Educator-Caregiver Communication Through Technology:

A Survey of Early Childhood Educators of the Deaf

A Dissertation

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Dad, remember all of those times I cried over math homework when you would try to help me? Well, here is one last math problem.

Question: Brynn moved out of South Dakota in 2009. In 14 years, she has moved approximately 16 times and lived in 6 different states. What is the estimated number of times Dad has helped Brynn move?

Answer: Thank you for helping me chase my dreams, Dad. I love you.

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Dedication

To my Deaf preschoolers who inspired my research and are now big 5th and 6th graders!

Thank you for letting me be your teacher.

You always let me try my best, make mistakes, and try again.

Your love has changed my world.

Abstract

There has been an increasingly steady growth and utilization of communication technology between early childhood educators and caregivers. This practice for communication has revealed benefits for educators, caregivers, and children as well as positive perceptions surrounding the use of technology for communication between school and home. Despite the largely positive findings, there is limited research of this nature in the field of Deaf education with early childhood educators and caregivers of Deaf children. The goal of this study was to develop a survey of educators who serve Deaf children (ages 3-8 years old) to examine the current state of how educators in early childhood were utilizing technology to communicate with students' caregivers, share American Sign Language resources to support language and literacy development, and identify differences between educational settings. Results revealed educators in early childhood Deaf education utilize a variety of technology for communication and hold generally positive perceptions about technology and how it can increase communication and knowledge between school and home. Perceptions about the benefits and challenges of using technology with caregivers aligned with findings from previous research. However, new benefits and challenges distinctive to early childhood Deaf education in the United States were also found. This research is one of the first studies to contribute and expand on the limited literature in early childhood Deaf education and explore possibilities for future research studies in the field of early childhood Deaf education and educator-caregiver communication through technologies.

Keywords: educator-caregiver communication, technology, Deaf, American Sign Language

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Key Terms and Definitions

Deaf: For the purposes of this study, I intentionally used the term **Deaf** to encompass all Deaf and Hard of Hearing individuals with varying identities, languages (signed, written, spoken), cultures, races, abilities (DeafBlind, DeafDisabled), hearing levels and home languages (Kurz et al., 2021).

Caregiver: The term caregiver is defined as any adult person(s) who provides daily care, and guardianship, and is the authorized person responsible for the Deaf child. Generally, this means parents or legal guardians.

Early Childhood (EC): is defined by NAEYC as birth to age 8 (NAEYC, 2022). For this study, I focused on ages 3-8 which is covered under early childhood or preschool, kindergarten, and elementary educational settings. Early childhood is the term used to encompass all of these age groups.

Technology: Any digital tool which can be used to communicate. This can include, but is not limited to emails, texting, phone calls, video calls, apps, websites, etc.

Communication: When one or more people (i.e., educators and/or caregivers) contact one another through the actions of calling, sending messages, pictures, videos, announcements, notifications, attachments/files, clicking "like", writing or signing comments, responding to questions. Communication can occur in multiple ways:

- ○ **One-way communication** the educator or caregiver contacts the other person and does not receive a response.

- **Two-way communication** the educator or caregiver contacts the other person and receives a response.

- **Non-existent communication:** neither the educator nor the caregiver contacts the other person.

Multilingual Deaf Education: is the utilization of two or more languages (ASL, English, additional signed and spoken languages, this encompasses bilingual-bicultural education) for the instruction of academic content embedded with a variety of multilingual-multimodal strategies (e.g., visual, written, spoken, tactile) and are used to support the linguistic needs of Deaf children. This educational approach respects and integrates multiple cultures of Deaf children into the curriculum including the cultures of the Deaf community, Deaf students, and their families (Kurz et al., 2021).

Listening and Spoken Language (LSL, auditory-oral/auditory verbal): an approach to teaching Deaf children oral language through early interventions with listening technology (e.g., hearing aids, cochlear implants) that aim to develop listening and spoken and language skills equivalent to hearing peers in early childhood (AG Bell, 2023).

Total Communication (TC): a combination of language and communication modalities (e.g., signed, written, oral, auditory, written, visual, gestures) often used simultaneously (Holcomb, 1970)

Manual Communication Systems: communication systems or modalities (not languages) that combine the use of spoken words and signed words. Some systems/modalities include: Simultaneous Communication (SimCom) which is using spoken words and signed words at the same time, Signed Exact English (SEE), Pidgin Signed English (PSE), and Cued Speech. For this study, these were included under the "additional modalities" categories.

Residential/Day Schools for the Deaf: Residential programs provide educational, athletic, social, and health programs and services to Deaf children from Pre-K-transition. In some settings, have parent-infant support, toddler groups, and/or caregiver support services. Deaf children often share the same languages (i.e., ASL, English, and additional languages) and modalities as their Deaf peers and educators/staff in the residential setting. Deaf students have the option to either commute to school daily or live in dormitories at the school during the week and travel home on the weekends (Easterbrooks, 1997). Day programs for the Deaf are similar to residential schools in that they provide all the same opportunities and services, except students do not live on campus and instead commute to school daily.

Self-Contained/Resource Setting: Self-contained/resource classrooms are located within the general education setting but are in classrooms that are specialized for Deaf students only to learn academic content for either parts of the day or all day. Students in these settings may sometimes attend general education classrooms with hearing peers for certain parts of their academic instruction or spend the full day in a self-contained/resource classroom.

Itinerant/Mainstream Setting: In itinerant settings, Deaf children attend school in general education classrooms with their hearing peers but are pulled out for one-on-one services. Educators who serve in itinerant/mainstream settings generally travel to the schools Deaf children attend to provide services in 1-1 or small group settings (often outside of the general education classroom) for short periods of time (e.g., 15-30 minutes). These educators may travel to schools in metropolitan areas or travel long distances between schools in more rural areas and often travel to multiple schools each day.

Chapter 1: Introduction

The concept of home-school connections through educator-caregiver communication, caregiver involvement in education, and its impact on children's educational outcomes has been a prominent area of interest for researchers in education (Epstein & Dauber, 1991; Fan & Chen; 2001; Henderson & Mapp, 2002). The findings of these studies have influenced elements of federal education laws. Specifically, the Individuals with Disabilities Education Act (IDEA, 2004) supports caregiver rights and responsibilities to be involved in their child's education both at school and in the home. In early childhood Deaf education, it is especially critical caregivers are involved from the beginning with their Deaf child's education and the decisions being made about their language development and educational outcomes. The research on caregiver involvement and IDEA suggests the importance of home-school connections and practices, such as educator-caregiver communication and caregiver involvement in education (Epstein, 2001; IDEA, 2004).

Caregiver involvement is especially critical in early childhood for Deaf children to support language acquisition and literacy development in the home. For Deaf children in early childhood, learning at home occurs when they have full access to a visual language (i.e., sign language) and communication with their caregivers. Deaf children who are born into hearing families who do not know American Sign Language (ASL), or other signed languages are at-risk for insufficient access to natural, visual language, communication, and culturally linguistic role models in early childhood (Gulati, 2019; Hall et al., 2017). Deaf children's lack of access to a fully accessible language can have long-term detrimental consequences, leading to language delays or even language deprivation (e.g., Black & Glickman, 2006; Hall, 2017) Mayberry &

Lock, 2003) impacting the development of literacy skills (Mayberry, 2011; Lederberg et al., 2013; Scott, 2022) among other critical areas of development including cognitive, behavioral, and social-emotional development (Barker et al., 2009; Black & Glickman, 2006; Gulati, 2014 & 2019; Lennenberg, 1967; Leybaert & D'Hondt, 2003; Penicaud et al., 2013; Schick et al., 2007).

There has been a rapid uptake in technology integration as a tool for communication between educators and caregivers including in early childhood settings (Burris, 2019; Higgins & Cherrington, 2017; Stratigos & Fenech, 2021). The utilization of technology for communication provides a mechanism for caregivers to be involved in their children's education. Research on caregiver involvement also suggests the importance of home-school connections and practices such as communication and caregiver involvement in education through technologies (Beaumont-Bates, 2017; Lim & Cho, 2019; Penman, 2014, Stratigos & Fenech, 2021).

Communication technologies such as ePortfolios, app and web-based communication technologies have created a virtual landscape for two-way communication practices to develop between educators and caregivers. Research findings from studies in early childhood education for hearing populations suggest there are numerous advantages of utilizing technology for communication between home and school. This has sparked collaborative and communicative approaches between educators and caregivers (Beaumont-Bates, 2017; Hooker, 2019; Lim & Cho, 2019; Penman, 2014), and has been shown to aid in initiating caregiver-child interactions, thus building upon the student's learning and knowledge outside of the classroom and in the home. Communication technologies can also expand traditional forms of communication (e.g., face-to-face, phone calls, journals) and provide an asynchronous way for relevant information to be exchanged between home and school (Burris, 2019).

Using technologies for communication with educators may be one way for caregivers to become more connected and involved in their children's education. This connection through technologies may provide opportunities for information about children to be exchanged in a collaborative and communicative approach between educators and caregivers and this may spark caregiver-child interactions, thus building or expanding upon the student's learning and knowledge outside of the classroom and in the home. This exchange between educators and caregivers through communication is particularly important in supporting the development of Deaf children. Educators possess a wealth of knowledge about the linguistic and cultural needs of Deaf children and many caregivers are knowledgeable about their Deaf children's life experiences within the context of the family and home.

Recently published literature providing evidence on the benefits of educator-caregiver communication through technology has made an important contribution in early childhood settings with hearing children (Beaumont-Bates, 2017; Higgins & Cherrington, 2017, Hooker, 2016; Stratigos & Fenech, 2021). However, little is known about these impacts in early childhood Deaf education. This has led to an examination of current literature and this dissertation study to determine if these educator-caregiver communicative practices through technology are taking place in early childhood Deaf education settings.

Study Purpose

This dissertation will expand the current literature in early childhood education with hearing populations to include some of the first research on educator-caregiver communication through technology in early childhood Deaf education. This will provide insight into what technologies educators currently use and their communication practices with caregivers of Deaf

children. The intention of the study is to explore how technology is used, what language and literacy resources are shared by educators, and educators' perceived benefits and challenges of utilizing the technology for communication. Ultimately, findings from this dissertation will provide a first look at the current practices of educators and caregivers utilizing technology in early childhood Deaf education and provide directions for future research in the field.

Research Questions

The purpose of this study is to explore and identify the current technologies being used in early childhood education by educators of Deaf children to communicate with their students' caregivers. The study will include an examination of the language and literacy resources shared and the educators' perceptions regarding benefits and the challenges of utilizing technologies with caregivers for communication in early childhood Deaf education. From this purpose, four research questions were developed:

1. *What technologies are being used by educators to communicate with caregivers in early childhood Deaf education and to what extent are they being used and how do they vary by educational setting?*

2. *In what ways and how often do educators utilize the technology to share ASL resources and information with caregivers and how do they vary by educational setting?*

3. *What are educators' perceptions of the challenges and benefits of using technology in early childhood Deaf education for communication with caregivers and how do they vary by educational setting?*

4. *Do early childhood educators vary in their use of technology for communication with caregivers based on educational settings (i.e., residential/day, itinerant/mainstream, and self-contained/resource classrooms)?*

Structure of Dissertation

This study is an investigation of educator-caregiver communication through technology in early childhood Deaf education and is guided by the theoretical Communities of Practice framework and the review of literature in Chapter 2. The reviewed literature is focused on educator-caregiver communication through technology in early childhood general education and the research on the importance of early access to ASL to support Deaf children's language and literacy development. Chapter 3 provides a detailed and precise description of the methods used for conducting the survey in ASL and English which includes the procedures for designing, formatting, and piloting the survey and rationale for the validity of the approach that was used. Chapter 4 is a summary of the findings and results from the research questions. Chapter 5 includes the discussion where the results are connected to the theoretical framework and reviewed literature. In this chapter the limitations of this study are addressed. Implications for practice and directions for future research related to educator-caregiver communication through technology are shared followed by the conclusions of the study.

Chapter 2: Review of Literature

The Communities of Practice (CoP) Framework (Lave & Wenger, 1991) provides the foundational theoretical support for this dissertation. This framework emphasizes two specific areas: (1) caregiver involvement by means of communication; and (2) elements of collaboration to address shared interests, underlying issues, and exchange information to improve skills individually and collaboratively. Deaf children's access to visible and interactive communication supports both language development and literacy skills (Kuntze & Golos, 2021). Both educators and caregivers of Deaf children are key players in fostering this development. In this section, I draw connections between the CoP framework and educator-caregiver communication through technologies in early childhood Deaf education settings.

Communities of Practice Framework

There are three tenants within the CoP social learning framework: domain, community, and practice (Lave & Wenger, 1991; E. Wenger-Trayner & B. Wenger-Trayner, 2015, Wenger-Trayner et al., 2023) captured in (Figure 1). A CoP is an organized social system in which groups of two or more people (e.g., an educator and a caregiver) create a cooperative and communicative relationship in which they share a passion or concern about a topic that is considered to be of importance or valuable to each member in the group (Lave, 1996; Lave & Wenger, 1991; Wenger, 1998; Wenger-Trayner, E. and Wenger-Trayner, B., 2015, Wenger, et al., 2002, Wenger, 2010; Wenger-Trayner et al., 2023).

Figure 1

Graphical Representation of the Communities of Practice Framework

Note. A graphical representation of the Communities of Practice framework (Lave & Wenger, 1991; E. Wenger-Trayner & B. Wenger-Trayner, 2015, Wenger-Trayner et al., 2023).

Domain

The *domain* component is the common ground and the commitment towards a topic or object of interest shared between members in a CoP (Wenger, 1998, 2010; E. Wenger-Trayner & B. Wenger-Trayner, 2015, Wenger-Trayner et al., 2023). For example, domain in early childhood Deaf education may be Deaf children's early access to ASL to support language acquisition and literacy development, a critical focus in education and at home. The educators and caregivers of these Deaf children share a commitment and interest in ensuring the Deaf child is acquiring a visually accessible language and their home language(s). An established domain between the caregivers and educators creates an opportunity for the development of learning from one another and developing collective competence towards their domain, the success of the Deaf child. This shared interest lends itself to the development of a community, the next pillar in the CoP framework.

Community

Those actively engaged and learning from one another are the members of the *community*, the social structure of the CoP (Wenger, 2010). In this study, the *community* is defined as the early childhood educators and caregivers of Deaf children who are engaged with one another in a partnership in the context of education of the Deaf child, which consists of a two-way reciprocal relationship using technology, but is not limited to this communicative practice or context. Regardless of what context the *community* develops, all educators and caregivers can form their own communities in face-to-face or technological landscapes based on their shared interests of the *domain*.

The support of visual language acquisition (the *domain*) within a *community* is necessary; however, it may differ significantly from one early childhood Deaf educational setting to another (i.e., residential/day program, itinerant, and self-contained). The formation of the *community* within a technological dimension may look different across educational settings and the age groups of students served by the early childhood educators. For example, within a residential/day early childhood program, Deaf children are a part of a "critical mass" with age-appropriate peers (National Association of the Deaf, 2022) and receive direct instruction within a classroom with an educator who serves early childhood. The type of technology utilized to create a *community* landscape in a residential day program may look different from an itinerant (mainstream) setting, as Deaf children often receive 1:1 service with an educator who may serve multiple students across ages birth-21, therefore influencing the type of technology chosen to communicate with caregivers.

