the significance of the current study. The chapter describes the literature search strategy used for the study and reviews the literature that examines technology use in the classroom—specifically the assets and liabilities SLPs and other educators have experienced as a consequence of iPad integration into educational programs. Furthermore, the chapter examines how SLPs are exploring iPad use and applications for speech therapy.

Literature Search Strategy

Specific search criteria were used to parse a large literature base for information on use of iPads in education, in general, and in speech-language pathology, in particular. The journal databases searched were: ASHA (search tab on http://www.asha.org/), JSTOR, EBSCO, and ERIC. All searches used combinations of these keywords: *iPad* (always included), *learning*, *speech-language pathology*, *therapy*, and *language instruction*. To address the specific issue of generational divides in technology use described in this chapter, the keyword *digital divide* was also used. After searching each index, key authors with multiple publications on iPad use in the classroom were identified, and the corpus of each author's work was reviewed for relevant research. Because marketing for the iPad began in 2010, all research on iPad use in education is limited to the 7-year span between its commercialization and the present.

Education and Mobile Technology

Youth mobile media consumption is one of history's most rapidly growing, far-reaching adoptions of communication technology (Squire & Dikkers, 2012), likely because mobile devices create new standards in interactivity and accessibility. These standards are as applicable

to classroom environments as they are to daily living and leisure. For example, the iPad can animate the static information presented in the traditional classroom through the use of the flash feedback and responsiveness of an addictive video game console via its touch-centric features and interactive applications, as this chapter shows. This interactivity draws students to these devices and further supports their integration into the classroom (Burden et al., 2012).

Additionally, iPad technologies have also broadened classroom learning possibilities by making technological environments more easily accessible to students and SLPs (Livingstone, 2012). Unlike computers and projectors with limited accessibility, the iPad provides instant handheld learning without the need for extensive setup, additional hardware (e.g., monitor, mouse, keyboard), or a nearby power source (its battery life is more than double that of an average laptop). The iPad can be held and manipulated by the hand alone, making it "[more] possible to view the world through a digital lens" (Karsenti & Fievez, 2013, p. 4). The true mobility of the device can potentially make electronically transmitted education in the classroom a less awkward, limited-use commodity.

The iPad's immersive environment and accessibility have motivated educators and speech pathologists to integrate it into their practices. Recent literature suggests a significant adoption of the technology in process within the field:

> iPads are quickly becoming a valuable therapy tool for clients with cognitive-communication deficits. Speech-language pathologists are beginning to introduce the iPad into [speech] therapy in innovative ways that capture their clients' attention, motivate them, and empower them to be successful outside of the [speech] therapy session (p. 84). . . . A recent survey conducted by the Pennsylvania Speech-Language-Hearing Association (2012) found that a majority of clinicians are currently using iPads

with their clients. Out of 139 individuals interviewed (136 SLPs and two audiologists

responded; one interviewee did not respond), 86 (62.3%) currently use an iPad (p. 85)

. . . . It is readily recognizable and spans the generations. (Atticks, 2012, p. 86)

To ensure that this educational environment transformation becomes increasingly efficient, it is

crucial to evaluate the iPad's capabilities in contemporary schooling structures.

The iPad's Core Components and Learning

Apps

The staple of such mobile technologies as the iPad is the *app*, a versatile, self-contained

environment that presents content to users. The app can be tailored to deliver specific learning

tasks, such as interactive speech games, or stimuli, such as flashcards and visual images, to

accompany words. Educational games and iPad apps can collect data and record language

samples while providing visual and audio feedback to motivate students to keep learning

(ASHA, 2011; Brown & Harmon, 2013).

Numerous iPad apps designed for educators in various environments, including SLPs, to

track students' progress and collect data on student activity as it happens. More than 500,000

available apps can supplement speech therapy (Atticks, 2012). These include Therapy Report

Center (Smarty Ears, 2016), which helps SLPs manage and track their students' progress by

collecting data on students' performance toward their speech goals. This app compiles all data

points and reports from speech apps utilized on the iPad and keeps all data on student

performance organized in one place, letting SLPs monitor a student's performance on a specific

goal. The SLP usually tallies the correct responses, quantifies performance as a percentage, and

creates personalized speech and language sessions based upon a previous intervention's

effectiveness. This new app technology enables the SLP to do all of these activities simultaneously.

Data Recording Automation

The automation of data recording within the app gives a more accurate representation (compared to a self-report) of how students use their practice time, which monitors practice when the instructor is not present. The data collection and monitoring process is crucial: "The accuracy of a speech or language analysis is paramount to decisions regarding delay, disorders, and treatment objectives" (Ingram, Bunta, & Ingram, 2004, p. 119). This gives SLPs a window on a student's progress from one moment in time to the next. Collecting and recording data via the iPad also increases the quality of feedback a clinician receives regarding session effectiveness, ultimately improving subsequent sessions.

According to GeekSLP (2013), a source of educational apps and technology information, another useful and popular app among SLPs is Talking Tom Cat (Outfit7 Limited, 2017). This gives auditory feedback by repeating the student's words while interacting with the student, thereby encouraging students to express their thoughts while maintaining their attention. After making a statement, the student can interact with the object—for example, a cat—by poking it, and the cat will respond dynamically with the last verbal input the student made. SLPs can use this app to entice students to practice pronunciation and sound out words during articulation therapy. The student can work on lists of words and compare their articulation to that of Talking Tom Cat, thus judging informally whether or not they pronounce the word correctly. This on-demand auditory and visual feedback keeps students more attentive than in traditional settings, empowering them to learn more.

Pictured Stimuli

Another popular app, Let's Name Things: Fun Deck (Super Duper Publications, 2015), lets students label common real-world objects. Its colorful stimuli provide familiar everyday items that can be manipulated and adapted to meet the SLP's needs for the lesson or for the student as a visual prompt. The SLP usually provides prompts, either verbally or visually, to help a student obtain a correct response. The SLP may record the student's voice when naming objects, and can play back this audio on demand to track the student's pronunciation improvements. The app also logs the student's correct responses for each session.

These features give the SLP a systematic method for tracking progress within the app and give the student the ability to self-monitor. This leads to better performance in a shorter time than traditional practice methods in which an SLP can monitor practice only during a live session and a student receives no immediate feedback when the SLP is absent. Thus, Let's Name Things: Fun Deck embodies a more exhaustive system of feedback than Talking Tom Cat, while providing the useful data reports found in Therapy Report Center.

Phonemic Awareness Training

Another app that helps students to learn consonant-vowel-consonant syllable structure is the Fat Cat app. Designed using research-based phonological awareness training methods, this app assists with the remediation of early reading skills (Carlson, 2013) by training students in phonemic awareness, phonics, auditory processing of sounds, and left-to-right visual tracking. The app does this through its assistance to a wide range of students, including English-as-a-new-language students, by providing the correct pronunciation of the sound when students are struggling with a new word. Versatile in its use as well as visual stimuli, this dynamic app provides visual support as needed for students with diverse learning requirements.

Touchscreen, Camera, and Microphone

Effective data collection, as evidenced in such apps as Therapy Report Center, provides useful feedback to instructors and SLPs that can be used to improve speech and language instruction. However, data may not be useful if they come from unmotivated students. In addition to the visual and auditory stimuli presented in the aforementioned apps, the iPad's interactive feature set—touchscreen, microphone, camera—fully use each application to keep students captivated. Talking Tom Cat keeps them entertained by responding dynamically to their touches as they practice their words. These features give life to otherwise monotonous work.

Larabee, Burns, and McComas (2014) described the touchscreen's ability to replicate and advance traditional exercises SLPs use, such as Elkonin's (1973) sound boxes activity, whereby students slide tokens in connected boxes across letters as they articulate their individual sounds and ultimately voice them together as a word. For example, tokens C, A, and T blend to articulate the word *cat* when placed into adjacent boxes. This strategy enables the use of manipulatives to assist the student in stretching out the sounds they learn. The word boxes of an iPad app called Build A Word—Easy Spelling with Phonics, developed by AtReks (2013), are a modification of sound boxes. Students are instructed to drag and drop letters into matching sections of connected boxes using the touchscreen, while articulating the sounds each letter makes.

In an 11-session intervention, Larabee et al. (2014) compared student improvements through the iPad application versus a traditional magnetic white board. While instructional approaches via the iPad did not necessarily yield better outcomes on student performance at the time of study, performance on retention tasks (i.e., the ability to recall targets) was notably

higher when students practiced on the iPad. The study also highlighted that engagement during study was higher when the iPad delivered instructional targets.

This was similar to reports by McClanahan et al. (2012) that iPad applications targeting specific reading skills increased task engagement. ASHA (2011) has praised the iPad's touch-motivated visual and audio feedback for captivating students as they are exposed to incidental learning. A student's environment changes every time the screen is touched, and this immediate feedback brings a sense of agency that keeps them drawn in. Burden et al.'s (2012) study found that 92% of a sample of students indicated via survey that they learned more on the iPad than in traditional methods (pencil and paper) and aging technological ones (desktop computers and laptops) and were more engaged in the iPad as well.

iPads, Apps, and AAC Devices

In addition to these apps, visual and audio feedback apps such as iCommunicate, Proloquo2Go, and Assistive Chat can allow the iPad to be a cost-effective augmentative alternative communication (AAC) device, providing the voice output necessary to help improve communication deficits. More than 100 AAC apps are available through iTunes and other sources, and the number of such apps is growing rapidly. SLPs can set up a technology-based treatment by uploading the app or software onto an iPad to act as an AAC device. King, Thomeczek, Voreis, and Scott (2014) found that students with severe communication delays and verbal skill deficiencies—not using an abundance of words to communicate because of an expressive language ability restriction—can benefit from AAC devices.

The AAC device can support communication, increase classroom participation, and teach specific academic skills such as functional play, communication, literacy, and expressive language (Dunham, 2011; Ficano, 2017; Gosnell, 2011). Many of the apps have been designed

and programmed for nonverbal students to touch icons that return speech with computer-generated voices. This allows these students to practice expressions in their private environment in the long term while having a tool for immediate communication in the short term, often engaging them with such captivating stimuli as interactive cartoon characters and music that accompanies the activity at hand. This process makes AAC-assisted exercises less tedious than traditional worksheets (Clark, 2016). King et al. (2014) reported conclusions from extended observations of student use of many popular iPad-based AAC apps (i.e., Assistive Chat, Grace Picture Exchange, iCommunicate, MyTalk Mobile, Proloquo2go, TouchChat) during speech and language therapy treatments. King et al. reported observing 51% of the app times for academic purposes were observed to support expressive, receptive, and literacy skills.

The iPad's feature set and various apps also enable educators and SLPs to better meet students' education and speech needs. The integration of iPads into school-based speech and language therapy settings can facilitate a student's conceptual understanding through visual and audio feedback within an interactive touch environment that minimizes boredom during speech and language therapy sessions. Gosnell (2011) reported that "iDevices [iPads and apps] are quickly becoming a key tool in SLPs' intervention arsenal. The multifunctional, engaging platform allows for a convergence of treatment materials, quick access and incentives . . . [iPads and apps] and data collection (p. 1)." iPads and apps are relatively inexpensive in the long run, available through local retailers or online stores, and easily downloaded.

The iPad benefited students with engagement and motivation difficulties during instruction; with iPad use, researchers noticed increases in students' focus and metacognitive skills in reading, and fifth-grade students diagnosed with a disability presented significant improvement in their overall reading ability (McClanahan et al., 2012). The iPad's effect on

learning "was [noted to be] small but positive when compared to traditional methods" (Larabee et al., 2014, p. 4).

The iPad and apps can provide visual and auditory feedback to aid students in speech therapy, such as with animation, visual support, and manipulation of stimuli on the iPad screen (Gosnell, 2011; Snape, Maiolo, & Litton, 2013). Furthermore, "Like Starfall, almost any app can be transformed into a treatment tool. The free app 'Doodle Buddy,' for example, created for 'painting, drawing, scribbling, and sketching,' can be adapted and used to meet many intervention goals" (Gosnell, 2011, p. 11). This is one way iPad devices provide customized learning experiences by enabling students to manipulate stimuli to better meet their educational needs, and to use such built-in tools as dictionaries, thesauri, and text-to-speech apps (Burden et al., 2012) to help them access and learn materials.