Practice

The *practice* component of the CoP framework is the third and final element. The *practice* is when CoP members (e.g., educators and caregivers) interactively exchange information, resources, and share experiences as a way of addressing their area of interest or concern relevant to the domain (e.g., language acquisition and emergent literacy development; Wenger, 2000; Wenger & Synder, 2000; Wenger 2010). There are many ways to share information and resources as a practice. One way is through technology.

The communication practice in the CoP in an early childhood Deaf education setting is educators using technology to provide caregivers with information and resources for supporting early visual language and literacy activities at home increasing interactions around language and literacy. Through this practice caregivers can utilize the resources shared with their Deaf child in their homes. Caregivers can also engage in the practice of utilizing technology to share information by responding to educators about their child from the home perspective. Each element within the framework, when combined, may contribute to an increase in caregiver involvement and communication between educators and caregivers with the intention to improve outcomes for Deaf children.

Educators and caregivers of Deaf children can be the creators of their own CoPs in early childhood education (ECE) through a mutual and informal process. With the rise of technologies, there is a creation of digital landscapes which provide space for formation of educator-caregiver CoPs. This process of creating CoPs between educators and caregivers and the utilization of the technologies may have far-reaching implications for how educators and caregivers communicate and are engaged with one another as it relates to the domain (i.e., Deaf children's language and

literacy development) in their CoPs. The communication and engagement through these digital landscapes warrants a review of the literature to determine the types of technologies being used, their benefits and the importance of early access to a visual language for Deaf children.

Review of Literature

To guide the dissertation study, a systematic literature review was conducted. It was anticipated there would be little research in early childhood Deaf education. A broad search of early childhood education was conducted to explore and identify current technologies being used for communication by educators and caregivers and their perceived benefits and challenges of using the technology for communication.

Two areas of research were reviewed that provided foundational support for this study. The first area I focused on was reviewing research related to the importance of caregivers and educators providing Deaf children early access to ASL and how this contributes to language and emergent literacy skills, as well as the consequences of late or limited access to language in early childhood. Then I conducted a systematic review of the current literature in early childhood education to explore types of technologies early childhood educators are using to communicate with caregivers and educators' and caregivers' perceptions of the benefits and disadvantages of using the technologies. This review provided evidence of how technologies contribute to the engagement of members in CoPs and their practice of exchanging and sharing pertinent information within their formed community. The findings in the review offered direction for the current study in early childhood Deaf education as there was limited literature found of this nature in the systematic review.

The Importance of Early Access to ASL for Deaf Children

Researchers have theorized that a critical period for language acquisition occurs from birth through early childhood (Lennenberg, 1967). Deaf children are predominantly born into hearing families (Mitchell & Karchmer, 2004), and when Deaf children are not provided access to visual language at home during these critical periods of development or are exposed to a visual language beyond the theorized critical period, are at risk for language deprivation (Hall, 2017; Hall et al., 2017, Gulati, 2018; Mayberry & Lock, 2003; Mayberry, 2010).

Early exposure to ASL (L1, first language) is also a critical factor in Deaf children's developing proficiency in a second language (L2, English) (Mayberry, 2007) or languages. For example, Deaf signing children who experience late or delayed exposure to ASL in early childhood are impacted in their English literacy development (Mayberry, 2007; Mayberry, 2010; Mayberry & Locke, 2003; Scott, 2022). Deaf children's proficiency in an L1 (ASL), is a main predictor in literacy skills (Hoffmeister, 2000; Scott & Hoffmeister, 2017; Strong & Prinz, 1997). Deaf children are increasingly entering preschool and kindergarten showing signs of delays in both language and literacy skills (Kritzner, 2009). These delays are attributed to the inaccessibility of a full, visual language in infancy and early childhood.

Early and consistent access to ASL for Deaf children can lead to proficiencies in multiple languages, and this includes all signed, written, and even spoken languages. According to the Gallaudet Research Institute (GRI), an increasing number of Deaf children come from multiple racial and ethnic backgrounds (2013) where multiple languages are used in the home. In a study examining written grammar comprehension (Cannon et al., 2015), researchers reported a total of 11 languages (other than ASL and English) used in homes of the Deaf children (*n*=49), who were

participants in the study. Providing early access to ASL can create a foundation in which children can become multilingual learners and communicate in languages used within their home environments with their caregivers. Children who are multilingual have been found to have increased metalinguistic awareness, greater cognitive flexibility, enhanced executive functioning skills (Bialystok et al., 2009) and are at an advantage with literacy skills (Berens et al., 2013). When caregivers provide Deaf children access to ASL without delay in early childhood, it supports foundational emergent literacy skills. Full access to visual language and consistent, meaningful opportunities to engage with literacy in early childhood at both home and school are predictors of successful outcomes for Deaf children (Calderon, 2002; Dickinson & Tabors, 2001; Golos & Moses, 2013; Kuntze, et al., 2014; Kuntze & Golos, 2021; Mayberry et al., 2011).

Deaf children can develop language and literacy skills through early engagement with ASL resources including read alouds in ASL (Berke, 2012), ASL rhyme/rhythm (Holcomb, 2023; Holcomb et al., 2022), and educational media in ASL (Golos, 2020; Golos & Moses, 2011, 2013). When educators and caregivers integrate these language and literacy rich activities into their classrooms and homes it can foster Deaf children's acquisition of language (e.g., ASL and additional languages) and literacy development.

There is some recent evidence that educators of Deaf children in early childhood are engaging Deaf children in some language and literacy activities in the classroom. In the Moses et al., (2018) study, researchers surveyed early childhood educators in the United including educators of hearing and Deaf children (N=155; n=93 educators of hearing children; n= 62 educators of Deaf children) regarding literacy activities and materials used in their classrooms with children. Results indicated approximately 70% of the early childhood Deaf educators were

reading aloud daily compared to the 91.4% of early childhood educators reading daily to hearing children. Other literacy activities educators of Deaf children used daily were writing in front of children (66.1%), using and explaining new words (69.4%), and talking about or pointing to writing on walls (50%).

Golos et al. (2018) further analyzed this data to better understand what activities the Deaf educators were engaging in. Educators (12.9%-14%) reported engaging in literacy related activities such as ABC/number/handshape stories daily and 8.2% used videos in ASL at least once per day. In these studies, 37.1% of respondents identified as Deaf and 43.5% used ASL/written English as their primary mode of communication in the classroom. Classroom practices such as these engage Deaf children in their learning through ASL by exposing them to new vocabulary, using fingerspelling, and making connections to printed English.

Early engagement with print in conjunction with early access to ASL through engaging in shared reading experiences, social interactions with cultural role models in-person, or through media experiences (Kuntze, et al., 2014), sets children up for positive outcomes with their literacy development. For example, Mayberry et al. (2010) found evidence to suggest a strong language foundation is a greater predictor in literacy skills than children's phonological coding awareness (PCA) skills and reading skills in Deaf children. The meta-analysis results showed only 11% of the variance in reading abilities in Deaf children was due to PCA skills. In contrast, language ability accounted for 35% of the variance in reading abilities in Deaf children which highlights the importance of literacy instruction for Deaf children through an emphasis on language skills. For Deaf children, this means their language abilities of ASL need to be fostered in both home and school to support their development of English literacy skills.

Scott's (2022) recent study provides confirming evidence that early exposure to ASL for Deaf children is correlated with higher reading comprehension scores when compared to Deaf children who had late exposure to ASL during early childhood. With early exposure and emphasis on language instruction in education, Deaf children can be able to develop the necessary linguistic skills which will contribute to their English language and literacy proficiencies.

Researchers have also found evidence that Deaf individuals who had late exposure to ASL experience increased cognitive loads during language comprehension activities (Malaia et al., 2020). Another study of Deaf children's signing ability, Henner et al., (2016) examined Deaf children's ASL syntax and language-based analogical reasoning skills with age related variables being examined (i.e., early/late-exposure to ASL and age of entry to a Deaf school (signing environment). Results revealed Deaf children who had access to ASL from birth performed better on these tests, while children who had late exposure and later entry to a signing environment had poorer performances on analytical and syntactic processing skills (Henner et al., 2016).

Exploratory research (Calderon, 2002) suggests mothers of Deaf children who demonstrated better communication skills with their Deaf child had children who demonstrated higher language, higher reading scores and less behavioral issues. This finding suggests the maternal skills of communication may have impacts on children's language, literacy, and social-emotional development. Children who are in impoverished language environments in early childhood may experience learning difficulties and struggles, emotional regulation, and social communications (Barker et al., 2009; Hall et al., 2017; Schick et al., 2007). Through natural,

visual social processes with Deaf adults/peers and caregivers who sign, Deaf children who are repeatedly and consistently exposed to a visual language can acquire languages and literacy skills (Kuntze & Golos, 2021). Providing Deaf children with fully accessible social language and socialized literacy interactions in early childhood in the home and school sets them up for positive outcomes.

There are severe consequences when caregivers and educators do not provide Deaf children access to a visual language in early childhood (Cheng et al., 2019; Mayberry, 2010; Mayberry et al., 2011; Mayberry et al., 2018). The risk of language deprivation can be mitigated by families and educators using visually accessible language (e.g., American Sign Language) both at home and school. Providing caregivers increased access to resources and language models can facilitate their ability to support early visual language and literacy development in their Deaf children. Educators and caregivers communicating through technologies could be one resource to increase Deaf children's access to early visual language in early childhood.

Educator-Caregiver Communication Through Technology in Early Childhood

A review of literature was conducted to seek evidence for what technologies are being used for communication between early childhood educators and caregivers. This search examined educators' perceptions of the benefits and challenges of utilizing technology for communication for caregiver involvement.

Literature Search

An extensive search using ERIC, Education Source, and Academic Premier databases was conducted to identify peer-reviewed articles which reported information related to educator-caregiver communication through technology. A variety of search terms were used to identify

relevant sources of information related to early childhood education, technology and communication including: *"parent-educator communication" or "parent-educator cooperation" or "parent-educator collaboration" or "parent-educator relationship" and technolog* or "digital documentation" or app* and "early childhood" or "preschool"*. An additional search using the keywords and additional Deaf education specific keywords, *"Deaf" or "Hard of Hearing" or "hearing loss" or "American Sign Language"* did not yield any relevant results.

To ensure the studies collected gave a more complete representation of the current technologies used in early childhood settings, the collected articles references were reviewed, and an ancestral search was conducted to identify additional articles fitting the inclusion criteria that were not found in the online search.

Inclusion Criteria

The development of technology in education is ever changing. This rapid pace prompted the systematic literature search to be intentionally narrowed and focused to include early childhood education research from the past eight years to ensure the technologies used by educators represented the most current technology practices and perceptions in early childhood educators and caregivers. Research included in the literature search were empirical and descriptive studies from peer-reviewed journals and theses from 2014-2022 that were available in English. These articles reported on the use of technologies (e.g., apps, websites, emails, text messaging) in early childhood settings and the perceptions of the benefits and challenges experienced by educators and caregivers.

Exclusion Criteria

There is much research in education related to technology for communication between educators and caregivers across all age groups. The focus was narrowed to include only studies conducted in early childhood educational settings for children. Studies focused solely on birth-age 2, elementary, and secondary education settings were excluded from the review and synthesis. Studies that investigated the perceptions of pre-service educators, administrators, schools, and/or communities were not included in the search for literature. Any articles that were not from peer-reviewed journals or theses from the 2014-2022 timeframe and were not available in English were excluded from the review. Additionally, any studies that did not mention technology for the purposes of communication through technologies between early childhood classroom educators and with caregivers were discarded.

The initial search for peer-reviewed journal articles that discussed educator-caregiver communication in early childhood was conducted through EBSCOHost databases: Academic Search Premier, Education Source, and ERIC. There was a total of 146 articles found. The 146 articles were screened for irrelevant articles using the inclusion and exclusion criteria and duplicate articles were eliminated. From the identified articles that met the criteria, an ancestral search process of the qualifying articles was used to identify additional empirical and descriptive studies to be analyzed for the literature review for a total of 16 relevant articles identified in the search process.

Based on the inclusion and exclusion criteria, and additional articles identified in the ancestral search, of the 146 articles, only 11% of the studies found in the literature search yielded relevant peer-reviewed academic journal articles specific to educators and caregivers in early

childhood education using technology for communication. In the search, none of the studies targeted early childhood education with educators and caregivers of Deaf children.

Types of Technologies Utilized in Early Childhood Settings

In the review of the research literature on the types of technologies and perceptions of educators and caregivers in early childhood education, a variety of research methods were used across the studies by researchers. Some of the primary methods across studies were interviews, semi structured interviews, focus groups, action research, and surveys. These methods in combination or used independently of one another were used to gather data on the technologies utilized and the perceptions of technologies that were used between educators and caregivers in educational and home settings. One study identified in the search for literature was the critical analysis conducted by Stratigos and Fenech (2021) which examined studies in early childhood education where educators and caregivers utilized apps for communication and identified benefits and challenges based on the studies. This article was not used within the reviewed literature but was used as a guide to identify literature for the review and helped give structure to the dissertation study.

Within each study, the technologies listed and described in Table 1 were identified to be used by the educators to communicate with the caregivers. These technologies are web-based platforms (e.g., ePortfolios, apps, emails), which can be accessed through websites or mobile devices (and sometimes both)

Table 1

Technologies Used in ECE for Educator and Caregiver Communication

Name	Summary of Technologies & Key Features	Participants	Authors
Eportfolios			
Educa Storypark	Designed with features to engage caregivers/families within their child's learning experiences at the early childhood centers which can be accessed through desktops, laptops, tablets or smartphones. ● learning story templates ● conversations ● Video ● Audio	educators (n=5) caregivers (n=16)	Beaumont-Bates, 2017 New Zealand
2 Unnamed	Two main ePortfolios from companies in New Zealand were used, but they were unnamed, and a general description was provided about the functions of hard copy ePortfolios which essentially are used to document student learning through creating stories, frequent snapshots, and used for communication with families.	schools (n=2) educators (n=16) caregivers (n=22) children (n=120) *survey respondents (n=115)*	Goodman & Cherrington, 2017 New Zealand

Unnamed e-Portfolio And Email	A platform in which artifacts or provides a narrative assessment about a child's learning, progress and achievements can be documented by educators through learning stories, video and photograph formats.	educators (*n*=7) caregivers (*n*=29) whānau (*n*=13)	Higgins, 2015 Higgins & Cherrington, 2017 New Zealand
Unnamed	A multimodal platform that captures children's learning through videos and learning stories which can be viewed and used to recall experiences of learning.	educators (*n*=7) caregivers (*n*=29) children (*n*=6)	Hooker, 2015, 2016, 2017, 2019 New Zealand
2 Unnamed Email	Digital versions of children's profile books or learning documentation which includes a community page and personal pages for each child.	6 kindergarten classrooms caregivers (*n*=49) educators (*n*=18)	Penman, 2014 New Zealand

Digital Documentation Portal

Unnamed Digital portal	The portal was accessed through phones, tablets, and computers. Features included: • View and add to the portfolio • Daily overviews • Messaging with educators	caregivers (*n*=42) responded to survey caregivers (*n*=6) in focus group	McFadden & Thomas, 2016 Australia

Cloud-Based Management ECEC Tool

TeachKloud	Purposefully designed tool for	educators (*n*=18)	Oke et al., 2021

	educators and familial involvement through sharing information and communicating. Features included: ● videos ● photographs ● written documentation	caregivers/families (*n*=15)	Ireland

Apps

Unnamed	A mobile documentation app with four menus: (1) My Child's News: individual journal entries with photographs, explanations, educator reflections, (2) Class News: a journal like entry with texts and pictures of small and large group activities in the classroom, (3) Class Announcements: contained pertinent information about class field trips, activities, or upcoming meetings and (4) Q & A: a space for caregivers to ask questions, share information and concerns or provide updates to caregivers. This platform was an app accessible through smart phones.	caregivers (*n*=274; 103 fathers & 171 mothers)	Lim & Cho, 2019 Korea
WhatsApp Social media	International social messaging platform where texts, pictures and videos can be exchanged.	educators (*n*=8) caregivers (*n*=24)	Özkan Yıldız & Yılmaz (2021) Turkey

Kinderloop	An app where photos of students are taken and brief descriptions of the activity in the photograph which can be linked to outcomes, principles/standards, policies, etc. The photo is posted for caregivers to view, like, and comment on.	13 interviews at (n=23) early learning centers with 2-3 educators per interview	Plumb & Kautz (2014) Australia
Classting	Caregivers could access through their mobile smart phones and view, comment, and like content posted by the educators. Features included 4 tabs: • posts • announcements • albums • miscellaneous	educators (n=1) caregivers (n=22) support staff (n=1) director (n=1)	Chen & Lin (2021) Taiwan

Combination of platforms

Emails, websites, text, surveys, online forms, links, online newsletters,	Preschool programs reported utilizing emails, websites, texts, app platforms (e.g., Tadpoles, Brightwheel, Kinderlime) surveys, online forms, links, online newsletters, all the web and/or app-based platforms for communicating with caregivers.	preschool programs (n=8) serving 950 children & families	Burris, 2019

Note. Whānau refers to the Maori term for extended family. This table was expanded and adapted based on Stratigos and Fenech (2021) study.

Technology Benefits Identified by Educators and Caregivers

Some of the studies in Table 1 included perceptions of educators and caregivers about the benefits of the technologies used in early childhood. Educators and caregivers both reported increased communication with one another due to the utilization of technologies such as ePortfolios and apps (Beaumont-Bates, 2017; Hooker, 2017, 2019; Lim & Cho, 2019; Penman, 2014). Caregivers and educators believed their communication was enhanced, stronger, and contributed to positive, collaborative, and more rapid development in their partnerships with one another (Beaumont-Bates, 2017; Chen & Lin, 2022; Hooker, 2017, 2019; Higgins & Cherrington, 2017; Oke et al., 2021). Caregivers reported frequent logins from various devices (e.g., phones, computers, tablets) to access photographs of their child during the week with 26% logging in 3-5 times and 44% 1-2 times per week (McFadden, 2016).

This increase in communication had benefits for both educators, caregivers, children, and extended families. Results across studies indicated the following benefits of the technologies: (1) caregivers reported being more informed about school and learning activities (Beaumont-Bates, 2017; Chen & Lin, 2022; Hooker, 2015, 2016, 2017, 2019; Higgins & Cherrington, 2017; Hooker, 2016; Lim & Cho, 2019; McFadden & Thomas, 2016; Oke et al., 2021; Özkan Yıldız & Yılmaz, 2021; Penman, 2014); (2) educators were able to make more well-informed pedagogical decisions (Beaumont-Bates, 2017; Higgins & Cherrington, 2017; Hooker, 2015, 2016, 2017, 2019, 2019; Lim & Cho, 2019; McFadden & Thomas, 2016; Oke et al., 2021; Penman, 2014); (3) children had increased communication and extended learning opportunities in the home with their caregivers and extended families (Beaumont-Bates, 2017; Chen & Lin, 2022; Hooker, 2015, 2016, 2017, 2019, Higgins & Cherrington, 2017; Penman, 2014); (4) general benefits such

as technology was a time saver, secure (Beaumont-Bates, 2017, Hooker, 2017), and easy access (Higgins & Cherrington (2017).

Caregivers reported one important benefit of the technology for communication was that they were more well-informed about school and learning activities (Beaumont-Bates, 2017; Lim & Cho, 2019; Hooker, 2015, 2016, 2017, 2019, Penman, 2014). Technologies such as e-Portfolio and social media provided caregivers a pathway for being able to view photographs (Özkan Yıldız & Yılmaz, 2021) and read about children's learning and school events, make comments on the children's learning within the platform, share the learning stories with family, friends, and increasing the opportunities to further discuss learning with children's educators (Beaumont-Bates, 2017; Chen & Lin, 2022; Hooker, 2017, 2019, Penman, 2014).

In regard to the benefit of educators being able to make more informed decisions, the increased communication between educators and caregivers enhanced educators' pedagogical knowledge and understanding of the home contexts. Educators indicated they were better able to tailor their instructional approaches around the children when taking into consideration what caregivers shared in their comments on the ePortfolios about their children and their learning (Penman, 2014). This in turn enhanced their face-to-face communications and dialogue around children's learning (Beaumont-Bates, 2017; Higgins & Cherrington, 2017; Hooker, 2017, 2019; Penman, 2014; Stratigos & Fenech, 2021). Another way educators were able to make more informed decisions was when they used ePortfolios to revisit and share the content they posted with their colleagues for discussions around their documentation and crafting of student learning (Hooker, 2019).

Educators also expressed that through technologies, they were able to provide caregivers examples of learning activities children engaged in (i.e., photographs, videos, text descriptions). The technologies provided a route for caregivers to be able to observe children's learning throughout the day in their educational setting. The documentation of children's activities could be individualized by the educator to demonstrate personalized instructional efforts toward the children's learning for the caregivers and families viewing (Oke et al., 2021; Stratigos & Fenech, 2021). The connections educators experienced with the caregivers and extended families ultimately strengthened their relationships and understanding of the children they served (Beaumont-Bates, 2017; Hooker, 2016, 2017)

Digital tools used to communicate and share information about children's learning created connections between the school and home (Goodman & Cherrington, 2017). Caregivers and extended families reported with satisfaction that they were able to engage in conversations with children about the activities the caregivers and extended families had viewed through the technologies (Beaumont-Bates, 2017; Higgins & Cherrington, 2017; Hooker, 2016, 2017; Lim & Cho, 2019; Oke et al., 2021; Penman, 2014). Caregivers who used mobile apps reported they were able to use what they learned from the app to have high quality communications with their children and had a higher preference for apps over websites (Chen & Lim, 2022). Educators expressed that increased communication through the technology platforms captured the familial and extended family's engagement with the student's learning which was not possible previously without the technologies (Beaumont-Bates, 2017, Hooker, 2016, 2017, 2019; Oke et al., 2021).

Caregivers reported children would also engage with their own learning by re-visiting and contributing to the ePortfolios. Sixty-seven percent of caregivers reported children would

add photos, 62% would add their voice, 58% would comment on their portfolios and 29% would

help caregivers write stories to contribute to the e-Portfolio (Goodman & Cherrington, 2017).

Thirty-four percent of children had regular access to their ePortfolios at least once a week

(Goodman & Cherrington, 2017).

Caregivers experienced emotional relief by having frequent updates about their child in

the classroom (Lim & Cho, 2019). Additionally, caregivers valued the individualization of

information being shared about their child in regard to the curriculum and how it aligned with

their child's development and progression within the classroom. Having information about the

development of the class as a whole was also an important factor for caregivers as they were able

to compare their own child's development to that of the group (McFadden & Thomas, 2016).

Educators across studies, specifically in studies that utilized e-Portfolios indicated there

was ease in utilizing technologies (Beaumont-Bates, 2017; Higgins & Cherrington, 2017 Hooker,

2017) that were not possible or required more time with paper-based portfolios. Educators were

able to use their time saved to focus on other important elements of communication and

informing caregivers about their child (Beaumont-Bates, 2017).

Technology Challenges Identified by Educators and Caregivers

In addition to the benefits technologies provided to educators and caregivers, they also

experienced challenges using technology for communication. Challenges reported by educators

and caregivers included (a) increased time engaging with technology leading to unbalanced

workloads for educators (Beaumont-Bates, 2017; Hooker, 2017; McFadden & Thomas, 2016;

Plumb & Kautz, 2014): (b) caregivers expressed desire for additional features and more high-

quality information to be shared about children's learning (Higgins & Cherrington, 2017; Lim &

Cho, 2019; McFadden & Thomas, 2017); (c) concerns with digital privacy and security (Chen & Lin, 2022; Higgins & Cherrington, 2016; McFadden & Thomas, 2016); and (d) learning curves with new technologies and technical problems with technologies (Beaumont-Bates, 2015; Chen & Lin, 2022; McFadden & Thomas, 2016).

The usage of technologies for communication contributed to increased time and workloads for educators (Beaumont-Bates, 2017; Hooker, 2017; McFadden & Thomas, 2016). Due to the increased communication reported by educators and caregivers, educators shared that some of their time outside of the workplace was spent utilizing the technologies (Beaumont-Bates, 2015; Hooker, 2017) and the requirements for frequency of their posting did not fall under standards of practice. There is a gray area on how much time educators are expected to use technologies for the purposes of sharing student learning and communicating with caregivers (Plumb & Kautz, 2014) in addition to their traditional workload for instructional planning and material development. The increased time and workloads for educators contributed to the intrusion on educators' personal time outside of the workspace.

Caregivers expressed a desire for additional features within some platforms as the technology they used was lacking features valued by the users (Lim & Cho, 2019). Fifty percent of fathers and mothers expressed they would want more features on the mobile documentation, indicating the limited features were a perceived challenge (Lim & Cho, 2019). Suggestions for additional features included options for caregiver-to-caregiver interaction opportunities, simultaneous downloads for multiple photographs, and commenting features for individual photographs (Lim & Cho, 2019).

Caregivers also reported they felt educators did not provide enough detailed information about their child's learning. For example, 35% of fathers and 24% of mothers also indicated they wanted more opportunities to view their children through photographs and videos and mothers (20%) in particular requested more immediate responses to questions they posed on the app (Lim & Cho, 2019). Caregivers expressed there was some limited follow-up on teacher postings and reported they desired more detailed information about their child's learning such as updates on their developments and their social interactions with their peers (Higgins & Cherrington, 2017; McFadden & Thomas, 2017). Alternatively, some educators reported the challenge of technology was the increased workload burden on educators in regard to time and work-life boundaries (McFadden & Thomas, 2017).

The utilization of digital technologies where children's information was being uploaded and shared through web-based platforms raised concerns for caregivers. Security and privacy within the communication platforms were concerns primarily of caregivers in studies with specific concerns related to the control of photographs being created and shared in a digital space (McFadden & Thomas, 2017). Many e-Portfolio platforms such as Storypark, Educa, and Kinderloop emphasized the digital safety and security of their platforms (Beaumont-Bates, 2017, Plumb & Kautz, 2014). Chen and Lin (2022) found caregivers reported they felt there was increased privacy with the mobile applications than web-based, but researchers learned caregivers misinterpreted privacy to mean that because sharing photos and videos was easier, not that the privacy of the technology platform had necessarily improved. Measures of platform security were reported to be a challenge for some caregivers such as accessing platforms or

generating and remembering passwords to log in to the platforms were experienced by some caregivers (McFadden & Thomas, 2017).

Another challenge identified in the research literature was that educators reported that there was a "learning curve" to using technology (Beaumont-Bates, 2017); however, once they overcame this challenge and became familiar with the technology, they grew in their confidence and were able to use ePortfolios to strengthen their current partnerships with caregivers and extended families (Beaumont-Bates, 2017). When attempting to increase caregivers sharing photos on the app from their workplaces to increase involvement, technical issues with the attachment feature of an app required app developers' attention (Chen & Lin, 2022). Caregivers also expressed a desire to be able to copy content from the app (Chen & Lin, 2022).

The types of technologies utilized for communication between educators and caregivers in early childhood education were found to have many similarities overall across the different ePortfolios, apps, and mobile documentation platforms. These technologies were perceived to have benefits and challenges as reported by educators and caregivers across studies. Though the technologies may have varied in how they were utilized in the different educational and home settings and throughout different countries, generally the benefits and challenges were reported to be similar for educators and caregivers regardless of the technologies used.

In the search for literature, it is possible there were journal articles that fit the criteria that were not captured with the selected search terms. My search did not reveal any literature related to educator-caregiver communication in early childhood Deaf education. However, some evidence suggests some early childhood educators of the Deaf are including some technologies into the classroom (Golos et. al., 2018) to support language and literacy development in early

childhood Deaf educational settings. In this survey of educators, Golos et al, (2018) found that while limited, educators are using some technologies with students in the classroom including watching and discussing videos in ASL. Educators also engaged students with ASL stories and songs (i.e., ABC, number, handshape, rhyme/rhythm) in their classroom practices (Golos et al., 2018). This indicates that educators are utilizing some technology based ASL resources in the classroom to support language and literacy, however, there is not yet evidence that these ASL resources were being shared beyond the classroom with caregivers.

Conclusion

The review of the importance of Deaf children's early access to visual language and literacy and the synthesis of empirical studies in early childhood education on educator-caregiver communication through technology provides a foundational knowledge of the existing research literature. The literature review revealed the current state of early childhood educators' and caregivers' communication and engagement practices through technology in early childhood education within general education. It also provided insight into the perceptions educators and caregivers hold about the technologies and communication within their CoPs. In regard to benefits, communication technologies are perceived to be effective tools for communication between educators and caregivers.

The scarcity of literature related to early childhood Deaf education provides researchers with a springboard for launching future studies that will address the research gap in Deaf education. It is possible that technologies similar to the ones identified in the research literature are being utilized by educators and caregivers in early childhood Deaf education populations

with similar benefits and challenges. The apparent lack of known empirical studies exposes a gap in the research literature.

Expanding the current ECE research on educator-caregiver communication technologies to include educators and caregivers of Deaf children is important. There is urgency for Deaf children to have access to a visual language during early childhood. Early access to ASL is imperative for developing literacy skills for Deaf children (Kuntze & Golos, 2021, Scott, 2022; Scott & Hoffmeister, 2017) and educators and caregivers are key players in providing Deaf children this early access to ASL. As technology continues to be a promising option for facilitating communication between educators and caregivers, promoting engagement and thus, connecting home and school with the potential to have a positive impact on Deaf children's language and literacy development, there is a need to expand research to include early childhood Deaf education.

Chapter 3: Methods

It is unknown how early childhood educators of Deaf children and caregivers are communicating through technology in early childhood Deaf education. In this study, a survey was distributed to early childhood educators of Deaf children (ages 3-8 years old) who work in early childhood Deaf educational settings in the United States. An exploration of the educators' practices revealed the types of technology early childhood Deaf educators use for communication with caregivers, their perceptions of the benefits and challenges of the technology, and how they shared ASL resources with caregivers to support Deaf children's language and literacy development. The findings from the reviewed literature, the gap in the literature, as well as the CoP framework, guided the research questions in this study:

1. *What technologies are being used by educators to communicate with caregivers in early childhood Deaf education and to what extent are they being used and how do they vary by educational setting?*

2. *In what ways and how often do educators utilize the technology to share ASL resources and information with caregivers and how do they vary by educational setting?*

3. *What are educators' perceptions of the challenges and benefits of using technology in early childhood Deaf education for communication with caregivers and how do they vary by educational setting?*

4. *Do early childhood educators vary in their use of technology for communication with caregivers based on educational settings (i.e., residential/day, itinerant, and self-contained classrooms)?*

There are two main parts to this methods chapter. First, is the description of the process of designing the survey in ASL and English and piloting the survey. This includes descriptions of internal validity and consistency related to the survey design. The second part of this chapter is the procedures of the study. This includes participant recruitment, dissemination of the survey, survey revisions and relaunch, and the content and external validity of the study.