Video and recording technology has also been used on the iPad with positive results. Burton et al. (2013) found that the use of video self-modeling with their students saw an increase in learning new skills. Moreover, video self-modeling has been widely used to teach students with autism and developmental disabilities (Cumming & Rodriguez, 2013).

iPads and Future Educators

The advantages of an interactive technological environment extend past the boundaries of age, enticing not only the younger populations of children in education, but also the rising generation of educators. Pegrum, Howitt, and Striepe (2013) explored the iPad 2's contribution to learning in a cohort of eight preservice teachers, including the teaching education they received, over a semester. These teachers reported that the diversity of apps enabled them to more easily gather and plan exercises to accompany their primary teaching than traditional methods did. In addition, their ability to connect the teaching device to wireless networks eased

communication with other students. The authors emphasized the iPad's assets: (a) portability;

(b) ability to connect to Wi-Fi or some network that ultimately provides flexibility; and (c)

immediacy of communication, empowerment, and engagement of learners. All eight preservice

teachers praised the iPad for its ability to record information, to find new information, and to

engage their students in the interactive learning process in these and other ways.

Many SLPs are developing specialized apps on their own and propagating their app

development and usage experiences among colleagues by listing favorite apps online, discussing

their benefits, and providing feedback on the most current mobile devices and speech-language

pathology applications on Twitter, Facebook, and such websites as GeekSLP, PocketSLP,

Speech-Language Pathology Sharing, SpeechTechie, and Technology in Practice SLP (Dunham,

2011). Furthermore, SLPs could discover many beneficial apps in the special education section

of the Apple iTunes App Store, and app-using SLPs can strengthen ties with patients and

families and extend treatment for speech-sound disorders and spoken language disorders into

their daily lives more frequently (Dunham, 2011).

The app's chief advantage is its versatile capacity to better meet students' needs

(Dunham, 2011). For SLPs, iPads offer many new features, such as integrated front-facing video

cameras, which may enable SLPs to devise creative ways to work on speech and language skills

with children. The apps are also multifaceted: They can record sessions and allow for feedback

in a way that empowers students to own their speech and language development.

Recent literature shows that the iPad not only augments a learner's experience, but also

offers "improved communication to enable professionals to share information and collect data;

effective iPad use improves communication to enable professionals to share data effectively with

each other" (ASHA, 2011, p 2). Perhaps the iPad's key feature is not its integration of camera

and touchscreen for an augmented learning experience, but the mobile form factor that allows portability and use of this technology almost anywhere (Pegrum et al., 2013).

All eight teachers in the study accessed new real and virtual learning spaces through the iPad. Its mobility enabled the teachers to take them almost anywhere or use them in fixed and transitory locations, thus meeting Puentedura's (2012) definition of these devices as "mobile" rather than "portable." The advantages of a truly mobile learning environment are more than theoretical: Participants in this study indicated that not only was the iPad durable and reliable, but it also fulfilled their educational goals more enjoyably (Pegrum et al., 2013).

Yusup (2014) examined first-generation iPad use as a learning device among primary school teachers enrolled in a bachelor of education program at a private university in Malaysia. A survey of 93 teachers who used iPads in an online distance learning program indicated that iPads had effective features and pedagogical tools that assisted the learning process. While participants reported a shortage of accessible learning content, they hypothesized that, with more learning content uploaded to such cloud-based content transmission applications as Dropbox, iPads could become primary learning and communication tools in the future.

The teachers also mentioned that the iPad's portability, lightness, responsive touchscreens, and text legibility encourage collaboration and information-sharing among users while bolstering the learning experience. This confirmed Fisher, Lucas, and Galstyan's (2013) finding that the iPad enhances collaboration because students can transition back and forth from private to public learning contexts. Also, the iPad's portability and use of intuitive applications has made the computing landscape more accessible and brought people together in social computing.

iPads in Clinical Environments

There is considerable evidence to demonstrate the iPad's effectiveness in augmenting the educational experiences of SLPs, teachers, and students. A study by Green (2011) illustrated its "greater success for people who have communication and cognitive challenges" (p. 1), which often make traditional education demanding, particularly in the classroom. As such, education professionals need to develop and adapt different forms of pedagogical practice to empower individuals with literacy, learning, and communication differences while they use technology.

According to Houston and Perigoe (2010), SLPs are dedicated to cultivating listening and speech strategies and interventions for children with communication disorders. If SLPs can do so with current and vivid apps and iPad utilities, these can be game changers. Intervention and treatment strategies have progressed and enabled children to expand their verbal skills when using these tools for speech and language instruction. The literature also mentions the use of stimuli to activate the brain to cause effective change via therapeutic means in the speech and language classroom: "Research has shown that the brain has neuroplastic qualities [and] is capable of making changes when properly stimulated" (Green, 2009, p. 1).

Furthermore, constant visual stimulation with speech stimuli can improve speech and language skills. When the stimulation's intensity increases, improvement quickens (Green, 2009). Studies have also indicated that multimedia treatment is an effective way to learn and that assistive technology has great potential to improve skills such as reading and writing when users view texts while hearing them aloud. Thus, the stimuli in a multimedia format can effectively support reading tasks (Green, 2009).

Banda, Copple, Koul, Sancibrian, and Bogschutz (2010) endorse the use of AAC devices with autistic individuals. In a public-school setting, these researchers investigated

autistic students use of a speech-generating device to request a desired object. The students watched a video prompt of an individual using the AAC device to request a desired item, which encouraged them to use their speech-generating devices to request their own items. This study showed that speech-generation technology could allow nonverbal individuals, autistic students, and people with other severe cognitive disabilities to place requests and communicate effectively in the classroom setting (Banda et al., 2010). King et al. (2014) provided additional evidence that SLPs can better serve the autistic population with use of iPads as AAC devices.

Studies like these show how SLPs successfully support students' communicative abilities to enhance their achievement in the classroom environment. For this purpose, AAC devices cost less for a much greater effect than outdated manipulatives that may or may not captivate students in speech and language instruction.

Apps created for a population with linguistic or cognitive deficits are common in acute care, clinical, and rehab settings. These apps enable the clinician to turn the once static, and perhaps outdated, therapy materials into dynamic, interactive sessions with bright visuals and multi-touch capabilities, thus creating customized, unique, and motivating therapy sessions for clients. Using apps to enrich therapy sessions can be more beneficial to clients, particularly digital immigrants, than using them simply to replace existing activities (Dignan, 2011).

The Speak It app, which takes a text and reads it aloud to the user, may be useful for a client with auditory comprehension difficulties. It contains a feature for slowing down the rate of speech, giving the user more time to process the incoming information. Proloquo2Go, also an assistive app for clients needing an AAC device, costs only about $200, compared to other existing AAC devices, which can cost thousands of dollars.

Often frustrating for students in the speech and language classroom is the burden of juggling their memory of actual definitions and pronunciations of new words with their struggles to focus on and articulate these words due to cognitive and speech deficits. Many apps, such as Dictionary.com and Google Translate, include word definitions and pronunciations on the screen. Thus, reading becomes more individualized, interactive, and engaging, but most importantly it becomes easier, as students can leave visible traces of their learning as they progress and more easily recover when they stumble (ASHA, 2011).

Gosnell (2011) also noted that traditional language treatment—for example, expanding mean length utterance, using various syntax forms, and increasing lexical diversity—could be targeted through apps. For example, a 5-year-old girl with cerebral palsy used Starfall, an expressive app for letter knowledge, phonemic awareness, and decoding skills. Before using it, she would not vocalize, but once engaged with it, she began to make sounds in response to the iPad.

In a case study, McClanahan et al. (2012) explored iPad utility tools and apps to provide intervention to fifth graders with ADHD. This has potential advantages for these students, including sustained attention, increased motivation, and issuance of various accommodations. The authors reported that technology used with struggling readers—e-books, text-to-speech options, computerized learning games—has been effective in teaching. Such enhancements hold tremendous implications for students with disabilities and learning challenges, such as ADHD or speech and language/hearing and/or visual impairment. The experiences of these students, as well as the others mentioned above, pool into a strong defense for iPad use in speech and language pathology.

Noteworthy Adaptation Barriers

To capitalize on a classroom of students natively comfortable with technology, educators must develop the skills to use these devices. Brown and Harmon (2013) noted that "many new clinicians are a part of the Millennial generation" (p. 1) and thus use iPad technology with great ease. Yet being a *millennial*—which Epstein and Howes (2006) defined as a person born between 1982 and 2002—does not guarantee integration of technology into a learning environment as an effective teaching tool. Along with the ability to easily navigate and teach others to use the device, an SLP must understand the unique qualities that make it more efficient than traditional teaching methods, as well as learn to select applications and features useful to the specific field of instruction. An SLP must also anticipate and plan for the drawbacks of transitioning from one teaching method to another. The choice of educators and administrators to anticipate potential barriers ensures that adaptation of the new technology is not merely a costly trend bearing no results.

iPads Are Not Automated Clinicians

Though much evidence suggests that iPads benefit students and SLPs alike, barriers to SLP use of iPads for speech and language instruction certainly exist. First, iPad applications are not advanced enough to fully replace SLPs (Larabee et al., 2014). Thus, incorporating an iPad into an SLP program should merely augment an SLP's practice. Digital natives well versed in daily technology use, as well as digital immigrants transitioning from environments where technology has little place, require adequate time, education, and experience to integrate a new technology into a traditional teaching environment without losing a traditional teacher's unique advantages (Burden, 2012; Gosnell, 2011; Green, 2009; Prensky, 2001). Even after this integration is complete, it requires specialists who can design support environments for

connectivity and security problems. Economic barriers that may prevent students from making use of such technologies should also be considered.

Educators must also harness technology to enhance curricular integration and support pre-specified learning goals, not simply function as instructional add-ons (Larabee et al., 2014). Larabee et al. (2014) found mixed effects of iPad application on student decoding performance, but students' task engagement in iPads was nonetheless consistently high.

Yusup (2014) noted another challenge iPads and apps posed: Their users' parents often based their assessments of SLPs' success on their children's actual use of the apps, and often expected the SLPs to comply with app limitations. SLPs often desire to use apps in lieu of speech-language treatment programs, which can lead to incorrect and deleterious clinical assessment strategies and treatment plans. The Rehabilitation Engineer Research Center on Communication Enhancement (2011) found the following:

> [M]obile technology is driving service delivery. Often a device and apps are selected before the clinician is even seen. . . . This can be a challenge in optimizing communication solutions. . . . At times there is a mismatch between communication goals and technology, notably when a device has been purchased for capabilities and apps (e.g., game applications) not directly related to communication or when access is too difficult. (p. 6)

Selecting the Right Applications

SLPs intending to use iPads to increase the quality of their practice must make evidence-based decisions in app selections. Moreover, most applications for the iPhone operating system devices, specifically the iPad, are out of sync with modern educational theories of learning the skills necessary to compete in the 21st century. Due to the proliferation of numerous

technological options, SLPs must remain focused and goal-oriented when using devices and apps.

The development of a useful curriculum that does more than incorporate the iPad as a novelty requires thoughtful consideration of: (a) the areas in which an iPad surpasses traditional teaching methods, and (b) a period of trial and error as the technology enters a classroom environment. Before teachers (especially SLPs) can implement iPads for instruction, professional development and appropriate time for planning should be allocated for them to learn how to use and incorporate them into their instruction. Thus, administration must allot an adequate amount of time and patience for this transition to the practitioner. Cumming, Strnadová, and Singh (2014) reported that some SLPs lacked preparation time, which prevented them from successfully implementing iPads.

Contextual Factors Regarding Potential iPad Use

The literature notes that technology can frustrate teachers uncomfortable with their own ability to maneuver the iPad device (Burden et al., 2012; Green, 2009). This may be due to lack of exposure and familiarity with operating the device with a level of ease and comfort: "There is much skill involved in software selection and usage. . . . One piece of software can be used in many different ways with different individuals to meet different goals. . . .[but] acquiring that skill requires effort" (Green, 2009, p. 3). Teachers may also fear using this technology, which might pose a problem (Burden et al., 2012; Gosnell, 2009; Green, 2009).

Adaptation is a Function of Age, Support, and Demographics

Evidence shows that the time given to educators to integrate the iPad into their environment should differ as a function of age. Educators and adults born in pre-digital times are sometimes called digital immigrants because of their non-fluid use of technology and mobile

devices such as the iPad. Prensky (2001) found that those born before the digital age are now

teaching and serving students in the classroom. By contrast, digital natives are fully fluid with

all technological devices and their use, thus very comfortable with those who push for use of the

iPad and similar technologies in speech and language classrooms. Older adults found cell

phones and websites less user friendly than did both middle-aged and young adults. Older adults

also reported less anxiety than middle-aged and young adults about leaving their cell phone at

home, insisting that technology did not alter how they communicated with others (Prensky,

2001). Loges and Jung (2001) also found age to significantly affect technology fluency, which

they associated with less access to the technology as well as a narrower range of personal online

goals. Age also influenced technology efficacy: Older adults were less confident in their ability

to use new apps.