Survey Design

Several critical steps were involved in designing, piloting, and revising the survey prior to launching it, as follows: (1) survey questions and response items were initially developed in written English; (2) the survey was reviewed by reviewers to ensure the English questions were measuring the constructs of the study; (3) the survey was revised based on feedback; (4) survey questions were translated into ASL; (5) the survey was piloted with ASL experts and professionals to address validity in the content and the design of the survey; (6) the survey was revised based on feedback.

The survey was designed online in Qualtrics, a preferred survey platform of the University of Minnesota. Questions were developed in ASL and written English to provide survey participants the option of how they would like to view the survey questions, in ASL, English, or both. This design of the survey is one of the first in early childhood Deaf education to utilize a visual language in the survey questions. The purpose of this was to increase accessibility for potential survey participants who identify as Deaf with ASL as their first language.

The content (written English questions and response items), survey structure, design and flow were reviewed for feedback by the dissertation committee, a current and former K-12

educator, and a former administrator with extensive experience in participating in surveys. All feedback on the structure, content, design, and flow was addressed and revised accordingly.

Survey Structure

The structure of the survey was an important consideration of the design process. Key components of the survey included: Information about the study, self-screening questions, consent statement, important definitions, survey questions, follow-up questions, feedback, and compensation information. The survey was structured as follows:

Introduction Letter and Definitions. The introduction included a welcome letter to educators in ASL and written English describing the study's purpose and participant qualifications. The letter also included important definitions (i.e., Deaf, caregiver, technology, and communication) to ensure they knew about how specific terminology would be used throughout the study. For example, the term Deaf was used as an all-encompassing term for Deaf and Hard of Hearing individuals with varying identities, languages (signed, written, spoken), cultures, races, abilities (DeafBlind, DeafDisabled), hearing levels and home languages (Kurz et al., 2021). It was important educators knew how the term Deaf was being used as an identity term rather than a hearing level specific term. Providing educators with clear descriptions of specific terms helped ensure educators had a clear understanding of the meaning of the terms as they answered the survey questions.

Eligibility Criteria. The introduction was followed by a section describing eligibility criteria for potential participants to self-screen to determine if they qualified to participate in the study by answering two questions. Participants were asked to indicate and specify their role as an educator (i.e., early childhood, kindergarten, elementary, or birth-21) and respond whether they

utilized technology. Those who did not meet the criteria were screened out to the end of the survey. Following the screening out, a statement appeared that explained they did not qualify based on one or more of their responses to the eligibility questions. This section depended on honesty and accurate responses of the participants.

Information and Consent for Research. These sections included all IRB-mandated information about the research study and a section for participants to consent to participate or not. Participants who did not consent to participating in the study were screened out to the end of the survey. A statement appeared explaining that they did not consent to the study and thanked them for their time and consideration. Those who consented to participate in the survey moved to the next section where specific definitions of terms were provided again.

Definitions Review. Prior to accessing the first question of the survey, participants were shown the definitions for technology and communication again in ASL and English. This was to ensure they had viewed/read and knew how the terminology was being used in the first section of the survey questions to ensure their answers to the questions were aligned with how the terms were defined for the study. Following the review of technology and communication, participants were able to access the first section of the survey.

Survey Questions. The survey included 40 questions which inquired about current participants' educator-caregiver communication practices using technology. Responses to the questions were intended to provide a snapshot of the current communication technology practices, perceptions, and demographic information of early childhood educators who use technology to communicate with caregivers of Deaf children (ages 3-8 years old). The questions within the survey were organized and structured around the study's research questions and CoP

framework. These questions were written as multiple choice, open-ended and Likert rating scale responses and took approximately 30-35 minutes or less for educators to complete. The survey was structured into four main segments based on the research questions. These included questions about the types of technologies used and communication patterns, ASL resource sharing, perceptions about the benefits and challenges of utilizing technology for communication, and demographics.

Technologies and Extent of Use. The focus of the first segment of the survey included questions that targeted the first research question and aligned with the *community* component of the CoP framework, which aided in determining how members of the *community* (i.e., educator and caregiver) are communicating and engaging with one another. The questions in this section were written to focus on the types of technology educators utilized and the types of communicative relationships that exist between educators and caregivers through technology. For example, one question was whether the educators' communication through technology was considered to be one-way communication, two-way communication, or non-existent. This type of question established the social structures that exist within the technology landscape between educators and caregivers.

ASL Resources and Information Sharing. The second segment of the survey was centered around the second research question and the practice and domain components of the CoP. In this portion of the survey, information was gathered about how educators use technology to engage in the *practice* component of the CoP of actively sharing information and ASL resources with caregivers to support the *domain*, or the area of interest (i.e., language and literacy) of Deaf children.

Benefits and Challenges of Technology for Communication. The third segment of the survey was designed to answer the third research question related to educators' perceptions of the challenges and benefits of utilizing technology for communication. These questions again align with the CoP framework in determining how the use of technology contributed to the *community* and *practices* formed by the educator and caregiver and how these practices are centered around the interests related to the Deaf child in regard to language and literacy.

Demographics and Educational Settings. The fourth and final segment of the survey included demographic questions which aligned with the fourth research question. The information shared by participants related to the demographics and educational settings they instruct in. The questions in this section were intended to provide information in which inferences can be made about variations that exist between educators who utilize technology for communication based on their educational programs, selected technologies, and their practices that are held in communicating with caregivers of Deaf children.

End of Survey Questions. When participants answered the last question of the survey and clicked to the next page, they saw a message that indicated they had completed all of the questions specific to the survey. The participants were asked to click to the next page to see follow-up questions and compensation information.

Survey Feedback, Future Research, and Compensation. In this section, several questions were asked to obtain participant survey feedback, contact information for future research and/or for compensation. Two questions asked participants about their experience with the languages used to understand the survey questions (i.e., ASL, English, or both). The first question asked which language(s) the participant used to understand the survey questions.

The next question asked for participant feedback specific to the design format of the survey for questions that were presented in ASL and designed as Likert-scale questions. The Likert scales associated with the response items were in ASL and English or English only. Given four screenshots of formats for survey questions, participants were asked to rank their most preferred (1) to least preferred (4) by writing 1, 2, 3, 4 next to each of the screenshots.

Next, participants were asked about their interest in participating in future research with the opportunity to share their contact information. In this question, it was explained that their contact information for future research would not be included within the survey results and was strictly confidential. They were provided a box where they could include their name, pronouns, and email address giving permission to contact them in the future.

The final question was specific to collecting contact information for compensation. In this question, participants were informed that if they responded to all of the questions and provided their contact information (name and email) they would be eligible to receive the $10 Amazon e-gift card. It was emphasized again that this contact information would not be associated with their responses to the survey. After they completed this, participants were instructed to click the next arrow and a colorful thank you GIF in English appeared on the last page of the survey along with a written message thanking educators for their time and effort in their participation.

Internal Validity

The survey was designed to minimize threats to internal validity. Each of the written English questions were reviewed by multiple experts to ensure they were written to accurately measure the constructs of the study. This included advisors, committee members, an early

childhood educator, a former early childhood educator, a K-12 educator, and a former administrator all many of whom had experience with technology and/or communication with caregivers through technology. Each of these reviewers provided feedback to ensure the survey questions were written accurately to measure what they were designed to and if not, provided suggestions for revisions. The survey also was piloted with three educators in Deaf education (two who are Deaf) who have several years of experience in the field and use ASL.

Threat of Attrition. The threat of attrition and non-response errors were natural threats to the internal validity of the survey design. Many factors can influence attrition and non-response errors, including the survey being too lengthy, poor visual design and layout, inaccessible to non-English users, complex questions, missing questions, and many other reasons. In an attempt to minimize these threats to the internal validity of the study, several strategies were employed to ensure participants completed the survey and reduce the threat of attrition on the internal validity of the study.

First, the survey questions were tailored to the targeted population of early childhood educators of the Deaf. The survey questions were created with visual accessibility in mind for educators by using both languages, ASL and written English. This was important as some of the potential participants' first language could be ASL. The questions were written to minimize the complexity and to be as straightforward as possible by ensuring the question stems aligned with the response items. All of the questions within the survey had a forced response prompt. This force response prompt was initiated if a participant intentionally or accidentally skipped a question with a request for the participant to answer the question and indicate which question(s)

were skipped. A survey progress bar was also included in the visual design of the study to indicate to the participant what percentage of the survey was completed.

Second, there were attempts to minimize the length of the survey. By structuring the questions in visually accessible formats that allow for quick responses through multiple choice or Likert-rating scales rather than having many open-ended questions. Limiting the number of open-ended responses, reduced the amount of time the participant would have to type answers for questions in the survey.

Close-ended questions, however, can also be considered a threat to validity. These types of response options run a risk of participants responding quickly and not fully reading the question and response choices and selecting an answer that is not accurate or true of their experience. To address this, like-questions with similar response choices were grouped together and all of the Likert-rating scale responses within specific sections were set up in the similar formats (e.g., do not agree to strongly agree) throughout the survey.

Another consideration made in the design of the survey was the option for additional information to be provided by participants. Close-ended questions with multiple choices or Likert-rating scales may not be representative of educators' experiences or perceptions, thus deterring the participant from responding to the question or continuing the survey. In order to counter this, many of the questions throughout the survey included the option for educators to include additional information in short answer form (a few words) that may not have been listed as a response choice. For example, educators were asked what additional ASL resources they shared with caregivers. They had the option to type a brief response for any additional ASL resources they share with educators (e.g., ASL apps).

Another strategy for addressing the threat of attrition was to design the survey so the demographic questions appeared at the end of the survey. Although researchers have not yet agreed on the placement of demographic questions at the beginning or end of a survey, some researchers encourage those who create surveys to consider the questions they are asking their sample (Green et al., 2000; Hughes et al., 2016). Research participants may sometimes be hesitant to respond to demographic information in the beginning of the survey as there may be personal or sensitive questions which could deter participants from participating. However, if survey questions are moved to the end, participants may feel more comfortable and they have already invested time within the study (Albert et al., 2010). Additionally, moving the demographic questions to the end of the survey provided participants a chance to answer the more critical research questions related to their communication with caregivers through technology and the sharing of ASL resources. It could be reasoned that this approach in the survey design may have built a level of trust with the participants and provided more certainty in the intent of the research prior to asking them to provide their demographic information straightaway in the start of the survey.

Another approach to countering the threat of attrition was ensuring the survey questions were created with an anti-biased or inclusive approach (Hughes et al., 2016). This required taking extra care in ensuring the demographic questions and response items were written and signed in an unbiased, culturally appropriate, and sensitive manner. It was important in developing and writing the demographic questions to recognize that it was a privilege to have participants willing to share personal information about their identities in the research study. Questions about identities were framed as a choice. Participants were invited to share their

identities if they were comfortable. This was one way to demonstrate understanding of privilege as a researcher to have this information about participants. For example, questions related to race were written as follows: "If you are comfortable sharing, how would you describe your race? *Check all that apply.*" The response items included culturally appropriate labeling of racial groups (e.g., Latinx/o/a) as well as the option: "I prefer not to share." This was important to provide this option so that participants did not feel they were being forced to share personal information.

It was also essential that the questions and response items did not indicate or create an appearance of "superiority". In traditional demographic question formats, individuals are asked to indicate their gender (with singular response options) "male", "female", and "other". These genders are usually listed in a way in which "male" is often displayed as the first response option, which automatically creates an appearance of superiority over other listed genders and often does not include all genders. The "other" option creates a binary or "otherness" and the appearance of superiority and lack of representation of all genders.

Instead of the gender question being written in the traditional singular choice format (e.g., male, female, other) the survey question was written as an open-ended question that welcomed the participant to share their gender, if they were comfortable, by typing their identified gender in an open-ended textbox. Participants also had the option to click "I prefer not to share." This type of question design appears across multiple demographic question/response items related to participants' identities with the goal of creating a survey that is welcoming, unbiased, and sensitive to the diversity in the field of Deaf education and the educators who serve in these roles.

Internal Consistency

The written English questions and response items were written, reviewed, and revised to ensure they were accurately measuring the constructs of this study. The revised English questions were then translated into ASL. It was important to ensure the translations of the ASL questions captured the meaning of the English questions for internal consistency in the survey. If the ASL translations held different meanings from the English questions, participants who used ASL to understand the questions may have provided responses that were different from participants who used English to understand the questions in the survey. A Deaf committee member supervised the translation process and provided feedback on the test videos created by the graduate student. The translations were then shared with two Deaf reviewers who teach in the University of Minnesota's ASL Department for feedback.

ASL Translations and Formatting

Translations. There were multiple steps in the translation process of the survey into ASL. First, I filmed the introduction letter and definitions in ASL for the initial section of the survey. A Deaf graduate student who is fluent in ASL and an expert in ASL translation was recruited for the translating of the English survey questions and response items. During the initial meeting and discussion, ideas were shared for the best way to capture the English questions and response items in ASL.

The initial meeting also included discussions for the expectations for the space where the translations were filmed, the lighting, background, and clothing the Deaf graduate student would wear during filming. It was agreed that the ASL translations would be filmed over several sessions in a studio with a green screen and controlled lighting to ensure the videos were

produced to be consistent, professional in appearance, and of high quality. In order to ensure consistency and color contrast from the background, the graduate student filming the translations wore a long sleeve black quarter-zip for all of the videos.

The Qualtrics English questions and response items were downloaded and shared with the Deaf graduate student in a Google Doc. Specifications for which questions and response items needing translations were written in the comments of the document. Some of the English response items were repetitive throughout the survey which meant some of the ASL translations only needed to be created once. For example, one question in the survey asked what languages were used by educators for instruction in their classroom and then listed language options such as ASL, English, and Spanish for the response items. Another question asked what languages were used in Deaf children's homes and then again listed the same languages (ASL, English, and Spanish) as response items. It was unnecessary for these response items to be filmed a second time as the response item videos could be reused across response items that had the same options. Another example of an English response item that appeared repeatedly throughout the survey was "I prefer not to share." The ASL translation video of this response item only needed to be created once and then could be reused across questions that had that same response item throughout the survey.

The Deaf graduate student created two test ASL translations in the studio. They sent the translations to me and the Deaf committee member for feedback prior to translating all survey questions into ASL. I provided minor feedback on modifications to sign choices to ensure the translations fit the meaning of the English question. The Deaf committee member agreed with this feedback, and I gave final approval for the Deaf graduate student to begin filming the ASL

translations of the survey questions. The Deaf graduate filmed the ASL translations in a studio and the videos were uploaded in Google Drive and shared with me to review.

I reviewed the videos to ensure accuracy of the ASL translations. Many of the videos included multiple questions from the survey and/or multiple takes of the translation of the survey questions and response items. There were also several questions and response items that were signed using options of different sign choices to represent the meaning of the question and response items. During the review, I selected the translations that best represented the meaning of the English survey question and response items to use in the survey. There were a few videos that required revisions as key information was not present in the translation or a response item translation was accidentally skipped. I made note of these errors next to the English questions and response items on the Google Doc.

The Deaf graduate student was limited in their availability to make revisions and in their access to the filming studio. Rather than have the Deaf graduate student make revisions over several sessions, I waited to share feedback for translation until the Deaf reviewers and the pilot participants had their opportunity to review and participate in the pilot of the survey. Their feedback as well as mine was compiled into the Google Doc and shared with the Deaf graduate student so they could make revisions in one filming session rather than multiple sessions.

Formatting of ASL Questions and Response Items. Prior to filming, I shared a concern of how long it would take for participants to view the videos of response items in ASL with the Deaf graduate student. An ASL translation of the English question and all of the response items for that question would require the participant to click the video to play. They would possibly have to wait for the video to load, watch the video and click replay again if they needed to see

the response item options again. This process would likely drastically increase the amount of time it would require participants viewing the questions and response items in ASL to complete the survey in comparison to a participant reading and re-reading the English response items.

The Deaf graduate student suggested a clever way to minimize the amount of time participants would need to view the videos. Their suggestion was to create a looped GIF as an alternative to the response items being videos. This would eliminate the process that is required for clicking on a video, waiting, watching, and clicking the video again for repeated information. Instead, the GIF would continuously play and would require no extra time or effort from the participant to view the response item. This was the approach decided upon and it created an equivalence between the English response item and the ASL response item in regard to time. The ASL translations for the English question stems, however, were in traditional video format requiring the participant to click play, watch the video, and click replay if needed. GIFs often do not exceed 15 seconds and many of the English question stems were longer in length and detail, thus requiring more time in ASL which would go over the 15 second GIF limit.

I reviewed the translated videos for accuracy and made notes of the inaccurate or missing translations. All accurately translated videos filmed were converted from MTS to MOV/MP4 through an online conversion tool, CloudConvert (cloudconvert.com). The videos were then downloaded and edited in iMovie to create more succinct videos and remove the multiple takes that occurred in the filming process for each question and response item. For example, sometimes when the Deaf graduate student filmed and translated a question and response items, it would require multiple takes before they successfully translated the question into ASL. These multiple takes needed to be edited from the translation videos. With the video edits, I created two

separate types of videos, question stem videos and multiple response item videos. Videos that

included the question stems were uploaded individually to YouTube. The videos were listed as

unpublished and then embedded into each of the question stems in the survey. The written

English questions were formatted to be directly under the ASL videos (Figure 2).

Figure 2

Example Survey Question in ASL and English

How frequently do you utilize technology when communicating about **classroom language and literacy activities** with caregivers of Deaf children (ages 3-8)?

The multiple response item videos were uploaded to Wave.video, an online video editing

tool. Select portions of the videos were generated into GIFs which were 15 seconds or less and

played on a loop. Approximately 150 GIFs were created for response items in ASL. The GIFs

were downloaded from Wave.video and then uploaded to the Qualtrics library. The GIFs were

then embedded above their respective English response items for each survey question.

Questions that included multiple response items such as Likert rating scales, were set up

into one of three different formats. These included either a standard-Likert (Figure 3), profile-

Likert (Figure 4), or carousel Likert (Figure 5) formats with the ASL translation response item in

a GIF above the English response item. The standard, profile, and carousel formats were included in the survey pilot.

Figure 3

Response Item in Standard Likert Format
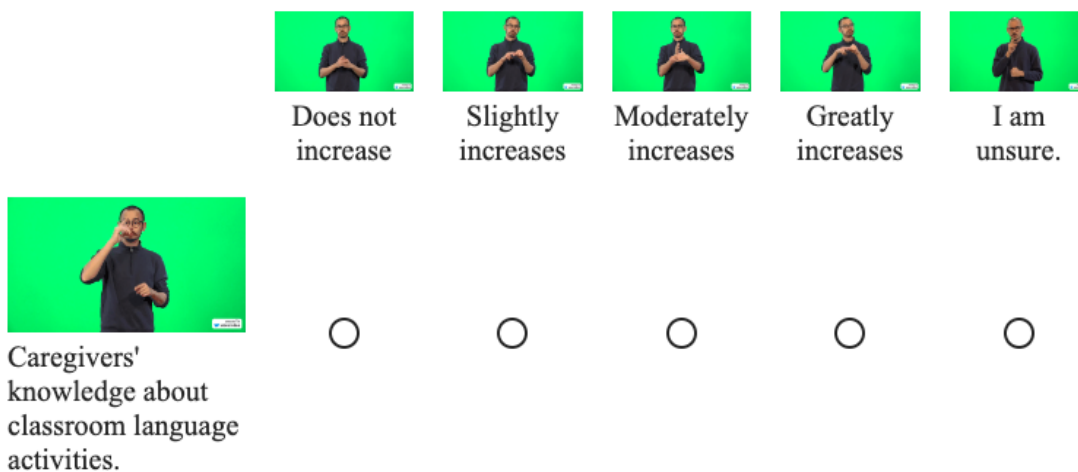
Figure 4

Response Item in Profile Likert Format
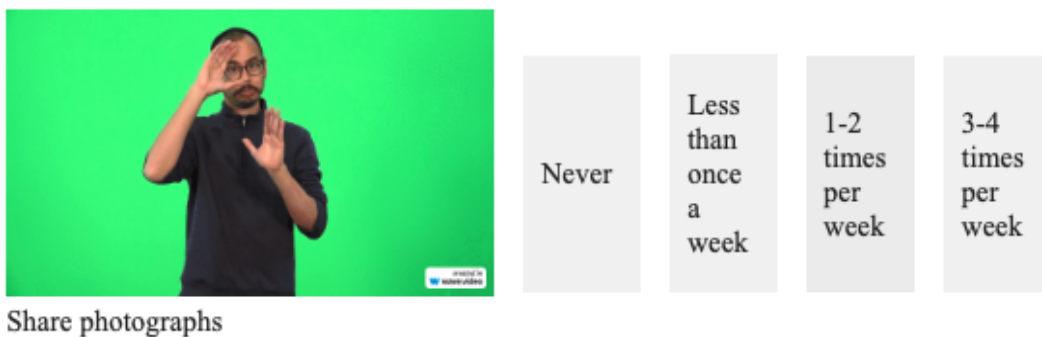
Figure 5

Response Item in Carousel Likert Format
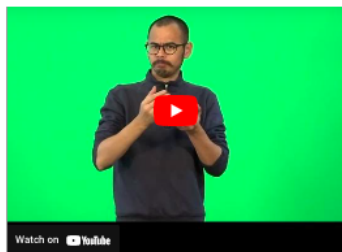
Survey Pilot

Once the survey structure was complete with the ASL videos embedded, it was ready to be reviewed and piloted. The purpose of the review was to get feedback on the ASL translations to ensure accuracy and that the meanings of the ASL translations were captured in the English questions and response items.

Survey Review. The survey was sent to two Deaf reviewers who were ASL experts at the University of Minnesota. The reviewers were recruited to provide feedback on the ASL

translations to ensure accuracy. They were sent a Google Doc that included directions for the review, the survey link, and the English survey where they were instructed to make comments if there were inaccuracies for particular questions. The Deaf reviewers provided feedback on the introduction letter and definitions through the definitions review in separate emails.

Pilot. Following the review, three pilot participants were recruited to test run the survey and provide feedback based on their experience taking the survey. Two of the pilot participants were Deaf and one hearing. A Deaf and hearing participant were current and former early childhood Deaf educators from two different educational settings (day program and itinerant settings). The other pilot participant was a Deaf ASL instructor and doctoral graduate student. All were emailed with directions for the pilot which included the survey link and the English questions where they could make comments for feedback.

Pilot participants were asked to navigate the survey as if they were current early childhood educators and to provide their feedback about the survey on a Google Doc that included the English survey questions and response items. They were asked to pay attention to the accuracy of the ASL and English questions and response items, design of the questions, missing ASL videos or GIFs, clarity, and size of ASL videos and GIFs, and any other issues that surfaced as they navigated the survey.

As part of the pilot process, participants were asked about their preferences for the design and flow of particular questions that included multiple response items in a matrix format (i.e., standard Likert-type, profile, and carousel formats, see Figures 3-5). For example, when standard Likert-type and profile formats were used for questions with multiple response items, the appearance of the GIFs would sometimes change. The GIFs sometimes would decrease

significantly creating inconsistency across the sizes within these formats. The carousel format left the GIF sizes as normal but made it difficult to see the question stem and made navigation to subsequent response items associated with the question challenging. It was important to discuss this matter further with the Deaf pilot participants to determine their preferences for those specific types of questions in regard to the appearance of the ASL GIFs in the response items and scales.

Both Deaf pilot participants were contacted for additional feedback through Zoom and in-person for the matrix format questions in the survey. The Deaf pilot participants were shown all of the options for the standard, profile, and carousel matrix based on each question with this set up. They were able to compare and contrast each option and make suggestions about what they considered the best set up despite some of the limitations of the platform changing the appearance of the ASL GIFs.

Deaf pilot participants indicated the profile and standard Likert format were the preferred formats for many of the survey questions that used Likert scales. However, due to Qualtrics limitations, ASL GIFs could not be embedded in the response items for the certain formats. Profile format only allowed English text for the response items. In standard Likert format, when the ASL GIFs were embedded with the response items, the GIF sizes were smaller than the original and usually inconsistent in size. Due to these limitations, the Deaf pilot participants feedback was that certain questions with scaled response items would be acceptable without ASL GIFs. They agreed survey participants could instead rely on the English text for the scaled response items if profile Likert format was used. For example, Deaf pilot participants felt the frequency questions and response items (e.g., never, once a week, 1-2 times per week) were of

lesser importance to have ASL GIFs as these questions did not require complex thinking for identifying the difference between less than once per week and 1-2 times per week. However, questions with scaled response items (e.g., slightly improves, moderately improves; Figure 6) were of greater importance to have ASL GIFs. This was because the difference in meaning between those response items in English were captured by "slightly" improves or "moderately" improves. In ASL this difference in meaning between slightly improves and moderately improves was captured through how the facial expressions change for each item. The different facial expressions in the ASL GIF gave equivalent meaning "slightly" and "moderately" agree.

Based on this feedback and further discussion with the Deaf pilot participants, I decided not to use the carousel format in any of the questions because it created difficulty in navigating the question and response items which might have risked participants missing a question in the actual survey. I decided to use the standard Likert and profile Likert for the questions with scaled response items. It was also decided to provide an alert to survey participants before they encountered these Likert scale questions to adjust their screens or be prepared to zoom in on the ASL GIFs as needed.

Figure 6

Example of Survey Question in Standard Likert Format

When you think about the technology you use most frequently with caregivers of Deaf children

(ages 3-8), to what degree do you think it **improves**...

	Does not improve	Slightly improves	Moderately improves	Greatly improves
My communication with caregivers.	o	o	o	o
My communication with students.	o	o	o	o
My connection with caregivers who use a different language than ASL or English.	o	o	o	o
My understanding of the Deaf child and their family in the home context, including home language(s).	o	o	o	o

The feedback both from the Deaf reviewers and pilot participants in the survey pilot was

reviewed and compiled with my original feedback on the ASL translations. Deaf pilot

participants shared that some videos were missing, or components of a video were missing which

may have been accidentally skipped in the ASL translation filming. The relevant feedback was

shared with the Deaf graduate for revisions of the ASL translations.

The Deaf graduate revised the videos that needed to be translated more accurately and created the missing videos. The process for converting, editing videos, creating GIFs, uploading and embedding into Qualtrics was repeated with the revised elements. All additional feedback provided by the Deaf pilot participants specific to the design and flow of questions in the survey were addressed through revisions. The majority of the feedback was minor in nature such as fixing typos or GIFs that were misplaced. Following the revisions, the survey was ready to be disseminated.

Procedures

The study was submitted to the University of Minnesota's Institutional Review Board (IRB) for review and approval. Materials shared with IRB included the Canva advertisement for recruitment and the survey questions in English. Based on past experiences that IRB does not have the capabilities to review the ASL components of the survey, I explained that the English components of the survey were translated into ASL, but they were not reviewed by IRB.

Participants

The targeted population for this study was early childhood educators who work with Deaf children between the ages of 3-8 years old from early childhood educational settings across the United States. Individuals who had access to the survey link were asked to specify their role as an early childhood educator and their use of technology prior to beginning the survey to provide self-screening and ensure they were eligible to participate.

Inclusion Criteria. Participants were educators who serve Deaf children (ages 3-8 years old) and who work in the United States. The educators invited to participate could work in various early childhood, kindergarten, and elementary educational settings such as

residential/day programs for the Deaf, itinerant, self-contained, or resource classrooms. This also included programs representing a broad range of educational philosophies, languages, and modes of communication for educating Deaf children, including multilingual-multimodal, bilingual-bicultural, listening, and spoken language (LSL), total communication, and/or cued speech. Programs that served intermediate or high school ages were included in the contact list as some educators in Deaf education serve across all age ranges, birth to age 21 range, including the early childhood age group. Educators who fit the criteria for serving in early childhood Deaf education must have also currently been using some form of technology (e.g., apps, websites, mobile devices) to communicate with caregivers in order to participate in the survey. All participants must also have had access to a computer or smartphone and use ASL and/or English languages in order to be able to access the survey questions in Qualtrics.

Exclusion Criteria. Keeping a focus within the United States Deaf education, only the 50 states were included and not the US territories such as Guam and US Virgin Islands. It was important to ensure the educators who were responding to the survey were educators who served Deaf children who were using ASL and/or English and no other signed languages that are often used outside of the United States.

Teachers who served elementary, intermediate, or high school ages or that taught across all age ranges but did not serve the early childhood range (3-8 years old) were not included. Any educator who did not use some form of technology for communication with caregivers was not eligible to participate.

Administrators and other professionals (e.g., audiologists, speech-language pathologists, auditory-verbal therapists, educational paras) were not included as the survey questions were

written and designed to target early childhood, kindergarten, and elementary educators.

Identifying Potential Participants. The first step taken to identify a participant contact list was to examine the annual reference issue published by the *American Annals of the Deaf* (AAD). This issue includes a directory of programs and schools for Deaf children in the United States. The most current issue available at the time was the AAD Volume 167, Number 2, Reference Issue 2021. The issue served as one of the participant identification sources and was used to identify potential eligible participants who worked in early childhood, kindergarten, and elementary educational settings as educators of Deaf children.

The directory includes the types of educational programs, which are listed as residential, day, and local programs. Within Deaf education in the United States, these are often recognized as residential/day programs, itinerant, and self-contained classrooms. The directory also provides contact information (e.g., websites, phone numbers, emails) for programs. Programs that did not specify the age groups served within the directory were included, as some programs may have had educators who worked in itinerant settings and served Deaf children from the birth to 21 age groups.

Using the directory as a guide, a spreadsheet was created to organize the schools, by state, names of programs, types of programs, and the available emails that were listed in the reference issue. Many schools listed in the issue did not provide email addresses. These programs were highlighted in the spreadsheet to indicate missing information.

An informal Google search was then conducted to seek missing emails from the highlighted programs. A search in Google and on school websites or sources associated with the schools was used to identify potential contact information for superintendents, administrators,

special education coordinators, or emails of Deaf educators associated with the programs. If multiple email addresses were available for a program, they were added to the spreadsheet. If email addresses were not accessible through the search, that program was not included in the final participant list for the survey distribution. Over 750 programs serving Deaf children were listed in the 2021 issue. From the directory and the search for missing emails, 816 emails were compiled in the Deaf program contact list spreadsheet.

Though many programs serve Deaf children across the United States, a previous national survey study (Golos et al., 2018) that used the AAD reference issue directory as a participant identification source yielded a low number of responses (N=62) from early childhood educators. criteria and the study design.