Technical Support

In addition to an adequate time window to fail and learn, both educators and students

need an experienced iPad user—usually an IT specialist—to provide large quantities of technical

assistance. Educators who did not receive assistance from IT specialists at their schools could

not fully implement iPads (Cumming et al., 2014). Initially, students were unable to use iPads,

as some lacked the Apple ID accounts needed to download applicable apps. To remedy this

issue, the school set up a help desk to help students to open accounts, and also instructed students

and faculty on helping participants install apps and download learning modules using Dropbox.

Epstein and Howes (2006) found that millennials felt more appreciated and secure in using this

technology when they received the appropriate training and support.

Disparities in Technology Access

Technology use may vary based on demographics, including the user's age, the user's years of experience with the technology, and the educational environment's administrative attitude toward iPads. Holloway (2000) found that race, ethnicity, and economic standing contributed to disparities in access to technology, and that the Internet may only provide such "equal opportunity" for those with access to it. Therefore, those without it may suffer educationally, culturally, and economically.

Additionally, analyses by Van Volkom, Stapley, and Amaturo (2014) revealed few gender differences in daily technology use. Women reported more frustration with technology and had different motivations for its use, while men reported more ease of use. Yet, the authors discovered salient generational differences. Patterns regarding use of iPad based on age, demographics, and efficacy would be interesting to explore regarding SLPs.

<center>**Summary**</center>

As noted in the literature, iPads may benefit the speech and language classroom, but the research is nascent in how speech pathologists perceive and employ these new technologies (Blackwell, 2013; Burden et al., 2012; Cohen et al., 2012; McClanahan et al., 2012). This chapter examined the ways apps can supplement the speech and language classroom with a technologically interactive, handily portable approach to learning. Still, barriers pose challenges for how SLPs use this technology, particularly the iPad. The current study was an attempt to clarify the iPad's adaptability to the speech and language classroom.

Chapter 3 examines the methodology for scrutinizing SLP use of iPad and app technology. The following chapter also provides more in-depth information on data analyses and procedural guidelines for conducting this study.

CHAPTER III

METHODOLOGY

Purpose of the Study

The purpose of this study was to examine SLPs' use of the iPad as a learning/intervention tool for speech and language instruction in relation to articulation, language, and vocabulary goals to facilitate literacy and language development in K–12 schools. This chapter outlines the study's research questions, procedures, participants, instrumentation, and data collection and analysis.

Research Questions

RQ1: How Are SLPs Using iPads?

- How much time do SLPs report using iPads for articulation goals (speech-sound disorders), language goals (grammar: verb–tense agreement, pronoun usage), and vocabulary goals (meanings of words)?

- What kinds of iPad apps do SLPs report using for articulation goals (speech-sound disorders), language goals (grammar: verb–tense agreement, pronoun usage), and vocabulary goals (meanings of words)?

RQ2: What Factors Relate to SLPs' Use of iPads?

- Does a relationship between iPad use and the SLP's demographic characteristics (years of experience, gender, education, work setting, borough location) exist?

- Does a relationship between iPad use and school-based support, professional development, and technical barriers exist?

- Does a relationship between technology efficacy and frequency of its use exist?

Procedures

A proposal was sent to the New York City Department of Education (NYC DOE; see Appendix B) and the Fordham University Institutional Review Board (see Appendix C) to obtain official approval to conduct this study. After both bodies granted permission, a phone conference with central office staff was set up to facilitate communication with the SLPs, in part to avoid bias in the study, in case some participants may have known the researcher beforehand.

The study survey can be found in Appendix D. An e-mail script and a link to the survey were provided to the NYC DOE's Office of Related Services to send to all NYC DOE-employed SLPs (see Appendix E). After reading the survey's introduction, candidates consented to participate (see Appendix F for informed consent form) and completed the questionnaire online via SurveyMonkey. The questionnaire assured participant anonymity about who had participated or who had reported using iPads for speech and language instruction. The staff sent one e-mail per week to the participants at three different times during the study, to remind them to complete the questionnaire if they had not done so.

Participants and Setting

NYC DOE-employed SLPs working in a K–12 setting were chosen as the study's population. The NYC DOE, the largest school district in the United States, serves about 1.1 million students in more than 1,800 schools and employs about 2,800 SLPs citywide. The SLPs employed in NYC DOE are typically licensed SLPs with a master's degree in speech-language pathology. Some of the participants had been in the school system for over 20 years, in which case they may have been working with a bachelor's in speech pathology and were "grandfathered" into being certified to practice. Typically, SLPs work eight 30-minute session days, while those in the middle and high school setting work five 45-minute session days.

Currently, there are slightly fewer than 100,000 students mandated for speech services as listed in their individualized education plan. SLPs are providing speech services as required by IDEA and federal law (PL-94-142). The NYC DOE has several entities servicing students: Districts 1–32 for community school districts and District 75 for impaired and severely handicapped students. Each setting constitutes different therapeutic and speech and classroom dynamics. Educational programs and related services, such as speech services, are provided in the different sites and schools for children and adolescents according to the special education continuum. Students are designated and provided these services by the Committee on Special Education.

Data Collection

Data collection included an online survey administered to participating NYC DOE employees. The researcher sent this instrument to SLPs working at elementary and secondary schools in NYC via an e-mail that included a link to SurveyMonkey, a cloud-based data collection service on a survey host site commonly used in research. Educational research extensively uses questionnaires and interviews to collect data about "phenomena that are not directly observable: inner experience, opinions, values, interest, and the like" (Gall, Gall, & Borg, 2007, p. 228). As such, this online survey was one effective way to gather information on how SLPs would use the iPad with their students. The survey also included qualitative items (posed as open-ended questions) to assess their use of apps for speech and language goals in articulation, language, and vocabulary. Open-ended questions are particularly advantageous when attempting to collect data on new topics or trends (Sue & Ritter, 2007).

The online format via SurveyMonkey allowed participants to complete the survey on either personal computers or mobile devices. This format also eliminated the need for data entry, which is typical when participants receive hard copies of a questionnaire. This was particularly

advantageous to this study, because removing the researcher from the data imputation process lowered the degree of human error.

Using Dillman's (2006) approach to Internet surveys, multiple contacts were initiated to remind potential respondents of the survey. SLPs could volunteer to participate in it from any location and at any time during the data collection period. Thus, the study did not limit participants to responding from a school location or during their work hours.

Instrumentation

The requisite data for this study were collected via an online survey containing six sections, each with different probing items in various formats including closed-ended "yes/no" items, single or multi-selection items, Likert-type responses, and open-text responses. The 24 items covered diverse facets of iPad use in the speech and language classroom. One open-ended item was used to elicit in-depth responses on app use to target speech and language goals, including changes in practice as a result of iPad use. A second open-ended item assessed the effectiveness of iPads and apps in speech and language instruction.

Items 1 through 3 of the survey were used to obtain consent and to determine if respondents were NYC DOE-employed SLPs. Section 1 contained questions about participants' iPad use for speech and language instruction. Section 2 examined SLPs' access to iPads and the level of support the school's administration gave SLPs to use iPads for instruction (Item 9). Section 3 and 4 inquired about SLPs' confidence in their use of iPads for speech and language instruction and technological efficacy (Items 10–11). Section 5 examined SLPs' reported barriers to use of iPads for speech and language instruction.

The survey was left open for a period of 4 weeks. At the end of the data collection period, all personal identifying information was removed from the database before the responses were parsed and analyzed.

Data Analysis

Data were entered into SPSS Version 22.0 for Windows to screen the data for accuracy, omissions, and outliers. Descriptive statistics and frequency distributions were used confirm that responses were within the possible range of values and that outliers did not distort the data. Outlier presence was tested by examining standardized values created for each subscale score, cases for values that fell above 3.29 and values that fell below -3.29 (Tabachnick & Fidell, 2012), and cases with missing data for nonrandom patterns. Descriptive statistics on the sample demographics and the variables used in the analysis were run, initially assessing demographic information as it compared to iPad use in the speech and language classroom.

To address RQ1, basic descriptive statistics—frequencies, percentages, modes, medians, cross-tabs—were used to describe how much time SLPs reported using iPads for articulation, language, and vocabulary goals. The data were analyzed to determine the factors affecting SLP' use of iPads in the speech and language classroom. To address the first part of RQ2, a chi-square statistical technique—appropriate to test for association between two categorical variables (Lomax & Hahs-Vaughn, 2012)—was used to test the degree of relationship between the dependent (frequency of iPad use) and independent (demographic characteristics) variables. To address the second part of RQ2, the chi-square technique was used to test the degree of relationship between the dependent (frequency of iPad use) and independent (school-based support, professional development, technical barriers) variables. Three additional factors were analyzed for correlations with iPad use in the speech and language classroom: (a) school-based

support, (b) professional development, and (c) technical barriers. To address the third part of RQ2, the chi-square statistical technique was used to test the degree of relationship between the dependent (frequency of iPad use) and independent (technology efficacy) variables. Descriptive statistics were then computed to describe the independent variables for each of the above questions

Qualitative analysis was conducted using a thematic coding method, wherein data were clustered by looking for common keywords, phrases, and concepts, which were used to determine codes. Participant responses were then situated within each code and codes were used to develop themes (Owen, 1984). The researcher read and re-read the responses to gather a more accurate understanding of SLPs' use of iPads. All coding and themes were organized using an Excel spreadsheet. The researcher organized the responses by code and then summarized the responses into themes that described specific ways SLPs reported using iPads in their practice. The same procedure was used to examine the open-ended responses that described ways iPads were effective and ineffective in speech therapy sessions

Research Questions and Data Analyses Alignment

Tables 2 and 3 summarize the research questions. Table 2 shows how each variable was measured for RQ1 and the specific statistics used for data analysis; Table 3 shows how each variable was measured for RQ2 and the specific statistics used for data analysis.

Validity

Before the study commenced, participants received an informed consent statement explaining the study's purpose, confirmation that their participation was voluntary, permission to withdraw at any time during the data collection period, and notification that data collected would be stored in a password-protected computer accessible only to the researcher.

Table 2

Research Questions and Analyses: Research Question 1

Research Question 1	Variables	Variable Type and Levels	Measurement of Variables	Data Analysis

1. How are SLPs using iPads?
a. How much time do SLPs report using iPads for:
  ▪ Articulation goals?
  ▪ Language goals (grammar: verb–tense agreement, pronoun usage, etc.)?
  ▪ Vocabulary goals (meaning of words)?
	How much time do SLPs report using iPads for the following:
	
	1. Articulation (Item 1)
	2. Language (Item 2)
	3. Vocabulary (Item 3)
		1. Never
		2. Less than 10 minutes
		3. About 20 minutes
		4. About 30 minutes
		5. About 40 minutes or more
			Time SLPs report using iPads for the three categories	Descriptive statistics—measures of central tendencies (mode, median), percentiles, and frequency for use of iPads for the three categories

b. What kinds of iPad apps do SLPs report using for:
  ▪ Articulation goals?
  ▪ Language goals (grammar: verb–tense agreement, pronoun usage, etc.)?
  ▪ Vocabulary goals (meaning of words)?
	iPad apps used for the following:
	1. Articulation goals (Item 4a)
	2. Language goals (Item 4b)
	3. Vocabulary goals (Item 4c)
		Categorical (nominal):
		To be coded based upon open-ended responses
			Type of iPad instructional apps used by SLPs	Descriptive statistics—mode, frequencies, and Percentages to describe frequency of apps used in the three categories

Note. SLP = speech-language pathologists.