Following the completion of the educational programs spreadsheet, a secondary contact list was developed for additional avenues in which the survey could be distributed to reach more potential participants. This second list included professional listservs and Deaf specific organizations at the national such as American College of Educators - Deaf and Hard of Hearing (ACE-DHH) and ACE-DHH Multilingual Special Interest Group (MLE-SIG) and Deaf and the Clerc Center. Under the state-wide professional organization, Minnesota Commission of Deaf, DeafBlind, and Hard of Hearing, two groups were identified and included which were the Minnesota Birth to Age Five and Kindergarten to 4th Grade Collaborative Groups. Professional and personal contacts in the field of Deaf education across the United States were also compiled and included.

Next, professional social media groups on Facebook for educators of Deaf children were identified and added as another source for recruiting participants for the study. The following Facebook groups were identified:

- Language First Professionals
- Deaf Education Professionals Tackling Language Deprivation
- Itinerant Teachers of the Deaf
- Technology in Deaf Ed
- Multicultural Teachers of the Deaf
- Teachers of the Deaf and HoH
- Teachers of the Deaf and Hard of Hearing
- Teachers of the Deaf and Hard of Hearing - DHH
- The Radical Middle Project in Deaf Education
- AERA SIG Deaf Education
- USU Deaf Education Alumni

Participant Recruitment. The next step was to create an advertisement for recruitment of eligible educators that would be distributed through the various channels. The advertisement was created in Canva. The advertisement was designed in a postcard format and intended to be eye-catching in color and imagery. The front of the advertisement played on the theme of communicating with eligible participants through technology (see Figure 7). The background of the picture was of an early childhood Deaf classroom. On the backside of the advertisement, there was a friendly welcome to the educator, an introduction of myself, a description of criteria for eligible educators, followed by a brief description of the study scope and rationale. Next, a description of how the educator could participate and the incentive of a $10 Amazon e-gift card for the completion of the survey was detailed with information related to the privacy and confidentiality of participating in the survey. Last, a QR code and link to the survey were Thus, steps to achieve a larger number of responses were taken within the inclusion/exclusion provided on the advertisement, with my name and email contact information.

Figure 7

Survey Recruitment Advertisement
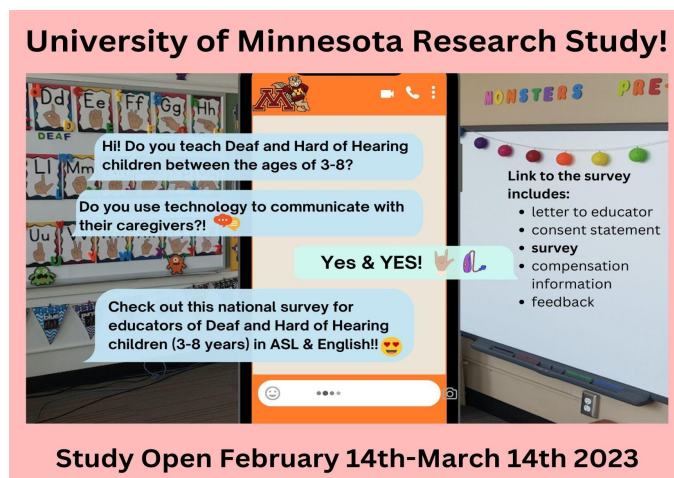
First Wave of Survey Launch

During the ACE-DHH 2023 conference, I had access to Deaf education professionals who would be able to distribute information about the survey with eligible early childhood educators and/or they would be eligible to participate in the study. Due to this convenient access to Deaf education professionals, the survey advertisement was soft launched in-person and to some professional Deaf education Facebook during the ACE-DHH 2023 conference.

The advertisements for recruitment were printed out on postcard material to be used as handouts and passed out to Deaf education colleagues (from across the United States) who attended the conference. The advertisements were handed out to colleagues with a signed and/or verbal description about the study with a request to participate and/or share with those who may be eligible.

Simultaneously, the advertisement for recruitment was also posted to my personal Facebook page. The public sharing settings for the post were turned on. The post was then

directly shared with a small selection of professional groups that had been identified. The original plan was for the survey to be shared more widely the following week with Deaf educational programs, national and state level organizations, additional professional Facebook groups, and personal contacts. However, there was an abrupt need to close the survey the day after the survey was posted.

In less than three hours, there were over 500 responses to the survey. Within 12 hours, there were over 1,200 responses. This was incredibly unusual based on previous research response patterns (Golos et al., 2018) and there was immediate concern about security breaches with the survey. As a result, the survey response collection was paused, and I sought help from committee members and conference attendees. It was determined approximately 99% of the responses in the 12-hour soft-launch time span were due to bot activity. It appeared fraudulent responses were submitted due to the $10 Amazon e-gift card incentive.

Multiple security measures had been taken in the development of the survey on Qualtrics including submission prevention, bot detection, security scan monitor, relevant ID, and indexing prevention. Yet, despite these steps, the platform security was unable to withstand the bot capabilities which led to the astounding bot activity in the 12-hour time span. The lack of security and regulation on the social media platform, Facebook, contributed to the ability of bots accessing the survey despite the posts only being shared on the professional Deaf education groups and the personal Facebook page.

Survey Security and Distribution Modifications

Extensive steps were taken to address the security issues and modify the survey distribution tactics. First, the original post was removed from Facebook which automatically

removed it from the professional groups. Then the ACE-DHH listservs were emailed in hopes

those who accepted the printed survey handouts would discard them. The email sent to the ACE-

DHH listserv about the temporary closure of the survey prompted some ACE-DHH members to

reach out with offers of support. Some committee members were also able to share some ideas

and resources on how to navigate relaunching the survey with increased security. Several phone

calls were also made to the Qualtrics company seeking consultation on ways to improve the

survey security within the platform.

Ultimately, the consensus from these sources was that providing the QR code or survey

link through social media was a gamble and the biggest risk to security, regardless of the

measures in place. Due to responses being collected anonymously, the Qualtrics consultants

determined there were limits on which security measures could be used. They confirmed that if

direct links to the survey were provided bots would continue to be a threat. This prompted a re-

evaluation of security measures and the distribution process prior to a relaunch of the survey.

Increased Security Measures. The security measures within the survey were amplified

in several ways. Qualtrics consultants, a published literature source shared by a committee

member, and Qualtrics XM Community forums provided recommendations and strategies for

preventing and addressing fraud in the design and structure of the survey.

One of the recommendations was to include a reCAPTCHA question for fraud detection.

The reCAPTCHA technology is able to detect if participants are more than likely humans or

bots, based on how the user interacts with the reCAPTCHA question. For example, a

reCAPTCHA question may show a block of random pictures and give an instruction such as,

"select all of the pictures that include a stop sign." Humans are able to successfully click all of

the images that showed part or a whole stop sign. This task is more difficult for a bot. Bots are less likely to understand the question or have the capability to orient to the task the question requires.

A reCAPTCHA question was added in the Introduction Letter and Definitions section of the survey. The reCAPTCHA technology provides a score based on how the participant interacted with the question. A reCAPTCHA score of greater than .5 (1 was ideal), indicated a low risk of fraud as the respondent is likely human. A reCAPTCHA score of .5 or less, indicates there is a high likelihood the respondent is a bot (Qualtrics, 2023). Embedded in the reCAPTCHA question is branch logic which would automatically screen out any participants who had a score of .5 or less from the survey. The potentially fraudulent participant would not be able to access the subsequent parts of the survey. If a participant was screened out of the survey, a message appeared for the respondent to email the researcher if they were screened out in error.

The addition of honeypot questions was another recommendation to attempt to increase the security of the survey and identify fraudulent responses (Hugh, 2021; Simone, 2019; Qualtrics 2023). If a bot had managed to pass the reCAPTCHA question in the introduction section of the survey, honeypot questions were in place to address the fraudulent responses. Honeypot questions are designed and coded and written to appear only to fraudulent participants, such as bots, and are invisible to human participants (Simone, 2019).

These "invisible" honeypot questions are created by writing a question that appears similar to the previous or subsequent question and then adding special JavaScript codes to the question to make the question invisible to humans. However, it would appear as a regular question to bots. Bots that are less advanced at detecting honeypots, in theory, are drawn to

answer the honeypot question as if it was a regular survey question. If a bot answers a honeypot question that is invisible to legitimate participants, the survey platform would record their answer, recognize it as fraudulent, and the branch logic would filter the bot out of the survey without letting it complete the remaining questions. All honeypot questions are written similarly to the legitimate survey questions within each section of the survey as some more advanced bots may be able to detect a question that did not align with other questions of the survey.

The first honeypot was placed in the Eligibility Criteria section of the survey between two legitimate eligibility questions. The structure and embedding of the legitimate and honeypot questions were structured as follows:

Legitimate Question

3. In order to continue to the research information and consent statement, please indicate your role as an educator serving Deaf and Hard of Hearing children ages 3-8 years old. Check all that apply.

- o I **am** an **early childhood educator** of Deaf and Hard of Hearing children.

- o I **am** a **kindergarten educator** of Deaf and Hard of Hearing children.

- o I **am** an **elementary educator** of Deaf and Hard of Hearing children.

- o I **am** an **educator** of Deaf and Hard of Hearing children and serve across multiple age groups (i.e., early childhood through transition ages)

- o I **am** not an educator of Deaf and Hard of Hearing children between the ages of 3-8 years old.

This question was followed by a honeypot question which had JavaScript coding embedded that was found on a Qualtrics community forum (Qualtrics, 2023). This question paired with the code

made the question invisible to human participants. This JavaScript code was applied to all

honeypot questions.

<u>Honeypot Question</u>

4. Please list the specific grade levels you teach (e.g., Pre-K, Kindergarten, 1st grade, etc.)

Figure 8

JavaScript Code to Embed in a Honeypot Survey Question

```
Qualtrics.SurveyEngine.addOnload(function()
{
jQuery("#"+this.questionId).prev('.Separator').hide();
jQuery("#"+this.questionId).hide();

});

Qualtrics.SurveyEngine.addOnReady(function()
{
   /*Place your JavaScript here to run when the page is fully displayed*/

});

Qualtrics.SurveyEngine.addOnUnload(function()
{
   /*Place your JavaScript here to run when the page is unloaded*/

});
```

The honeypot question was then sandwiched with a final eligibility question:

<u>Legitimate Question</u>

5. Please indicate whether you use technology to communicate with caregivers of your Deaf and

Hard of Hearing children (ages 3-8). If you do not use technology to communicate with

caregivers of Deaf children (ages 3-8), unfortunately, you do not qualify to participate in this

survey, but your consideration for participation is appreciated!

☐ I **<u>use</u>** technology to communicate with caregivers.

☐ I <u>do not</u> use technology to communicate with caregivers.

Honeypot questions were embedded within several sections of the survey. There were four total honeypots added to the Definitions Review section, the end of ASL Resources and Information section, and the Survey Feedback, Future Research, and Compensation section. All of the other sections of the survey remained unchanged.

Although security measures were strengthened, it did not guarantee that the security would not once again be breached. Addressing potential future security breaches required additional steps in ensuring how bots would be prevented from accessing the survey. The next action was to modify the plan for relaunching and disseminating the survey.

Distribution Modifications. Social media was still a viable option for disseminating the survey, despite initial concerns about bots, the recruitment materials just needed to be modified. To do this, the original information about the study remained, but the Canva advertisements used on Facebook for participant recruitment were modified and the QR code and survey link was removed. The dates for the launch and closure of the survey were also updated. Educators were encouraged to reach out directly to the researcher through email to get more information about the study and asked to share how they learned about the study in their email in order to receive the survey link. This allowed for screening to ensure legitimacy of the email and the request. The advertisement with the link was shared directly with the inquirer with a request for them to not distribute the survey information except directly with eligible participants and not on social media to ensure the security of the survey remained intact.

The advertisement that was shared directly to the Listservs, national and state level professional groups, AAD directory, professional and personal contacts was also modified. These channels were considered to be more secure and direct in distribution, thus, a lesser threat

of bot activity. The QR code and survey link was not removed from the updated advertisement shared through these channels. However, there was an addition of a short request in the email message asking contacts to only share the advertisement directly with those who may be eligible to participate and to not share on social media for survey security purposes.

The distribution of the survey occurred incrementally across a week. This was a way to monitor if there was any apparent bot or fraudulent activity. The distribution started with emails to all contacts, then was disseminated on social media. Emails for all contacts with the appropriate recruitment materials were revised.

Relaunching the Survey

With the amplified security measures, the modified recruitment materials, and a new distribution approach, the survey was relaunched. A mass email was sent on the first day of relaunch to Deaf programs' emails which included a brief request to share the survey information with eligible educators along with the advertisement and the links to the survey. Two days later a second mass email was sent through the ACE-DHH and ACE-DHH MLE-SIG listservs with the same information. The following day, emails with the survey information were shared with personal Deaf education contacts across the United States. The survey was monitored daily for any suspicious activity or responses.

The following week, the survey was distributed to state-level listservs, the Clerc Center, and on my personal Facebook page. The public sharing settings were turned on and the survey was distributed to the professional Deaf education groups. Personal contacts also helped share the advertisement on their own Facebook pages and tagged potentially eligible participants or individuals to help spread the word about the survey. The incoming data continued to be

monitored daily to ensure there was no fraudulent activity. Within a week, all contacts that had been identified had received the information about the survey.

Reminder emails were created and distributed to the Deaf programs directory and Facebook posts for all professional Deaf education groups two weeks prior to the closure of the survey. An additional Facebook reminder for the professional groups was distributed again one week prior to the closure of the survey. Any emails requesting the survey information were responded to promptly with the survey information and link. The survey was closed after approximately one month of being active.

Participants who completed 100% of the survey, as indicated by the results in Qualtrics, were emailed a $10 Amazon e-gift card with a message of thanks (Figure 9) and gratitude for their participation in the study after a completed response was received.

Figure 9

E-Giftcard Thank You Message

Note. An image designed similarly to the survey recruitment advertisement with a message thanking the educator for their participation that was received with their Amazon e-gift card for the completion of the survey.

Content Validity

The design of questions with ASL videos and the response items with ASL GIFs for the survey were dependent on feedback from Deaf individuals. Following the pilot of the survey, the pilot participants provided in-depth feedback on the design of Likert-rating scale questions. There were three potential formats (i.e., standard likert, profile likert, and carousel likert) within Qualtrics platform in which the questions and response items could be designed in. Based on the input from the Deaf pilot participants, both indicated they preferred the standard Likert, and the profile Likert options over the carousel Likert options. Gathering this type of input and feedback from the Deaf participants was a crucial part of the survey design process. It was important the ASL components of the survey were displayed in a way that would be preferable to Deaf people who would be participating in the survey and receptively accessing and understanding the questions and response items in ASL.

External Validity

A small sample size was predicted prior to the distribution of the study based on Golos' et. al. (2018) study, which received a small number of responses (*N*=62) from early childhood educators of the Deaf. In that particular survey study, Deaf residential and day early childhood Deaf education programs were focal contacts from the AAD directory.

In order to address this threat of low responses from early childhood Deaf educators, several steps were taken in an attempt to recruit more early childhood educators. One approach was to include all types of programs (i.e., residential, day, itinerant, mainstream) from the AAD directory contact list with goals of recruiting educators from all settings. Within the recruitment

efforts, early childhood Deaf educators were also incentivized to participate and complete the survey for a $10 Amazon e-gift card.

The recruitment materials were designed to align with IRB requirements yet were created in a way to display a level of enthusiasm, to be personable, and visually appealing. Friendly, culturally appropriate language was written within the materials to invite and welcome the educators to participate and influence a feeling that their input is valued.

Lastly, addressing the threat of a small sample size was done through frequent and scheduled reminders distributed through the selected channels. Expressions of appreciation and gratitude for those who shared the study with eligible participants was also included within reminders that were sent.

Chapter 4: Results

Four research questions guided this study. Data analysis of the survey results was conducted for each research question and displayed in sequential order. Descriptive statistics were used to summarize and represent the demographic information of the educators and their students' and caregivers' backgrounds and the results of three research questions. Data was analyzed in Qualtrics (Text IQ, Stats IQ, and Crosstabs IQ) and SPSS. The results for questions 1-3 were grouped based on the research questions with descriptive statistics and organized into tables and charts. A statistical analysis was conducted to answer the fourth research question using the Chi-Square Test of Independence.

Demographics

Educators of the Deaf in the United States

The estimates of the general population of educators serving Deaf children across the United States and educational settings is varied. Studies in the field that try to capture this data can provide general percentages of educators representing different demographic categories but may not be entirely accurate. Previous studies have found that a large percentage of educators report as white (>90%), hearing (62%-90%), and female (>95%; male ~5%). Deaf and Hard of Hearing educators make up a small percentage (7%-30%) or less. This is also true of participants who identify as Asian/Asian American, Black/African American, Hispanic/Latinx/a/o, or other races/ethnicities made up only >10% of respondents (Golos et al., 2018; GRI, 2011; Luckner & Ayantoye; 2013).

Survey Educator Backgrounds

Participating educators (*N*=46) shared information about their demographics (e.g., Deaf/hearing identity, gender, age, race; Table 2) and background information related to Deaf education (e.g., educational settings, grade levels served, languages and communication modalities used for instruction and in students' homes). The demographic findings were similar to national data. In regard to the largest percentages by age group, participants ages 31-40 years old accounted for almost 35% of respondents, followed by participants who were 50 years and older (23.9%) and 41-50 years old (21.7%). Ages 22-30 years old was the smallest age group (19.6%) represented in this study. The participants wrote open-ended responses to share their gender identity in three ways (i.e., female, woman and male). Female and woman were combined into one gender category. Females/women made up 82.7% of the respondents, males were 8.7%, and 8.7% of respondents preferred not to share their gender identity. The majority of respondents identified their race as white only (89.1%). Educators who identified as Deaf or Hard of Hearing made up less than 25% of the survey participants. Eleven participants identified as Deaf (*n*=8) or Hard of Hearing (*n*=3) in total (Table 2).

Table 2

Demographic Information Reported in Percentages of Respondents

Demographics		*Educators (%) N=46*
Gender	Female/Woman	82.6%
	Male	8.7%
	I prefer not to share.	8.7%
Deaf/Hearing Identity	Deaf	17.4%

	Hard of Hearing	6.5%
	DeafBlind, DeafDisabled, Late-Deafened, CODA (Child of Deaf Adult)	-
	Hearing	76.1%
Deaf Educators of Color		
- Asian American		2.17%
- Indigenous or Alaska Native, Hispanic/ Latinx/a/o, White		2.17%
Hard of Hearing Educators of Color		-
Hearing Educators of Color		
- Hispanic/ Latinx/a/o, White		2.17%
- Hispanic/ Latinx/a/o		2.17%
Deaf Educators white (only)		13%
Hard of Hearing Educators white (only)		6.5%
Hearing Educators white (only)		70%
I prefer not to share.		2.17%

Educators reported their degrees, licenses, endorsements, and certifications. Fifty-eight percent of educators reported that they held a master's degree in Deaf education. They also were licensed in Deaf and Hard of Hearing (89.1%), special education (43.5%) early childhood (23.9%), and Council on the Education of the Deaf Certification (CED) (13%). Additional degrees, licenses, certifications, and endorsements reported included elementary education, middle school education, special education, early childhood, listening and spoken language, reading, literacy, math, language arts, English language learning (ELL), ASD, DCD, gifted and talented, national interpreting certification (NIC), administration, leadership.

Early Childhood Settings

Educators worked in a variety of early childhood Deaf settings including Deaf residential/day programs (30%), itinerant/mainstream (50%), self-contained/resource classrooms (13%), and outreach/consultant settings (6.5%; Figure 10). Over 70% of educators taught in Deaf education settings for 6-10 years or more. Those who identified as Deaf or Hard of Hearing (23.9%), five Deaf educators worked in the residential/day programs, two Deaf educators were in the itinerant/resource programs, and one Deaf educator in the self-contained/resource programs. The remaining (*n*=3) who identified as Hard of Hearing all worked in itinerant/mainstream settings. There were no educators who identified as Deaf or Hard of Hearing in the outreach/consultant settings (*n*=3), they all identified as hearing. All others who did not identify as Deaf or Hard of Hearing identified as hearing (Table 2).

Figure 10

Current Early Childhood Educational Settings Educators Serve In
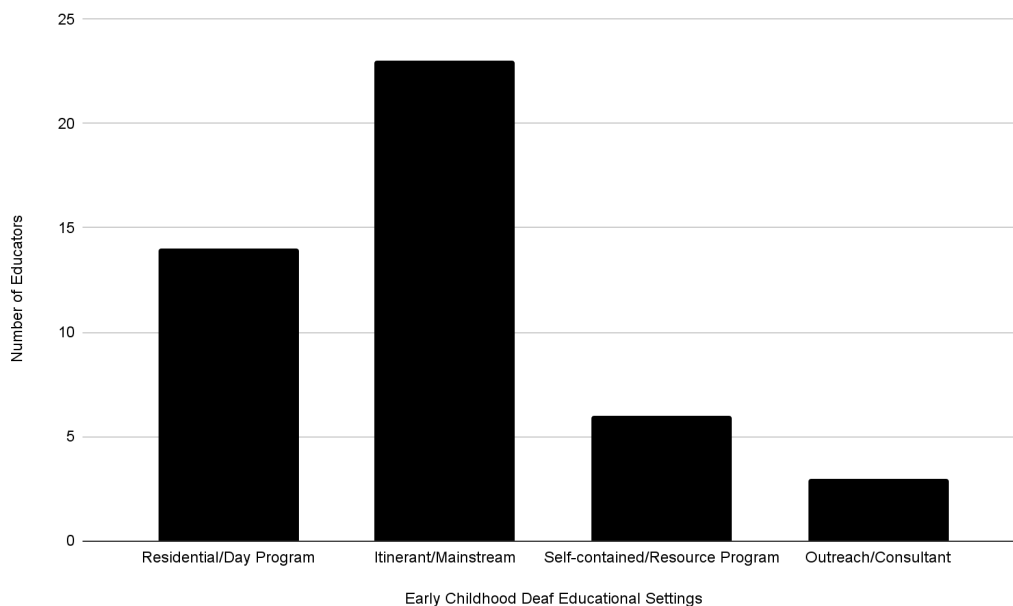
Within the different early childhood educational settings, educators worked with grade levels from preschool through second grade throughout different regions in the United States (see Table 3, p. 74). Those working in preschool/Pre-K only comprised 17.4% of the sample, while the other 82.6% worked across preschool through 2nd grade levels. Almost 60% of the responses to the survey indicated respondents were from the Midwest, 21.7% from the Mountain States, 10.9% from the Northeast/Mid-Atlantic, with smaller representations from the West Coast (6.5%) and the South (2.2%) (Figure 11).

Figure 11

Early Childhood Educators by Region in the United States

Early Childhood Educators By Region in the United States

Northeast/Mid-Atlantic 10.9%

Mountain States 21.7%

West Coast 6.5%

South 2.2%

Midwest 58.7%
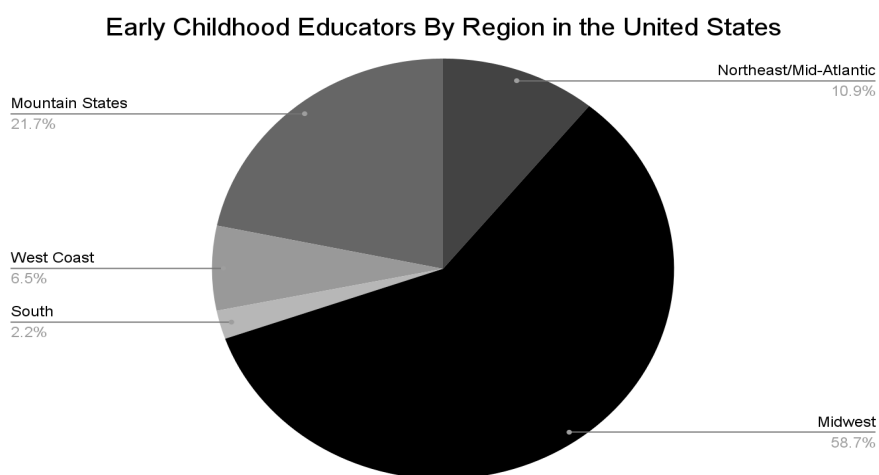
Note. The regions of the United States were categorized as follows: Northeast/Mid-Atlantic (PA, NY, VT, NH, MA, CT, ME, RI, NJ, MD, DE, DC), Midwest (OH, IN, IL, MI, WI, MN, IA, MO, ND, SD, NE, KS), Mountain States (MT, ID, WY, NV, UT, CO, AZ, NM), South (VA, NC, GA, FL, AL, TN, KY, WV, MS, AR, LA, OK, TX), West Coast (CA, OR, WA). There were no respondents from the Pacific region (AK, HI).

Table 3

Number of Educators Across Settings and the Grades Levels Taught

Educational Settings	Preschool/Pre-K only	Pre-K-2nd Grade educators (*N*=46)
Residential/Day Programs *n=14*	4	10
Itinerant/Mainstream *n=23*	2	21
Self-Contained/Resource Program *n=6*	2	4
Outreach/Consultant *n=3*	-	3

Educators shared the languages they used for classroom instruction with Deaf children. Across residential/day settings, itinerant/mainstream, and self-contained/resource programs, 66-71% of educators used ASL and English as languages of instruction. One educator from a residential/day program used ASL only and another educator indicated they used ASL/English and additional languages (i.e., Mandarin) in their instruction. Two educators from residential/day programs reported they used listening and spoken language with their students during instruction. In itinerant/mainstream settings, 17% of educators used English only in their instruction, 8.6% used ASL/English and additional languages, 4% used spoken English and additional spoken languages. In self-contained/resource settings, one educator used ASL/English, one used ASL/English and additional languages, and another used English only in their instruction of Deaf students. Data is captured in Table 4.

Table 4

Languages Used in Instruction by Educational Settings

Languages used in instruction	Deaf Residential/ Day Programs *n=14*	Itinerant/ Mainstream Programs *n=23*	Self-contained/ Resource Programs *n=6*	Outreach/ Consultant *n=3*
ASL only	1	-	-	-
ASL/English	10	16	4	1
ASL/English/additional languages	1	2	1	1
English (spoken) only	2	4	1	1
English/additional languages	-	1	-	-

In addition to languages used, Educators also reported the modes of communication they used in their instruction of Deaf students. Educators reported the modes of communication used were sign only (4.3%) spoken only (4.3%), signed/spoken only (2.17%), signed and additional modalities (15.2%), signed/spoken/additional modalities (63%), and 11% used spoken language and additional modalities. This is presented in Table 5 and shows the variation of communication modalities across educational settings.

Although many reported ASL and English and some spoken English were languages of instruction with Deaf children, several educators did not report utilizing written English as a mode of communication in their instruction with Deaf children. In residential/day, itinerant/mainstream, and self-contained/resource settings, 28% of educators did not report including written language as a modality of instruction of their Deaf students.

Table 5

Educators' Modes of Communication in Instruction by Educational Settings

Communication modalities in instruction	Residential/ Day Programs *n=14*	Itinerant/ Mainstream Programs *n=23*	Self-contained/ Resource Programs *n=6*	Outreach/ Consultant *n=3*
Signed only	2	-	-	-
Signed/additional modalities	6	-	1	-
Signed/spoken only	-	-	1	-
Signed/spoken/ Additional modalities	3	20	3	3
Spoken only	1	-	1	-
Spoken/additional modalities	2	3	-	-

Note. Additional modalities reported by educators included written, Cued Speech, Total Communication, gestures, home signs, and other (i.e., interpreters, AAC, pictures).

Caregiver Demographics

Educators reported the languages used in the homes by caregivers to communicate with their Deaf children. According to the educators, none of the caregivers utilized ASL/English only in the home, they used additional languages in conjunction with ASL/English (6.5%). The languages used in the homes included some spoken language(s) only (10.9%) as well as a combination (i.e., ASL, English, Spanish (Table 6). In addition to these languages, approximately 35% of caregivers also used one or more of seventeen additional languages

(signed and spoken) in their homes with their Deaf children. These languages included: Amharic, Bosnian, Burmese, Farsi, French, French Congo, Karen, Kiche, Korean, Lao, Lingala, Ojibwe, Swahili, Tagalog, Urdu, Vietnamese, and Venezuelan Sign Language.

The modes of communication caregivers utilized in their homes with Deaf children were examined to identify what modes were used as well as similarities or differences across educational settings. The modalities ranged from Cued Speech, Total Communication (signing/speaking simultaneously [Sim-Com], SEE, PSE), gestures/home signs, and AAC (augmentative and alternative communication). Approximately 21.7% of educators reported caregivers used spoken English and additional modalities, or a combination of spoken English, additional spoken languages and modalities. By contrast, 61% of educators reported caregivers used ASL/English and additional modalities, or a combination of ASL/English, additional languages and modalities. A visual representation of this information across educational settings is presented in Table 6.

Table 6

Languages and Communication Modalities Used in Homes of Deaf Students by Educational Settings

Languages/modalities used in the homes	Deaf Residential/ Day Programs *n*=14	Itinerant/ Mainstream Programs *n*=23	Self-contained/ Resource Programs *n*=6	Outreach/ Consultant *n*=3
ASL/English	-	-	-	-
ASL/English/additional languages	2	-	1	-
ASL/English/additional modalities	3	4	-	-
ASL/English/additional languages/modalities	8	8	3	2
Spoken English only	-	1	1	-
Spoken English/additional languages	1	2	-	-
Spoken English/additional modalities	-	2	1	-
Spoken English/additional languages/modalities	-	6	-	1

Survey Format Preferences

At the end of the survey, participants were asked follow-up questions after the research specific questions. These questions were to gather more information about their experience taking a survey with ASL and English provided as language options. The first question inquired about their use of language(s) during the survey to understand the survey questions and response items. Responses showed 54% of survey participants used English to understand the survey questions and 45% stated they used both ASL and English to understand the survey questions and response items.

The next question asked educators about their preference for the design and formatting of the ASL/English questions and response items during the survey. Educators were shown four screenshots of survey response items in different Likert-scale formats (standard or profile) and asked to rank their preference for the layouts from 1-4 with 1 being their most preferred layout and 4 being their least preferred. The layout of the screenshots included were as follows:

- Format #1: ASL/English response items with English only scale in profile Likert
- Format #2: English only response items with ASL/English scale in standard Likert
- Format #3: ASL/English response items with English only in standard Likert
- Format #4: ASL English response items ASL/English scale items in standard Likert

The results from this feedback were inconclusive; some educators did not rank each option 1-4.