Table 3

Research Questions and Analyses: Research Question 2

Research Question 2	Variables	Variable Type and Levels	Measurement of Variables	Data Analysis
2.. What are the factors that are related to SLPs use of iPads? a. Does a relationship between iPad use and SLP's demographic characteristics (years of experience, gender, education, work setting, and borough location) exist?	How much time do SLPs report using iPads for the following (DV):	Ordinal: 1. Never 2. Less than 10 minutes 3. About 20 minutes 4. About 30 minutes 5. About 40 or more minutes	Time SLPs report using iPads for the three categories	Descriptive statistics—frequencies and percentages, and chi-square for categorical variables Cross tabs
b. Does a relationship between iPad use and (i) school-based support, (ii) professional development, and (iii) technical barriers exist?	School-based support (IV) Professional development (IV) (Item 9 and 10)	Continuous: Likert scale: 1–5 1 = *Strongly disagree* 2 = *Disagree* 3 = *Neither agree nor disagree* 4 = *Agree* 5 = *Strongly agree*	School-based support Professional development	
	Technical barriers (IV) (Item 21)	Categorical (Dichotomous) Yes or No	Technical barriers to iPad use	
c. Does a relationship between technology efficacy and frequency of use exist?	How much time do SLPs report using iPads for the following (DV):	Ordinal: 1. Never 2. Fewer than 10 minutes 3. About 20 minutes 4. About 30 minutes 5. About 40 or more minutes	Time SLPs report using iPads for the three categories	Descriptive statistics—frequencies and percentages, and chi-square for categorical variables Cross tabs
	Technology efficacy (IV) (Item 11–20)	Ordinal: Likert scale: 1–5 1 = *Not confident* 2 = *Somewhat confident* 3 = *Neutral* 4 = *Confident* 5 = *Very confident*	Technology efficacy	

Note. SLP = speech-language pathologist, IV = independent variable, DV = dependent variable

The consent form stated that, by clicking on the "agree to participate" icon, the participants were providing informed consent and confirmation that they understood their aforementioned rights. Participants also received the researcher's contact information for asking additional questions and for contacting the researcher after the study if they desired a copy of the results. The consent form ensured that any contact with the researcher would remain confidential.

SurveyMonkey was used to collect and manage data during the quantitative phase, as this platform offered an explicit guarantee of security, privacy, and anonymity for all research files. In SurveyMonkey, responses were collected using a weblink collector, a versatile data-gathering method that lets the creator generate a survey URL to paste into an e-mail to send to participants. After the raw data were downloaded from the SurveyMonkey website, they were stored on a secure hard drive where they will be retained for no more than 5 years.

Summary

This study aimed to examine iPad use among SLPs in NYC public schools. This chapter outlined the participants, materials, and procedures for a study that explored K–12 SLPs' use of the iPad for speech and language instruction. SLPs employed with the NYC DOE were asked to participate in an online survey regarding iPad use. Open-ended responses about the changes and effectiveness of speech and language instruction with iPad use were used as data for analysis to address the two open-ended questions on the survey.

Chapter 4 presents an analysis of the quantitative and open-ended items used in the study. The findings are outlined according to the research questions and focus on the frequency of iPad use as well as types of apps used for speech and language instruction.

CHAPTER IV

FINDINGS

Quantitative Analysis

Sample Characteristics

The researcher invited by e-mail a total of 2,964 SLPs who worked in the NYC DOE to participate in the study; 357 of them completed the survey. Of those, 337 consented to provide their information for research purposes, but only 189 (56% of the 337) indicated that they were licensed SLPs and NYC DOE employees. Thus, all subsequent analyses focused on the sample of 189 licensed employees. Some participants did not complete all items on the survey, and less than 5% of the data were missing. The sample was comprised of nine male SLPS and 180 female SLPs.

Table 4 displays the demographic information of the 189 participants, broken down by use of iPads for speech and language services. Regarding general trends for the overall sample, the majority were White female ASHA members who held master's degrees in education and worked in elementary-school settings. Work experience as an SLP varied across the sample: most reported having worked in that capacity for more than 6 years. The sample consisted of representatives from all five boroughs of NYC; most worked in Districts 1–32, while the remainder worked in District 75. As mentioned in Chapter 3, Districts 1–32 include regular community schools in which programs and services are provided to general- and special-education student peers. District 75 schools provide more modified programs and services to students with conditions or diagnoses that require more support and accommodations.

Table 4

Demographic Characteristics of SLPs By Use iPad in Speech and Language Session

| | Use iPad | | | | | |
| | Yes | | No | | Total | |
Demographic Characteristics	*n*	%	*n*	%	*n*	%
Gender						
Female	77	95.1	103	95.4	180	95.2
Male	4	4.9	5	4.6	9	4.8
Total Count	81	100.0	108	100.0	189	100.0
Ethnicity						
American Indian or Alaskan Native	1	1.2	0	0	1	.5
Asian or Pacific Islander	3	3.7	6	5.6	9	4.8
Black	8	9.9	13	12.0	21	11.1
Latino	13	16.0	22	20.4	35	18.5
White	48	59.3	58	53.7	106	56.1
Other	8	9.9	9	8.3	17	9.0
Total Count	81	100.0	108	100.0	189	100.0
Education						
Masters	76	93.8	103	94.7	179	94.7
Doctorate	1	1.2	0	0	1	.5
Other	4	4.9	5	4.6	9	4.8
Total Count	81	100.0	108	100.0	189	100.0
NYC DOE Employee						
Yes	81	100.0	108	100.0	189	100.0
Licensed NY State SLP						
Yes	81	100.0	108	100.0	189	100.0
ASHA Member						
Yes	78	96.3	101	93.5	179	94.7
No	3	3.7	7	6.5	10	5.3
Total Count	81	100.0	108	100.0	189	100.0
Years as SLP						
≤ 5	29	35.8	40	37.0	69	36.5
6–10	24	29.6	27	25.0	51	27.0
11–15	13	16.0	16	14.8	29	15.3
16–20	8	9.9	13	12.0	21	11.1
21–25	4	4.9	8	7.4	12	6.3
26–30	1	1.2	1	.9	2	1.1
31–35	1	1.2	1	.9	2	1.1
36–40	1	1.2	2	1.9	3	1.6
Total Count	81	100.0	108	100.0	189	100.0
Work Setting						
Elementary	47	58.0	62	57.4	109	57.7
Middle school	21	25.9	28	25.9	49	25.9

(Table continues)

| Demographic Characteristics | Use iPad | | | | | |
| | Yes | | No | | Total | |
	n	%	*n*	%	*n*	%
High school	13	16.0	18	16.7	31	16.4
Total Count	81	100.0	108	100.0	189	100.0
Borough location						
Manhattan	23	28.4	20	18.5	43	22.8
Queens	9	11.1	12	11.1	21	11.1
Brooklyn	20	24.7	25	23.1	45	23.8
Bronx	26	32.1	43	39.8	69	36.5
Staten Island	3	3.7	8	7.4	11	5.8
Total Count	81	100.0	108	100.0	189	100.0
NYC DOE District						
District 1–32	53	67.9	95	90.5	148	80.9
District 75	25	32.1	10	9.5	35	19.1
Total Count	81	100.0	108	100.0	189	100.0

Note. NYC DOE = New York City Department of Education; SLP = speech-language pathologist.

Among SLPs who used iPads for services (*n* = 81), most were, again, White female ASHA members with master's degrees in education and employment in elementary-school settings (see Table 4). Regarding work experience, the profile was similar to the overall sample: most had worked for more than 6 years as SLPs, all five boroughs were represented, most worked in Districts 1–32, the others in District 75. Thus, the subsample of participants who used iPads mirrored the overall sample (see Table 4).

RQ1: How Are SLPs Using iPads?

The first research question related to how much time SLPs reported using iPads for meeting articulation, language, and vocabulary goals (see Tables 5–8). SLPs were less likely to use iPads for articulation goals than for language, vocabulary, or behavior goals. Most reported typical speech sessions lasting 30 minutes and using iPads for a maximum of 20 minutes. As part of RQ1, the researcher sought to determine what kinds of iPad apps SLPs specifically used for articulation, language, and vocabulary goals (see Tables 9–11; see also Appendix G for an exhaustive list of apps based on goal type).

Table 5

Use of iPads for Articulation Goals (Speech-Sound Disorders)

	n	%	Valid %	Cumulative %
Valid				
Never	24	29.6	30.4	30.4
Less than 10 min	30	37.0	38.0	68.4
About 20 min	19	23.5	24.1	92.4
About 30 min	6	7.4	7.6	100.0
Total	79	97.5	100.0	
Missing	2	2.5		
Total	81	100.0		

Table 6

Use of iPads for Language Goals (i.e., Grammar, Verb Tense Agreement, Pronoun Usage)

	n	%	Valid %	Cumulative %
Valid				
Never	13	16.0	16.3	16.3
Less than 10 min	43	53.1	53.8	70.0
About 20 min	22	27.2	27.5	97.5
About 30 min	2	2.5	2.5	100.0
Total	80	98.8	100.0	
Missing	1	1.2		
Total	81	100.0		

Table 7

Use of iPads for Vocabulary Goals (Meaning of Words)

	n	%	Valid %	Cumulative %
Valid				
Never	15	18.5	18.8	18.8
Less than 10 min	40	49.4	50.0	68.8
About 20 min	20	24.7	25.0	93.8
About 30 min	3	3.7	3.8	97.5
About 40 min or more	2	2.5	2.5	100.0
Total	80	98.8	100.0	
Missing	1	1.2		
Total	81	100.0		

Table 8

Use of iPads for Behavior Rewards (Incentive or Reward)

	n	%	Valid %	Cumulative %
Valid				
Never	12	14.8	15.2	15.2
Less than 10 min	64	79.0	81.0	96.2
About 20 min	2	2.5	2.5	98.7
About 30 min	1	1.2	1.3	100.0
Total	79	97.5	100.0	
Missing	2	2.5		
Total	81	100.0		

Table 9

Most Reported iPad Apps Used for Articulation Goals

	n	%
Articulation Station	25	31
Phonics Studio	5	6
Artic Bee	4	5
Speech Tutor	3	4

Table 10

Most Reported iPad Apps Used for Language Goals

	n	%
Super Duper	9	11
Milo	6	7
Toontastic	6	7
LAMP	5	6
Wh-Questions	5	6

Table 11

Most Reported iPad Apps for Vocabulary Goals

	n	%
Super Duper	10	12
LAMP	6	7
My Play Home	5	6
Proloquo2Go	5	6

Apps used for articulation goals. Articulation Station (31%) was the most commonly used app. Other apps included Artic Bee (5%), Phonics Studio (6%), and Speech Tutor (4%). In total, participants used 37 different apps, 28 of which only one person used. One third (33%) of the SLPs using iPads did not report the apps they used.

Apps used for language goals. SLPs used a wide variety of apps to meet language goals. They reported Super Duper (11%) most frequently. Other apps included Brain Pop (4%), Fun with Verbs (4%), LAMP (6%), Language Adventure (5%), Milo (7%), My Play Home (4%), Starfall (5%), Story Builder (4%), Story Maker (4%), Toca Boca (4%), Toontastic (7%), and Wh-Questions (6%). In total, participants used 100 different apps, 77 of which only one person used. About one quarter (22%) of the SLPs using iPads did not report which apps they used.

Apps used for vocabulary goals. Thirty-two SLPs reported using Super Duper (12%). Other apps included Google (4%), LAMP (7%), My Play Home (6%), and Proloquo2Go (6%). In total, participants used 59 apps, 45 of which only one person used. About one third (32%) of the SLPs using iPads did not report which apps they used. SLPs used a range of different apps for different purposes related to speech and language instruction.

RQ2: What Factors Are Related to SLPs' Use of iPads?

For RQ2, the researcher explored the variation in iPad use based on certain demographic characteristics (see Tables 12–15), using a series of chi-square analyses to examine whether iPad use varied by gender, education, work setting, and borough location. Results indicated no systematic differences by gender, $\chi^2(1) = .01$, $p = .921$; education, $\chi^2(2) = 1.35$, $p = .508$; work setting, $\chi^2(2) = .01$, $p = .993$; or borough location, $\chi^2(4) = 3.88$, $p = .423$.

Table 12

Using an iPad × Gender Crosstab

| | iPad Use | | | |
| | Yes | | No | |
Gender	Count	Expected Count	Count	Expected Count
Female	77	77.1	103	102.9
Male	4	3.9	5	5.1

Table 13

Using an iPad × Education Level Crosstab

| | iPad Use | | | |
| Education Level | Yes | | No | |
	Count	Expected Count	Count	Expected Count
Master's	76	76.7	103	102.3
Doctorate	1	0.4	0	0.6
Other	4	3.9	5	5.1

Table 14

Using an iPad × Work Setting Crosstab

| | iPad Use | | | |
| Work Setting | Yes | | No | |
	Count	Expected Count	Count	Expected Count
Elementary	47	46.7	62	62.3
Middle School	21	21.0	28	28.0
High School	13	13.3	18	17.7

In addition, the researcher used a correlational analysis to examine the relationship between years of SLP experience and iPad use. Results showed a positive, weak, statistically nonsignificant relationship, $r = .04$, $p = .584$, suggesting no relationship between SLPs' experience and iPad use.

Table 15

Using an iPad × Borough Location Crosstab

	iPad Use			
	Yes		No	
Borough Location	Count	Expected Count	Count	Expected Count
Manhattan	23	18.4	20	24.6
Queens	9	9.0	12	12.0
Brooklyn	20	19.3	25	25.7
Bronx	26	29.6	43	39.4
Staten Island	3	4.7	8	6.3

The researcher conducted additional analyses to explore the relationships between iPad use and school-based support, professional development, and perceived technical barriers, assessing iPad use on an interval scale (ranging from *never* to *about 40 minutes or more*) for articulation goals, language goals, vocabulary goals, and behavior rewards. The correlation coefficients between iPad use and support and training are displayed in Table 16. Results showed a positive, statistically significant relationship between support and vocabulary goals and behavior rewards, as well as a positive relationship between behavior rewards and training.

Table 16

Correlation Between iPad Use and Support and Training

Use of iPad for Meeting	Support	Training
Articulation goals (speech-sound disorders)[a]	.096	-.177
Language goals (i.e., grammar-verb tense agreement, pronoun usage)[b]	.135	-.019
Vocabulary goals (meaning of words)[b]	.242[*]	.150
Behavior rewards (incentive or reward)[a]	.393[**]	.285[*]

[a]$n = 79$ for all analyses.
[b]$n = 80$.
*$p < .05$. ** $p < .01$.

The relationships among iPad use, iPad efficacy, and tech efficacy are displayed in Table 17. Results indicated that participants with higher iPad efficacy were more likely to use the iPad to meet students' articulation and language goals. The researcher detected no statistically significant relationships between iPad use and tech efficacy. These findings thus suggest a stronger relationship between iPad use and skills related to iPad use.

Table 17

Correlation Between iPad Use and iPad Efficacy and Tech Efficacy

Use of iPad for Meeting	iPad Efficacy	Tech Efficacy
Articulation goals (speech-sound disorders)[a]	.233*	.075
Language goals (i.e., grammar-verb tense agreement, pronoun usage)[b]	.445**	.182
Vocabulary goals (meaning of words)[b]	.177	.164
Behavior rewards (incentive or reward)[a]	.025	-.130

[a]$n = 79$ for all analyses.
[b]$n = 80$.
*$p < .05$. ** $p < .01$.

Additionally, the researcher explored the relationships between barriers and the four categories of iPad use—articulation goals, language goals, vocabulary goals, and rewards—using a series of chi-square analyses. Results indicated that there were no statistically significant relationships between barriers to iPad use and the four categories: articulation, $\chi^2(3) = 2.203$, $p = .531$ and $LR(3) = 2.188$, $p = .534$; language, $\chi^2(3) = 3.114$, $p = .374$ and $LR(3) = 3.810$, $p = .283$; vocabulary, $\chi^2(4) = 4.763$, $p = .313$ and $LR(4) = 5.811$, $p = .214$; and rewards $\chi^2(3) = 1.391$, $p = .708$ and $LR(3) = 1.753$, $p = .625$.

Qualitative Analysis

A qualitative analysis was conducted to examine responses to two open-ended survey questions describing changes in speech and language instruction and perceptions of the effectiveness of iPad use in speech therapy sessions. A thematic coding method was used to

complete the qualitative data analysis. Data were clustered by frequent words and phrases, coded, and analyzed for themes. Six themes emerged from the data analysis: (a) Engagement, Reward, and Incentive; (b) Instructional Support; (c) Access to Instructional Material; (d) Data Collection and Progress Monitoring; (e) Interactive Learning; (f) AAC Efficiency (see Table 18).

Table 18

Themes Related to SLPs' Practice Changes With iPad Use

Frequency (*n*)	Occurrence of Theme (%)	Theme	Indicators of Theme
48	66%	Engagement, Reward, and Incentive Provision	Any report of iPad use for student engagement, rewards, and/or incentives to attain learning goals during speech and language activities.
33	45%	Instructional Support	Any report of iPad use to support students in their speech and language goals by providing feedback and using game apps to target specific speech and language tasks and skills.
31	42%	Access Instructional Material	Any report of iPad use to obtain materials to be used during speech and language instruction (e.g., updated word lists, grammar drills).
10	14%	Data Collection and Progress Monitoring	Any report or indication of iPad use for collecting data or progress monitoring.
10	14%	Interactive Learning	Any report of iPad use for hands-on or interactive learning by sharing materials with peers.
8	11%	AAC Efficiency	Any report or indication of iPad use as an AAC tool targeting communication goals.

Note. SLP = speech-language pathologists.

Engagement, Reward, and Incentive Provision

Forty-eight SLPs (66%) discussed how the iPad incentivized students to work toward their speech and language goals. SLPs referred to the iPad as a strong motivational tool for engaging students in the learning process, while also targeting specific speech and language goals. One participant shared, "It's extremely motivating for students. Trials are embedded in lively colorful animated games." Another participant shared, "Students enjoy technology and it's useful as a reward where I still introduce language appropriate tasks or puzzles."

Instructional Support

Thirty-three SLPs (45%) used the iPad as an instructional support tool to give students feedback during speech and language sessions, to target specific speech and language goals with game apps, to research words and concepts with their students, and/or to review previous sessions. One participant shared, "The iPad has enabled me to move beyond the traditional methods of speech-language instruction." Another participant explained, "It allows me and my students to be able to research things in seconds." Furthermore, SLPs mentioned using iPad apps to create novel activities that targeted speech sounds. They also used apps as visual aids for English-language learners and hearing-impaired students. SLPs used apps to customize learning sessions based on students' needs. One explained, "Articulation Station in particular has a novel way of creating activities for sounds in all positions."

Access to Instructional Material

Thirty-one SLPs (42%) noted that easy access to instructional materials on the iPad significantly changed their speech and language instruction. SLPs emphasized materials that facilitated reading (e.g., updated word lists, grammar drills, children's articles) as well as pictures and videos, which concretized terms and concepts for students. One participant said,

"The students rely heavily on picture support and with the click of a button they are able to access pictures." Another participant shared, "It has made it easier for me to access computer documents to use as hands-on visuals in sessions."

Data Collection and Progress Monitoring

Ten SLPs (14%) discussed how the iPad assisted with administrative tasks, such as data collection and tracking student progress. SLPs used iPads to present data in more student-friendly formats (e.g., colorful graphs). One participant said, "Some apps have data collection built in so it makes it easier to track progress when data is accurately collected for you."

Interactive Learning

According to 10 SLPs (14%), the iPad facilitated moving beyond pen-and-paper instruction and provided a more interactive, hands-on approach to learning that motivated students more than traditional methods. One participant shared that the iPad provided "interactive ways to share pictures and engage children." Another participant shared the following:

> I often pair books with interactive videos. For example, we read *The Jungle Book* and then watched clips of the old movie and the new movie for a compare/contrast activity. This helped children who present with little interest in books become more engaged.

AAC Efficiency

Eight SLPs (11%) reported using the iPad as an AAC device for targeting articulation goals. Students used iPads to ask questions, make comments, access vocabulary words, and reinforce concepts taught in class. One participant explained, "For AAC users, I use it all of the time to get students ready for communication devices." Another participant added, "The primary way that iPads are used in our school is as AAC devices."

Overall Effectiveness and Limitations of iPad

Overall effectiveness. Forty-seven SLPs (78%) described ways the iPad enhanced speech and language instruction. They deemed the iPad effective when paired with well-chosen apps, such as Articulation Station. Articulation Station provides feedback, records data, and offers suggestions for targeted vocabulary. The iPad also allowed students to choose activities, which according to SLPs, ultimately helped them to achieve their speech and language goals.

SLPs described how the iPad helped to reinforce concepts during speech and language sessions, enabling students to research and explore concepts to understand them more fully. Due to the interactive nature of the iPad, SLPs found that students were better able to hold their attention during lessons and recall information.

One SLP reported that the iPad gave students a sense of security about their learning goals and freedom to make mistakes because it allowed them to practice speech and language exercises at home. SLPs also said that the iPad provided students with relatable models and multiple learning opportunities during speech and language therapy sessions.

Limitations of the iPad. Twelve SLPs (20%) referred to the ways in which the iPad was ineffective. For instance, students with behavior issues could be sidetracked from the lessons. If not given a structured framework for the sessions, including pre-teaching and reviewing of speech and language concepts, students might consider the apps to be just for fun and not for learning. One SLP reported that although the iPad facilitated a range of skills—such as following directions, practical learning techniques, and proper use of language—it could have a negative effect on students on the autism spectrum (e.g., lack of social interaction).

Summary

This study focused on SLPs' iPad use for speech and language instruction, specifically for articulation, language, and vocabulary goals, as well as behavior incentives and rewards. The quantitative results showed that SLPs across the NYC DOE used iPads for a variety of speech and language instruction activities. Most SLPs reported using the iPad for language goals (98%), vocabulary goals (94%), and articulation goals (92%), respectively. The data also showed that SLPs used iPads for approximately 20 minutes during a 30-minute speech and language classroom session.

The results showed no relationship between years of SLP experience and frequency of iPad use. Use of iPads did not differ based on demographic characteristics (i.e., gender, education, work setting, borough, and years of experience). SLPs were more likely to use the iPad for rewards and vocabulary if school support was present. Hence, the more support SLPs received, the more frequently they used iPads for behavioral rewards or to support vocabulary goals. Furthermore, SLPs' iPad use increased if they felt confident using the iPad with students for speech and language instruction. Results indicated that there were no statistically significant relationships between barriers and categories of iPad use.

Participants had many different iPad app options. Consequently, the types of apps they used varied greatly based on their specific goals and purposes. Most SLPs reported using a variety of apps for articulation, language, and vocabulary goals. For articulation goals, the three most frequently used were: Articulation Station (31%), Phonics Studio (6%), and Artic Bee (5%). For language goals, the three most used were Super Duper (11%), Milo (7%), and LAMP (6%). For vocabulary goals, the three most used were Super Duper (12%), LAMP (7%), and Proloquo2Go (6%). Overall, apps were used in a variety of ways to meet students' needs, which

indicates that app selection and use varied based on the objective of the speech and language session.

The qualitative analysis provided in-depth descriptions of SLPs' use of iPads and iPad apps in speech-language therapy. SLPs reported that the iPad changed their practice by providing more options for instruction (e.g., picture and video support), allowing for easier access to materials, making data tracking easier and more accurate, and allowing for quicker access to supplemental materials during sessions. In general, SLPs noted that the iPad helped to further engage students and provided rewards and incentives. Overall, the iPad was found to be effective for speech and language instruction. SLPs found that the iPad helped to increase student engagement and was adaptive to a wide range of learning styles. SLPs noted, however, that it is important to consider the limitations; in particular, the iPad should be used in the context of a structured speech-language session with a clear focus and learning expectations for students.

CHAPTER V

DISCUSSION

This chapter summarizes the findings on SLPs' use of iPads for articulation, language, and vocabulary goals. It examines factors related to iPad use, including professional development and support for SLPs, training in iPad use, and barriers to effective iPad use. Changes in SLPs' teaching practice as a result of iPad use are discussed. The chapter concludes with a discussion of the study's implications, limitations, and future recommendations.

Discussion of Findings

Since its release on January 27, 2010, the iPad has influenced many practices in the education field (Blackwell, 2013; Brown & Harmon, 2013; Burden et al., 2012; McClanahan et al., 2012; O'Malley et al., 2013). The current study provided insight into the capacity of the iPad to provide instructional support for SLPs' speech and language goals for their students in a K–12 setting. Data revealed that slightly less than half of school-based SLPs (42.8%) are using iPad technology in their speech and language classrooms.

RQ1: How Are SLPs Using iPads?

Findings revealed that SLPs are using the iPad and iPad apps for generally 20 minutes per class for articulation, language, and vocabulary goals, and less than 10 minutes per class for behavior rewards. SLPs tended to use the iPad more often for language and vocabulary goals than for articulation goals, likely because articulation goals and skill-building in this specific area are typically done in earlier grades (ASHA, 2015b).

Approximately 17% of the participants reported that the iPad was a highly effective and engaging reward/incentive because they could use the device (a) to reinforce concepts previously learned, (b) to provide an incentive at the end of the session, (c) to provide feedback and prompts

to receive targeted or correct responses to particular questions, (d) to make sessions more interactive through videos and picture stimuli, and (e) as an AAC device for students with limited expressive abilities. These findings are consistent with the information in the literature that apps can provide visual and audio feedback to motivate students and keep them learning (ASHA, 2011; Brown & Harmon, 2013), and that iPads can supplement speech therapy as an instructional tool (Atticks, 2012).

Findings indicated that iPads were used for about half to two thirds of each instructional session to target speech and language goals with pictures, videos, and e-story books. Findings from this study thus suggest that SLPs can use the iPad for a number of purposes. Consistent with the literature, iPads can be used to collect data, provide pictorial and audio support, and offer interactive apps to supplement speech and language materials (ASHA, 2011; Atticks, 2012, Brown & Harmon, 2013).

The second part of RQ1 examined the following: What kinds of apps do SLPs report using for articulation, language and vocabulary goals? SLPs in this study used 196 different apps: 37 for articulation goals, 100 for language goals, and 59 for vocabulary goals. The most favored apps were Articulation Station and Super Duper. Both are common in the speech-language instruction field, and many SLPs considered them highly engaging for their visual and data collection capacities.

Articulation Station. This app has 22 available sound programs to address articulation goals. Tutorial information is available on the app, which helps SLPs to use it for specific student goals. It can be used to practice targeted sounds in three areas: words, sentences, and stories. SLPs can collect data right on the app, which can be modified to suit each student's

needs. SLPs in this study noted how app customization has changed speech and language sessions.

Super Duper. This app has many language-based applications: Wh Question Cards, Core Curriculum Pre-K–K, Let's Name Things, Fun Deck, and so on. Super Duper apps contained colorfully animated speech and language materials and game-like activities that many students enjoyed. The Super Duper Story Maker App, for example, enables users to create stories and include personal photos in them. It has numerous features: voice recording, story sharing, and ability to turn pages like in a book. One SLP shared the following insights:

> Using iPads as a utility, for instance, to record a speech or language sample is highly useful. This is different from using specific apps designed for intervention, which can often be as distracting as they are motivating. Using games or other preferred apps as rewards (typically briefly—less than 5 minutes at the end of a session) can be a useful motivator for some students.

Goal facilitation. Eight SLPs reported that the data collection features of apps and their adaptability to many uses facilitated the attainment of students' instructional and therapeutic goals. According to ASHA (2011), "Many educational apps can easily be incorporated into the therapy setting and can be used to collect data, record conversational samples, motivate students" (p. 1). Data collection on apps should be done strategically, placing students' needs first and addressing their specific behavioral, speech, and language goals. SLPs must also use caution and professional judgment when using mobile devices as AACs (ASHA, 2015; Muñoz et al. 2013). Above all, iPad applications must not replace regular classroom instruction, but must be used "as indirect support for existing communicative skills, as an instructional tool, and to meet specific device-dependent communication goals" (Muñoz et al., 2013, p. 139). The framework posited

by Muñoz et al. (2013) provides guidance for use of apps for treatment, including improving basic speech-language abilities, compensatory strategy, fostering engagement, supplemental practice, and communication used to meet communicative intent. Thus, SLPs can target appropriate areas when using apps for speech and language instruction.

SLPs in this study indicated that the iPad is being used in a variety of ways to facilitate speech and language instruction. With well-selected apps, the iPad can aid SLPs in helping students to target specific speech and language areas, learn new words, and practice articulation sounds. Apps provide visual feedback and are interactive, allowing for multiple learning modalities. According to SLPs, iPad features such the notepad, PDF reader, audio recorder, and flashcards were adaptive to many learning styles. Previous studies have also found that the interactive features of the iPad facilitate learning (Gosnell, 2011; Snape et al., 2013). As in previous studies (ASHA, 2011; Atticks, 2012), qualitative findings indicated that SLPs utilized instructional speech and language tools to target specific goals related to articulation, language, and vocabulary.

RQ2: What Factors Relate to SLPs' Use of iPads?

Though research has found that iPad use among teachers facilitates student learning (Burden et al., 2012), limited research has been conducted on iPad use among SLPs. This study examined iPad use among a diverse group of SLPs. iPad use was compared across a range of demographic factors: gender, education, years of experience, work setting, and location. No significant differences emerged in the data for comparisons based on these demographic factors. This suggests that iPad use was relatively similar across demographic groups in this study. Future studies should aim to recruit a larger sample, which might help to detect differences based on demographic factors.

Previous studies have found differences in use of technology based on educators' years of experience. For instance, Prensky's (2001) found that educators varied in how they integrated technology into instruction: Digital immigrants utilized iPads significantly less than digital natives. In this study, SLPs used iPads to a similar extent, regardless of years of experience. This difference could be a function of time: iPad use is fairly ubiquitous now and different age groups have had substantial time to adopt the technology. This study thus demonstrated that SLPs with varying degrees of experience were able to effectively use iPads for speech and language instruction.

School-based support. Results showed a positive, statistically significant relationship between school support for SLPs and the vocabulary goals and behavior rewards SLPs set for their students. There was a positive relationship between student behavior rewards and iPad use. Thus, the need for support and professional development opportunities for SLPs was evident. The literature shows how lack of training and support can prevent appropriate and successful integration of the iPad (Burden et al., 2012; Gosnell, 2011; Green, 2009, Muñoz et al., 2013). Responses from SLPs in this study were consistent with these findings. According to Burden et al. (2012) school-based support and formal iPad use training should be supplied specifically when requested, "but must not involve formal, regimented training that is unnecessary and counterproductive" (p. 12). Findings from this study were consistent with the literature, indicating that appropriate support and professional development opportunities are needed to effectively implement educational programs using tablets such as the iPad.

Professional development and technical barriers. Green (2009) argued that implementing technology within the school setting—the speech and language classroom, in this study—should not be a struggle for SLPs. Because technology rapidly changes overtime

(Muñoz et al., 2013), consistent and relevant professional development for iPads and other mobile technologies is needed. Trainings could be beneficial to aid educators when new technology is released or to keep up with updates in current technologies (e.g., app updates). In this study, SLPs referred to the need for better infrastructure to support iPad use (e.g., improved Internet connection and bandwidth). Before SLPs can use iPads for instruction, time for professional development should be allocated for them to learn how to properly incorporate them into their teaching routine (Atticks, 2012; Burden et al., 2012, Green, 2009). SLPs should continually update their instructional strategies as technology evolves.

Gosnell, Costello, and Shane (2011) expressed concern that most SLPs use iPads and iPad apps in speech and language therapy based on hearing positive reactions from others or based on online reviews, rather than undergoing concrete trainings to learn evidence-based approaches. One problem with not using evidence-based approaches is that SLPs might begin to match students with specific apps instead of seeking an app that fits a student's particular learning needs. Research indicates that SLPs who receive support and professional development on iPad use tend to use the technology more frequently (Muñoz et al., 2013). SLPs should, nonetheless, make evidence-based decisions when selecting apps (Muñoz et al., 2013), because many may not be up to date with modern educational theories.

Efficacy and iPad use. Results indicated that participants with higher iPad efficacy were more likely to use the iPad to meet students' articulation and language goals. This suggests that the more comfortable SLPs felt with the iPad, the more likely they were to integrate iPad use into instruction in order to target speech and language goals and further engage students in the learning process. SLPs will likely become more comfortable with iPads as students become

more responsive to an interactive, hands-on, game-oriented approach to speech therapy (Atticks, 2012; Gosnell, 2011).

Findings from this study have implications for school administrators. Administrators should work to support SLPs by providing the necessary funds for technology. iPad/app technology should be considered a central focus in speech and language instruction, not simply an instructional add-on (Larabee et al., 2014).

Qualitative Findings

The study's qualitative portion aimed to understand how SLPs' speech and language instruction had changed with their use of the iPad and its effectiveness as a teaching tool. Results indicated that speech and language service delivery through the iPad improved access to instruction materials, increased interactive learning, provided more novel activities, and facilitated data collection and student progress monitoring for SLPs. SLPs could readily download apps to facilitate instruction. Apps that facilitated reading were particularly useful, such as word lists, children's articles, and grammar drills. Pictures and videos helped to concretize terms and concepts. Findings also indicated that SLPs can use the iPad to give students feedback during speech and language sessions in order to target specific speech and language goals. Apps allowed for multiple means of pursuing goals and for ongoing tracking of progress.

The iPad helped SLPs' to take their practice beyond traditional instruction methods, offering a more interactive, hands-on-approach. Using apps, SLPs created novel activities to target speech goals. SLPs also reported that the iPad helped them to share tracking data in student-friendly formats (e.g., colorful graphs). The ability to provide visual support can

enhance instruction and give students with diverse learning needs additional support in achieving their learning goals (Atticks, 2012; Burden et al., 2012).

Comparison to Previous Research

Some of the quantitative findings in this study were novel. For instance, previous studies did not ask participants to measure how much time they used the iPad in the classroom; thus, the amount of time spent on specific goals was not measured. In this study, apps were used primarily for language, vocabulary, and articulation goals; they were also used for behavioral rewards. This study was also one of the first to examine iPad use specifically in special education, particularly for students with speech and language disabilities. Another unique finding was that iPad use did not vary based on demographic factors, such as age, gender, or years of experience. This suggests that iPads may be beneficial to a wide range of SLPs.

This study also strengthens the case for technology-aided teaching as a new pedagogy for students with special needs (Atticks, 2012; Gosnell, 2009). The study showed how the iPad—with colorful images, clear audio, and interactive videos on a large multitouch screen—can help to engage students and increase their motivation. This finding was consistent with the ASHA's (2015a, 2015b, 2015c) findings that students with disabilities, especially those who work with speech pathologists, can enrich their language and vocabulary skills by using media.

Results of this study confirmed findings from previous research that iPads optimize learning (Blackwell, 2013; Brown & Harmon, 2013; Burden et al., 2012; McClanahan et al., 2012; O'Malley et al., 2013). iPads improved students' and SLPs' access to and efficient use of educational technology. iPads helped SLPs to manipulate learning stimuli based on students' specific educational needs; they helped SLPs to reinforce teachers' efforts to engage and encourage students to use apps inside and outside the classroom.

The finding that most SLPs use the iPad as an AAC device was supported by past studies (King et al., 2014). Like an AAC device, the iPad can increase class participation and teach specific skills such as functional play, communication, literacy, and expressive language (Dunham, 2011; Gosnell, 2011; King et al., 2014). Gosnell (2011) reported that tablets are increasingly becoming one of the main tools SLPs use in their intervention activities, which was also the case among SLPs in this study. McClanahan et al. (2012) in particular claimed that the iPad was beneficial for students with engagement and motivation difficulties. Most participants in this study reported observing increased student engagement and motivation as a result of iPad use.

Implications for SLPs and School and District Leaders

Findings from this study suggest that SLPs who receive more support and professional development in iPad use will likely use the technology more frequently in their instruction. This lends credence to Burden et al.'s (2012) conclusion that the more support teachers have when using the iPad, the more frequently and effectively they will use it. SLPs can use the iPad and iPad apps to meet their students' educational needs. SLPs should, however, make evidence-based decisions when selecting apps, as many are not current with contemporary educational theories (Muñoz et al., 2013).

This study also found a positive relationship between professional development and iPad/app use: SLPs need more professional development and training in iPad use in order to leverage the technology for students with speech and language difficulties. To do so, both educators and students need an experienced iPad user—usually an IT specialist—to provide ongoing technical assistance. Green (2009) noted that SLPs and educators alike should seek

assistance and professional development in classroom technology to be skillful and knowledgeable, especially given the huge push to integrate technology into the classroom.

iPads and apps can be cost-effective instructional tools (ASHA, 2011; Burden et al., 2013), though they must be constantly updated to meet to current educational standards. For instance, some of the speech materials in the apps (Muñoz et al., 2013) must be adapted to students' specific communication goals. Green (2009) emphasized the large number of digital products available, which enables teachers to work with their students on a range of academic subjects using multimedia. SLPs can use sound or graphics to support students in answering questions, completing assignments, and achieving their personal goals. If students need assistance with a specific area of instruction, apps can be used to provide detailed visual and auditory feedback.

Professional development is key to SLPs' successful integration of mobile technology into the speech and language classroom. Therefore, professional development programs should aim to educate SLPs on iPad and app use. School and district leaders should provide this support upon hiring an SLP and should aim to tailor support to SLP's particular needs and knowledge base.

<div align="center">**Limitations of the Study**</div>

One limitation of this study was that it only focused on speech-sound disorders (articulation), language disorders (grammar), and vocabulary deficiencies (meanings of words). Concentration on those three areas allowed for an in-depth examination of the barriers and implications of iPad use for speech and language instruction in each area, which filled gaps in the literature. Yet other areas of SLP support need investigation as well, such as fluency goals, phonemic awareness skills, and reading and writing tasks. Also, pragmatics, or the social use of

language, could be explored with students diagnosed with autism, given that some of the SLPs who participated in this study showed the advantages of supporting students with this diagnosis by using iPads and apps as instructional tools.

Second, the survey instrument developed for this study was based on examples of surveys conducted in the literature. Future studies should attempt to validate an instrument to measure iPad use in educational settings. Future investigations might also include a more extensive qualitative component. For instance, more open-ended questions on the survey might help to obtain more data on SLPs' specific choices of apps for instruction.

Third, the lack of direct communication with SLPs from the NYC DOE may have limited participation in this study. A large sample size would allow for more comparisons based on demographic factors, such age, gender, and years of experience. Future studies could potentially include both part-time and full-time SLPs, as well as SLPs from other districts, in order to obtain a broader picture of iPad and app use in the classroom.

Finally, future studies should attempt to make more gender comparisons. It is possible that a larger sample size would reveal differences in app selection and use based on gender. In this study, the sample was predominantly female, which was a direct reflection of the typical demographics of SLPs in the field (ASHA, 2014).

Recommendations for Future Research

The results of this study call for future exploration of iPad use for other purposes, including stuttering and other speech impairments, accent reduction, and other forms of speech and voice improvement. Interviews and observations with all key stakeholders—students, administrators, parents, speech-and-language-impaired students, and SLPs—can help researchers

to better understand how SLPs modify their pedagogical practice for these particular areas of instruction.

Future studies on iPads and apps should also obtain input from students so that researchers can better understand students' learning experiences and perceptions of the instructional method. Such studies would enable SLPs to continue to support students' speech and language goals, and could provide feedback and improvement recommendations to developers of speech and language apps.

In addition, future research can examine iPad technology and AAC devices designed to support students with severe expressive language impairments, who would require such devices in order to have effective communication exchanges with classmates, teachers, and other school staff. Information from this research can assist SLPs in providing effective services to students with severe communication disabilities.

Based on the quantitative findings, this study suggests that lack of professional development and support can serve as a barrier to successful integration of technology. Future investigations should include interviews with iPad trainers, SLPs, and school administrators to determine effective means of implementing professional development programs.

Conclusion

This study explored the nature and efficacy of iPad use in speech and language classrooms for the purpose of achieving student goals in articulation, language, and vocabulary. Findings indicated that slightly less than half of the SLPs used iPads primarily for language and vocabulary goals, followed by articulation goals. The study also highlighted SLPs' nearly 200 apps for speech and language instruction, emphasizing that iPads' vivid, colorful stimuli and

versatile uses for speech and language goals enable SLPs to be more fluid and creative with their instruction.

Muñoz et al. (2013) provided a conceptual framework for mobile device and app use that set the tone for SLPs; they insisted that apps must be appropriately selected to ensure their efficacy as instructional tools. SLPs in this study selected apps geared toward achieving specific learning objectives with their students. Professional development and support from district-level and school-level administrators can minimize barriers to effective iPad and app use. Moreover, the continual advancement of technology will continue to change SLPs' delivery of instruction to support students' goals in all areas of speech and language acquisition. This study begins to clarify the numerous opportunities that iPads and iPad apps offer for individuals learning in speech therapy.

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APPENDIX A

PERMISSION TO USE FIGURE FOR FRAMEWORK

FORDHAM

Garvin Romane <romane@fordham.edu>

Use of Framework - Be Smarter Than Your Phone: A Framework for Using Apps in Clinical Practice
6 messages

Garvin Romane <romane@fordham.edu>   Tue, Dec 29, 2015 at 6:37 PM
To: m.munozMuñoz@tcu.edu
Cc: Garvin Romane <romane@fordham.edu>
Bcc: "G.P.R." <gpr135@gmail.com>

Dr. Muñoz -

I hope this email finds you well. I read your article titled, Be Smarter Than Your Phone: A Framework for Using Apps in Clinical Practice, and I was hoping to use your framework as one of the theoretical frameworks and apply it to my dissertation study. Specifically Figure 1 and Tables 1 and 2.

My study will focus on how SLPs in NYC are using iPad devices for speech and language practice.

Please let me know if I have your permission to use the figures and tables from your article.

Best Regards,

Garvin R.
--
Garvin P. Romane, M.S.Ed., M.A., CCC-SLP
Doctoral Candidate (ABD)
PhD - Language, Literacy, and Learning
Fordham University
Graduate School of Education
Division of Curriculum and Teaching
113 West 60th Street #1103B
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romane@fordham.edu
Cell: 516-567-7742

Muñoz, Maria <m.Muñoz@tcu.edu>   Wed, Dec 30, 2015 at 10:15 AM
To: Garvin Romane <romane@fordham.edu>

Hi. I'm glad you found our framework interesting and would like to hear more about your study. I believe you need to contact the publisher for the permission to use the figures as they own the copyright to the article. Please let me know if you have any additional questions.

Maria

Sent from my iPhone
[Quoted text hidden]

Permissions Asha <Permissions@asha.org>   Wed, Jan 20, 2016 at 2:50 PM
To: Garvin Romane <romane@fordham.edu>
Cc: NSSLHA <NSSLHA@asha.org>

Dear Mr. Romane:
Thank you for contacting ASHA. Permission is granted to reprint Figure 1 and Tables 1 and 2 from "Smarter Than Your Phone: A Framework for Using Apps in Clinical Practice." Please cite ASHA as the source. Should your work be published at a later date, please contact us again for permission to use in that case.
Sincerely,
Libby
Libby Bauer
Subscription and Permissions Manager
American Speech-Language-Hearing Association

APPENDIX B

NEW YORK CITY DEPARTMENT OF EDUCATION IRB

Department of Education
Carmen Fariña, Chancellor

Research and Policy Support Group

**52 Chambers Street
Room 310
New York, NY 10007**

June 16, 2016

Mr. Garvin P Romane
135 East Avenue
Freeport, NY 11520

Dear Mr. Romane:

I am happy to inform you that the New York City Department of Education Institutional Review Board (NYCDOE IRB) has approved your research proposal, "School-Based Speech-Language Pathologists' Use of iPads." The NYCDOE IRB has assigned your study the file number of 1357. Please make certain that all correspondence regarding this project references this number. The IRB has determined that the study poses minimal risk to participants. The approval is for a period of one year:

Approval Date:	**June 16, 2016**
Expiration Date:	**June 15, 2017**

Responsibilities of Principal Investigators: Please find below a list of responsibilities of Principal Investigators who have DOE IRB approval to conduct research in New York City public schools.

- Approval by this office does not guarantee access to any particular school, individual or data. You are responsible for making appropriate contacts and getting the required permissions and consents before initiating the study.
- When requesting permission to conduct research, submit a letter to the school principal summarizing your research design and methodology along with this IRB Approval letter. Each principal agreeing to participate must sign the enclosed Approval to Conduct Research in Schools/Districts form. *A completed and signed form for every school included in your research must be emailed to* IRB@schools.nyc.gov . Principals may also ask you to show them the receipt issued by the NYC Department of Education at the time of your fingerprinting.
- You are responsible for ensuring that all researchers on your team conducting research in NYC public schools are fingerprinted by the NYC Department of Education. Please note: This rule applies to all research in schools conducted with students and/or staff. See the attached fingerprinting materials. For additional information click here. Fingerprinting staff will ask you for your identification and social security number and for your DOE IRB approval letter. You must be fingerprinted during the school year in which the letter is issued.   Researchers who join the study team after the inception of the research must also be fingerprinted. Please provide a list of their names and social security numbers to the NYC Department of Education Research and Policy Support Group for tracking their eligibility and security clearance. The cost of fingerprinting is $130. *A copy of the fingerprinting receipt must be emailed to* IRB@schools.nyc.gov .
- You are responsible for ensuring that the research is conducted in accordance with your research proposal as approved by the DOE IRB and for the actions of all co-investigators and research staff involved with the research.

- You are responsible for informing all participants (e.g., administrators, teachers, parents, and students) that their participation is strictly voluntary and that there are no consequences for non-participation or withdrawal at any time during the study.
- Researchers must: use the consent forms approved by the DOE IRB; provide all research subjects with copies of their signed forms; maintain signed forms in a secure place for a period of at least three years after study completion; and destroy the forms in accordance with the data disposal plan approved by the IRB.

Mandatory Reporting to the IRB: The principal investigator must report to the Research and Policy Support Group, within five business days, any serious problem, adverse effect, or outcome that occurs with frequency or degree of severity greater than that anticipated. In addition, the principal investigator must report any event or series of events that prompt the temporary or permanent suspension of a research project involving human subjects or any deviations from the approved protocol.

Amendments/Modifications: All amendments/modification of protocols involving human subjects must have prior IRB approval, except those involving the prevention of immediate harm to a subject, which must be reported within 24 hours to the NYC Department of Education IRB.
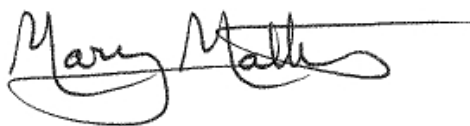
Continuation of your research: It is your responsibility to insure that an application for continuing review approval is submitted six weeks before the expiration date noted above. If you do not receive approval before the expiration date, all study activities must stop until you receive a new approval letter.

Research findings: We require a copy of the report of findings from the research. Interim reports may also be requested for multi-year studies. Your report should not include identification of the superintendency, district, any school, student, or staff member. Please send an electronic copy of the final report to: irb@schools.nyc.gov.

If you have any questions, please contact Dr. Mary Mattis at 212.374.3913.

Good luck with your research.

Sincerely,

Mary C. Mattis, PhD
Director, Institutional Review Board

cc: Barbara Dworkowitz

APPENDIX C

FORDHAM UNIVERSITY IRB APPROVAL

FORDHAM UNIVERSITY
THE JESUIT UNIVERSITY OF NEW YORK

Fordham University IRB	*Protocol Exemption Notification*

To: Garvin Romane

From: Michele Kuchera, IRB Office

Subject: Protocol #447

Date: 05/27/2016

The protocol **447. School-Based Speech-Language Pathologists' Use of iPads** has been verified by the Fordham University IRB as **Exempt** according to 45CFR46.101(b)(1): Educational Practices on 05/27/2016.

Please note that changes to your protocol may affect its exempt status. Please contact irb@fordham.edu to discuss any changes you may contemplate.

Thanks,

Michele Kuchera,
IRB Office

Institutional Review Board

Fordham University

Collins Hall, B-31/B-34

Phone: (718)-817-0876

(718)817-0055

Email: irb@fordham.edu

APPENDIX D

SURVEY OF SCHOOL-BASED SPEECH-LANGUAGE PATHOLOGISTS' IPAD USE

Research Title: School-Based Speech-Language Pathologists' Use of iPads

Informed Consent

Purpose of the research study:
You are invited to participate in a research about the use of iPads in your speech and language session. The study's goal is to understand how speech-language pathologists (SLPs) are using the iPad device with students during speech therapy.

Investigator:
Garvin P. Romane
Doctoral Student at Fordham University
Language, Literacy and Learning

What you will be asked to do in the study:
Participation in this study is voluntary. If you agree to participate, then you will complete a questionnaire, which includes questions about how you use the iPad device in your speech and language classroom, along with the various apps. The information you share with me will be kept completely confidential.

Time required:
15 to 20 minutes to complete the questionnaire.

Risks and Benefits:
There are no feasible risks that can be attributed to participating in this study. Participation is voluntary and you do not need to feel pressured or coerced to participate. The researcher is not in any supervisory or evaluative position and has no authority over the participants.

A potential benefit for your contribution will allow us to learn what possible support and direction the field of speech pathology needs to support the use of iPads in a speech and language classroom.

Compensation:
No compensation will be offered.

Confidentiality:
The survey will be completely anonymous. I will not be collecting any personally identifying information as part of this study (including your name). Thus, there will be no way for me to know who participated in this study. The survey data will not be shared with anyone at your school. Your data will only be accessible by my dissertation committee members and I.

Voluntary participation:
Your participation in this study is completely voluntary.

Right to withdraw from the study:
Participants have the right to withdraw from the study at any time. You may choose to stop participating in the study at any time by not completing the survey.

Who to contact if you have any questions about the study:
Garvin P. Romane
Fordham University   **Email: romane@fordham.edu**

Who to contact if you have any questions about your rights as a research participant in the study:
Michele Kuchera
IRB Manager, Fordham University
Phone: 718-817-0876   **Email: IRB@fordham.edu**

YOU ARE ABLE TO PRINT THIS FORM WHETHER OR NOT YOU AGREE TO PARTICIPATE

*1. I agree to participate in the "School-Based Speech-Language Pathologists' Use of iPads" research. If you consent to participate, please click 'Yes' and proceed to the next page by clicking 'Next.'
☐ Yes

No

Thank you!

*2. Are you employed with the New York City Department of Education?

Yes

No

*3. Are you using an iPad in your speech and language session (speech therapy)?

Yes

No

Section I: Use of iPads for Speech and Language Instruction

*4. In a speech and language session (0 to 40 + minutes), how much time are you using the

iPad for the following:

	Never	Less than 10 minutes	About 20 minutes	About 30 minutes	About 40 minutes or more
Articulation Goals (Speech-Sound Disorders)?					
Language Goals (i.e., grammar—verb-tense agreement, pronoun usage)?					
Vocabulary Goals (meaning of words)?					
Behavior Rewards (incentive or reward)?					

*5. What apps are you currently using for the following: (Please name the Apps):

Articulation Goals? _____

Language Goals? _____

Vocabulary Goals? _____

*6. In what ways has the iPad changed the way you provide speech and language instruction?

_____

	Not at all	Slightly	Moderately	Very Effective	Extremely
	1	2	3	4	5
*7. Overall, how effective are iPad apps in achieving articulation, language, and vocabulary goals?					

*8. Please describe how iPads have been effective or ineffective for speech and language instruction.

_____

Section II: School-Based Support of iPad Use for Speech and Language Instruction

*9. Please rate the following questions based on your experience regarding school-based support for iPad use (1-5, strongly disagree to strongly agree).

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
	1	2	3	4	5
A person at my school provides technical support.					
Colleagues (i.e., general education teachers) support the use of iPads to help students learn during speech and language instruction.					
Our school administrators support educators in using iPads to help students learn at our school.					
Our school administrators support educators by providing training and assistance in using iPads to help students learn at our school.					
My school provides training on how to use iPads for speech and language session.					

Section III: Confidence in iPad Use for Speech & Language Instruction (Efficacy)

*10. How confident are you in using iPads for the following:

	Not at all confident	Slightly confident	Moderately confident	Very confident	Extremely confident
	1	**2**	**3**	**4**	**5**
I can use the iPad/Apps to increase articulation goals.					
I can use the iPad/Apps to increase language (i.e., grammar – verb tense agreement, pronoun usage).					
I can use the iPad/Apps to increase vocabulary (word meaning).					

Section IV: Technological Efficacy

*11. How confident are you in using technology for the following:

	Not at all confident	Slightly confident	Moderately confident	Very confident	Extremely confident
	1	2	3	4	5
I feel confident that I can successfully teach relevant speech and language goals by appropriately using technology.					
I feel confident that I can evaluate Apps and iPad utilities (such as video and notes) for the purpose of speech and language instruction.					
I feel confident that I can motivate students to use technology-based devices such as the iPad and/or other technology devices (tablet, e-readers, iPod).					
I feel confident that I can incorporate technology into my speech and language session.					
I feel confident using technology in my teaching.					
I feel confident using the iPad/Apps in the speech and language session.					
Please rate yourself on how confident you are in using iPad apps in achieving articulation, language, and vocabulary.					

Section V: Barriers to Use of iPads for Speech and Language Instruction

*12. Have you experienced any barriers to iPad use for speech and language instruction?

Yes

No

*13. What barriers have you experienced in using iPads in speech therapy? (check all that apply)

Haven't found good apps.

Lack of iPads at my school.

Internet/bandwidth issues at school.

Lack of support from building administration (principal, speech supervisor).

Loss of class time due to technical issues.

Lack of knowledge regarding how to use the iPad.

Other priorities

Other (please specify) _____

Section VI: Demographic Information

*14. What is your gender?

Female

Male

Other

*15. What languages do you speak fluently: (Check all that apply)

Arabic

Chinese

English

French

French Creole

Hindi

Spanish

Urdu

Other (please specify)

_____

*16. What is your ethnicity? (Please select all that apply)

American Indian or Alaskan Native

Asian or Pacific Islander

Black or African American

Hispanic or Latino

White / Caucasian

Prefer not to answer

Other (please specify)

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*17. What is the highest degree you have received in speech-language pathology?

Bachelor's degree

Graduate degree (Master's)

Doctorate degree

Other (please specify)

*18. How many years have you worked as a speech-language pathologist?

(Please enter a number)

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*19. What is your current work setting? (Check all that apply)

Elementary School

Middle School

High School

*20. In which borough do you work? (Check all that apply)

Manhattan

Queens

Brooklyn

Bronx

Staten Island

*21. In which New York City Department of Education school district do you work?

District 1-32 (Community Schools)

District 75

Other (please specify)

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*22. Are you a speech provider/teacher? (TSHH/TSSLD)

Yes

No

*23. Are you a licensed New York State speech-language pathologist?

Yes

No

*24. Are you a member of ASHA (American Speech Language Hearing Association –

CCC-SLP)?

Yes

No

Note: * indicates the specific survey item had to be completed

APPENDIX E

E-MAIL TO PARTICIPANTS

SLPs' Use of iPads in the Speech and Language Classroom, Survey Instrument

Dear SLP,

I am writing to invite you to take a short survey to help us understand the impact of iPads in the speech and language classroom (speech therapy).

It should take you about 15-20 minutes to complete, and there is space for you to input comments. We appreciate your honest responses to the questions in the survey. Fordham University's Institutional Review Board has approved this research dissertation/study.

All responses are completely anonymous. I will not be collecting any personally identifying information as part of this study.

Here is a link to the survey:
https://www.surveymonkey.com/r/SLPs-iPads

If you have any questions, feel free to email me at romane@fordham.edu.

Best Regards,

Garvin P. Romane, CCC-SLP
Fordham University

APPENDIX F

INFORMED CONSENT

FORDHAM

U N I V E R S I T Y   *New York City's Jesuit University*

Informed Consent

Protocol Title:
School-Based Speech-Language Pathologists' Use of iPads

Please read this consent document carefully before you decide to participate in this study.

Purpose of the research study:
You are invited to participate in a research study about the use of iPads in your speech and language classroom. The study's goal is to understand how speech-language pathologists (SLPs) are using the iPad device with students during speech therapy.

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Who to contact if you have any questions about the study:
Garvin P. Romane
Fordham University   E-mail: romane@fordham.edu

Who to contact if you have any questions about your rights as a research participant in the study:
Michele Kuchera, IRB Manager
Phone: 718-817-0876   E-mail: IRB@fordham.edu

YOU ARE ABLE TO PRINT THIS FORM WHETHER OR NOT YOU AGREE TO PARTICIPATE

I agree to participate in this study, "School-Based Speech-Language Pathologists' Use of iPads." If you consent to participate, please click on yes and proceed to the next page by clicking next.

Thank you!

APPENDIX G

APPS USED BY GOAL TYPE

Table G1

iPad Apps Used for Articulation Goals

	n	%
Apraxia	1	1
Artic Bee	4	5
Artic Therapy	1	1
Articulate It	1	1
Articulation Station	25	31
Articulation Test Center	1	1
Busy Bee	1	1
Google	1	1
Linguisystems Apraxia Cards	1	1
Lisp Therapy	2	2
Minimal Pairs	1	1
Mommy Speech Therapy	1	1
NAED Speech App	1	1
Oral Motor App	2	2
Phonics Genius	1	1
Phonics Studio	5	6
Phonological Awareness	1	1
Phonological Processes	1	1
Photos	1	1
Pic Collage	1	1
Pinterest	1	1
Pocket Pairs	1	1
R Intensive	1	1
Recorder	1	1
Smarty Ears	1	1
Sound Match	1	1
Sound Touch	1	1
Sounds of Speech	1	1
Speech Sounds	2	2
Speech Trainer 3D	1	1
Speech Tutor	3	4
Speech Wizard	1	1
Super Duper	2	2
Talking Tom Cat	1	1
Tiga Talk	1	1
Vocab Bingo	1	1
Word Vault	2	2
None Listed	27	33

Table G2

iPad Apps Used for Language Goals

	n	*%*
Ablenet Apps	1	1
Actions	1	1
Adams Game	1	1
Auditory Workout	2	2
Autism App	1	1
Autism iHelp	1	1
Between the Lines	1	1
Bitsboard	1	1
Brain Pop	3	4
Cake Doodle	1	1
Compare / Contrast	2	2
Conversation Builder	1	1
Conversation Therapy	1	1
Cookie Doodle	1	1
Describe It to Me	1	1
Describe This & Picture This	1	1
Dr. Panda	1	1
Duolingo	1	1
Emotions	1	1
Epic	1	1
Expressive Builder	2	2
First Phrases	2	2
Follow Directions	1	1
Fun with Prepositions	1	1
Fun with Verbs	3	4
Gotalk Apps	1	1
Google	1	1
Grammaropolis	1	1
Hole Story	1	1
Hooked on Phonics	1	1
iBooks	1	1
iTooch	1	1
Injini	1	1
Irregular Past Tense	1	1
iSequence	2	2
LAMP	5	6
Language Adventure	4	5
Language Builder	1	1
Language Empires	1	1
Language Therapy	1	1
Listen Preschool	1	1
Main Idea - Short Texts	1	1
Matt & Molly Social Stories	1	1
McGraw Hill Grammar	1	1
Milo	6	7
Monster at the End of the Story	1	1
My First Phrases	1	1
My First Words	1	1
My Play Home	3	4
Newsela	1	1

	n	*%*
Nick Jr.	1	1
Opposites	1	1
Parts of Speech App	1	1
Photos	1	1
Pictello	1	1
Pinterest	1	1
PRC	1	1
Proloquo2Go	2	2
Puppet Pals	1	1
Question Builder	1	1
Questionit	1	1
Quizoid	1	1
Reading Comprehension	1	1
Retell	1	1
Safari	1	1
Sentence Builder	2	2
Sentence Maker	1	1
Sequencing	1	1
SGM	2	2
Sight Words	1	1
Smarty Ears	1	1
Social Detective	2	2
Social Express	2	2
Sonoflex	1	1
Speak & Translate	1	1
Speech Flip Book	1	1
Spelling Station	1	1
Sports	1	1
Starfall	4	5
Story Builder	3	4
Story Dice	1	1
Story Maker	3	4
Sunrise Pro	1	1
Super Duper	9	11
Symbol Reader	1	1
Teach Me	1	1
Tense Builder	1	1
Theme Maker	1	1
Toca Boca	3	4
Toontastic	6	7
TouchChat	1	1
Verb News	1	1
Verbal Reasoning	1	1
Verbally	1	1
Voice Dream Reader	1	1
Wee Sing	1	1
Wh-Questions	5	6
What's In the Bag	1	1
YouTube	1	1
Zoo Animals	1	1
None Listed	18	22

Table G3

iPad Apps Used for Vocabulary Goals

	n	%
AAC	1	1
Analogies for Kids	1	1
ASL Dictionary	1	1
Assistive Express	1	1
Bitsbiard	1	1
Brain Pop	1	1
Category Therapy	1	1
Comp. Builder 2	1	1
Describe It to Me	2	2
Dictionary App	2	2
Dr. Panda	1	1
Easy As	1	1
Emotions	1	1
Flash Cards	2	2
GALE	1	1
Google	3	4
Go Talk Now	1	1
Grammaropolis	1	1
Homophones	1	1
Kid's Vocabulary	1	1
Kindle	1	1
LAMP	6	7
Let's Name Things	1	1
Milo	1	1
My First Words	1	1
My Play Home	5	6
Multiple Meaning	1	1
Name Things	2	2
PDF	1	1
Pinterest	1	1
PowerPoint	1	1
Proloquo2Go	5	6
Proloquo4Text	1	1
Read Aloud Books	1	1
Real Vocabulary	1	1
Safari	2	2
Sentence Builder	1	1
Same Meaning Magic	1	1
Smarty Ears	1	1
Speech Rehab.	1	1
Splingo	1	1
Sono Flex	2	2
Starfall	1	1
Story Grammar Marker	1	1
Super Duper	10	12
TD Compass	1	1
This Is to That	1	1
Toca Boca	2	2
Toontastic	2	2
TouchChat HD	2	2

	n	%
Vocab Junkie	1	1
Vocabulary Builder Games	1	1
Vocabulary Spelling City	1	1
Winning Words	1	1
Word Ball	1	1
Word Vault	1	1
Word Wall	1	1
Wordventure	1	1
YouTube	1	1
None Listed	26	32