Figure 12

Example of an ASL/English Response Item in Profile Likert Format

Email (e.g., School email, Gmail, Yahoo, Hotmail)
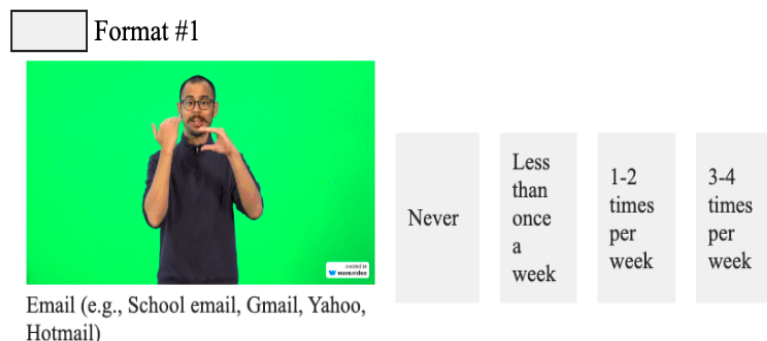
Research Question 1 Results

What technologies are being used by educators to communicate with caregivers in early childhood Deaf education, to what extent are they being used and how do they vary by educational setting?

Educators were first asked to report to what extent they used technology to communicate with caregivers. All 100% of responses indicated educators use technology to communicate with less than half of their students' caregivers. The caregivers they did use technology to communicate with, 80.4% shared that this communication was two-way or interactive rather than one-sided communication (19.6%).

The technologies used for communication with caregivers were reported by type, name, and frequency of use. Educators use a multitude of technologies across all educational settings, and most use more than one form of technology for communication with caregivers. Educators who reported using email shared their different email platforms such as school email, Gmail, Yahoo and Outlook. Some also reported using apps and websites (which could be used on a mobile device or computer) including Seesaw, Class Dojo, Remind, school website,

ParentSquare, Google Voice, Google Drive, Pinkcat, PowerPoint, Talking Points, and Schoology. Video conferencing technologies included Google Meets, Google Hangout, FaceTime, Skype Zoom, TEAMS, Video Phone, Purple Communications, and VRS. Those who used mobile phones (which included apps/websites) named the following technologies: Zoom, Instagram, Google Voice as well as calling and text messaging.

The types of technology utilized most frequently to communicate with caregivers varied. Overall, they reported that mobile phones (calls/texts/SMS) were most frequently used (37%), followed by email (34.8%) and apps or websites (28.3%) (see Figure 13). The types of technology used most frequently by settings varied. In residential/day programs, apps and websites were the most frequently used, while in itinerant settings, email and mobile phones were most frequently used. Those working in self-contained/resource programs used mobile phones and in outreach/consultant programs email was the most frequently used. The types of technologies and frequency of utilization of technologies to communicate with caregivers across educational settings are reported in Table 7 (p. 84).

Figure 13

Technology Most Frequently Utilized by Educators to Communicate with Caregivers
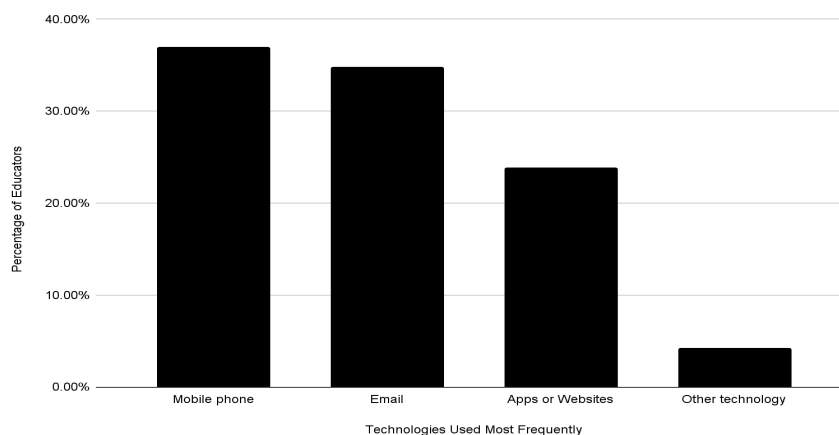
When asked how frequently they utilized technology with caregivers, only a few educators reported using technology every day. The majority reported using some technology less than once a week, on average. Educators reported the weekly average number of minutes they spent utilizing technology for communication with caregivers and how many years they had been using their most frequently utilized technology. Approximately 50% of educators spend 20 minutes or less, 37% spend 21-40 minutes per week, 13% spend 40 minutes or more weekly. Sixty-seven percent of the educators had used their most frequently utilized technology for communication with caregivers for 3 years or more. Just under 20% used their most frequently used technology 1-3 years and 13% had used their technology for one year or less.

Table 7

Frequency of the Current Technologies Used by Educators Across Early Childhood Deaf Educational Settings on Average in a Week

Types of Technology	Frequency of Use	Residential/ Day Programs *n=14*	Itinerant/ Mainstream Programs *n=23*	Self-contained/ Resource Programs *n=6*	Outreach/ Consultant *n=3*
Email	Never/less than once a week	10	8	3	-
	1-4 times per week	3	13	2	3
	At least once per day	1	2	1	-
Apps or Websites	Never/less than once a week	3	18	3	1
	1-4 times per week	7	4	3	2
	At least once per day	4	1	-	-
Video conference calls	Never/less than once a week	11	17	5	2
	1-4 times per week	3	5	-	1
	At least once per day	-	1	1	-
Video Phone/VRS	Never/less than once a week	14	22	6	3
	1-4 times per week	-	-	-	-
	At least once per day	-	1	-	-

Mobile phone (calls/text/SMS)	Never/less than once a week	11	10	1	1
	1-4 times per week	3	9	5	1
	At least once per day	-	4	-	1

With regard to who selected the technology educators used for communication with caregivers, results indicated 39% of educators (across all settings) self-selected the technology; for 28%, districts and/or administrators selected the technology (across all settings). Over 20% percent of educators reported they both self-selected and the district and/or administrators selected the technology. Another 13% indicated a combination of self-selecting, district/administrators selecting, and others selecting the technology (e.g., caregivers). One educator from an itinerant/mainstream setting indicated they worked for an outside agency for the school district and did not have access to the same technology as the district teachers but would collaborate with teachers in the district who had access to the technology to share the relevant information with caregivers. They indicated they self-selected technology and the administrator/district selected the technology they utilized. Another educator stated their administrator was looking into having them use a more confidential app for communication.

In relation to the type of technology selected, half of educators reported they had not considered using other types of technology while 43% indicated they had considered using other types of technology and 6.5% would use other technology for communication if it was approved by administrators. An educator from a self-contained program reported they would use a Video Phone if it was approved by administration.

Educators were asked if and how frequently they shared language and literacy classroom activities with caregivers. They reported sharing classroom language (69.6%) and literacy (52.2%) activities through technology with caregivers. This included sharing photographs (67.4%), videos (56.5%), private messages (84.8%) and group messages (26.1%) about language/literacy development and using language translations (23.9%). These activities were shared at least once per week by 19%-21% of educators while others shared language and literacy activities less than once a week or never across settings. Frequency of sharing across early childhood Deaf educational settings are represented in Table 8 (p. 88).

Educators utilized technology to respond to caregivers in a variety of ways. These included viewing messages (84%), answering questions from caregivers about language/literacy (74%), asking questions or making comments about language and literacy information shared by caregivers (54%). The frequency in which these responses occurred within one week varied across educational settings. (Table 9, p. 90).

Table 8

Frequency of Educators' Use of Technology to Communicate About Classroom Language and Literacy Activities

Language and Literacy Classroom Activities	% of total educators (*N*=46)	Frequency of Sharing	Residential/ Day Programs *n*=14	Itinerant/ Mainstream Programs *n*=23	Self-contained/ Resource Programs *n*=6	Outreach/ Consultant *n*=3
Share photographs	67.4	Never/less than once a week	4	18	2	1
		1-4 times per week	8	5	4	2
		At least once per day	2	-	-	-
Share videos	56.5	Never/less than once a week	7	20	6	2
		1-4 times per week	6	3	-	1
		At least once per day	1	-	-	-
Share language activities for home	69.6	Never/less than once a week	11	18	5	2
		1-4 times per week	3	5	-	1
		At least once per day	-	-	1	-
Share literacy activities for home	52.2	Never/less than once a week	11	20	5	1
		1-4 times per week	3	3	1	2
		At least once per day	-	-	-	-

Send private messages about language/literacy development	84.8	Never/less than once a week	6	14	5	-
		1-4 times per week	8	8	1	2
		At least once per day	-	1	-	1
Send group messages about language/literacy development	26.1	Never/less than once a week	12	20	4	3
		1-4 times per week	1	2	1	-
		At least once per day	1	1	1	-
Use language translations	23.9	Never/less than once a week	10	22	6	2
		1-4 times per week	4	1	-	1
		At least once per day	-	-	-	-

Table 9

Frequency and Use of Technology to Respond to Caregivers About Language and Literacy Across Educational Settings

Responses to Caregivers Through Technology	Frequency	Residential/ Day Programs *n=14*	Itinerant/ Mainstream Programs *n=23*	Self-contained/ Resource Programs *n=6*	Outreach/ Consultant *n=3*
View messages	Never/less than once a week	1	15	4	-
	1-4 times per week	8	6	1	2
	At least once per day	5	2	1	1
Answer questions about language/literacy	Never/less than once a week	8	19	5	-
	1-4 times per week	6	4	1	3
	At least once per day	-	-	-	-
Make comments about information caregivers share about language/literacy	Never/less than once a week	9	21	5	0
	1-4 times per week	5	2	1	3
	At least once per day	-	-	-	-
	Never/less than once a week	9	20	5	-

Ask questions about information caregivers share about language/literacy	1-4 times per week	5	3	1	3
	At least once per day	-	-	-	-
Use language translations	Never/less than once a week	9	22	6	2
	1-4 times per week	5	1	-	1
	At least once per day	-	-	-	-

Research Question 1 Summary

In summary, related to the first research question, educators reported utilizing a variety of technologies for communication with caregivers; many of the technologies include email, mobile phones, and apps/websites. These technologies are among the ways they share photographs/videos, language, and literacy specific information, and to communicate generally with caregivers. The frequency of this communication through technology for the majority appears to be once a week or less across all educational settings.

Research Question 2 Results

In what ways and how often do educators utilize the technology to share ASL resources and information with caregivers and how do they vary by educational setting?

Results from the second research question showed what types of ASL resources educators shared with caregivers through technology. They reported they shared read alouds in ASL (61%), literacy activities in ASL (46%), and new vocabulary words in ASL (78%). Less than 28% of educators shared ASL rhyme/rhythm and ABC/number/handshape stories. Educational media and games in ASL (e.g., Peter's Picture) was shared by 37% and 26% of educators, respectively, while 80% shared school and community resources in ASL. Fifteen percent reported sharing additional ASL resources such as apps/websites and free online classes for ASL learning and practice.

Given options of never, less than once a week, 1-2 times per week, 3-4 times per week and every day, educators were asked to report how frequently they utilized technologies to share the resources in ASL that they reported sharing with caregivers. Results from this question indicated educators regularly share ASL read alouds (24%), literacy activities in ASL (17%), or

new vocabulary words in ASL (28%) 1-2 times per week. Approximately 71-83% indicated they share these ASL resources less than once a week or never. Educators (8% or less) share ASL rhyme/rhythm and ABC/number/handshape stories at least once a week, while over 91% reported sharing these resources less than once a week or never. Educational media and games in ASL are shared at least once a week by 10-13%, with over 86% sharing these ASL resources less than once a week. Only 13% of educators reported sharing school/community resources to learn ASL, while 87% reported they share these resources less than once a week or never. In Table 10, results are presented on the number of educators that share ASL resources at least once a week broken down by educational setting.

Table 10

Educators Who Utilize Technology to Share ASL Resources At Least Once Per Week

ASL Resources Shared by Educators	Residential/ Day Programs *n*=14	Itinerant/ Mainstream Programs *n*=22	Self-contained/ Resource Programs *n*=6	Outreach/ Consultant *n*=3
Read Alouds in ASL	7	3	-	1
Literacy Activities in ASL	5	1	-	2
New vocabulary in ASL	5	6	-	2
Rhyme/rhythm/ABC/number/handshape stories in ASL	2	1	-	1
Educational media in ASL (e.g., Peter's Picture)	4	2	-	-
Educational games in ASL (Peter's Picture App)	3	2	-	-
School/community classes to learn ASL	2	3	1	-

Note. An educator in the itinerant setting was inconsistent in their reporting of which ASL resources they shared, and they were removed from these results.

Those who indicated they never share the ASL resources listed in the survey were asked why they did not share these resources. Five main thematic categories emerged from the analysis of open-ended responses: (a) caregivers have limited knowledge or skills in ASL, (b) the relationship between the caregiver mode of communication/languages at home and/or caregivers' disinterest in ASL, (c) ASL resources were outside of educator expertise, (d) limited time to share resources, and (e) access to resources. There was also an additional "other category" added for responses that did not align with the categories and appeared infrequently in the responses.

Caregivers Limited Knowledge or Skills in ASL

Educators who reported caregivers had limited knowledge or skill in ASL mentioned that sharing ASL resources may be overwhelming for some parents. One educator stated, "I do not share ASL handshape or ASL rhymes because most parents are still learning vocab. This would be way above where they are at." Another educator reported that they did not share some ASL resources because, "parents need to have a strong background in ASL grammar and Deaf culture in order to understand the assignment."

Caregivers' Preferred Mode of Communication and Disinterest in ASL

The relationship between the students' hearing levels, primary mode of communication at home, and/or caregiver disinterest in ASL was one of the larger thematic categories. Educators indicated that many of their students' primary mode of communication and/or language in the home is spoken language(s). ASL is often not used by caregivers with the child and some educators believe there is a disinterest or lack of appreciation for ASL resources. One educator stated, "Many of my current students do not use ASL as their primary language and their caregivers have no desire to learn the language. If the parents are interested, I absolutely send

resources for their use at home." Another said, "With lots of my families, they are listening and oral language focused and don't appreciate ASL resources shared." A third educator said,

> "All of the students I provide services to use speech and listening to
> communicate. Their parents have chosen that for them and often their mild or
> unilateral hearing losses are appropriate for that choice. ALL of my students
> speak English and a spoken language other than English. So ASL is not being
> used."

Lack of Expertise on ASL Resources

The next theme indicating why educators do not share ASL resources was that it was outside of their expertise. These responses were from three educators who work as listening and spoken language educators. They indicated they did not share ASL resources as it was out of the scope of their practice but mentioned that their co-teachers who use ASL in their instruction would often share ASL resources with caregivers. One educator shared, "I am an LSL teacher, so I am not an expert on ASL resources. I have recently shared information with parents about some local resources in learning ASL, but it's just not what I teach."

Time Constraints

Time was another reason why educators were not sharing ASL resources. Educators shared that finding ASL resources as well as screening, organizing, and finding ways to share the ASL resources takes a lot of time. Some educators shared concerns about having trouble finding ASL resources (i.e., rhyming, handshape stories) from reputable sources. Others also stated that they do not routinely share ASL resources; for example, "It takes time to get it organized and

send it out. I need to review ASL resources before I share them. I want to make sure it is high quality and accurate ASL resources."

Educators also indicated they do not share ASL resources for reasons related to access. One educator shared that many of the resources they find are on social media but chooses not to share with families that might not have access. Another educator indicated the resources they use are subscription based and are not accessible to caregivers. Other educators shared that they do not share resources because caregivers do not access or utilize the resources they share. Another with a similar experience stated they just share the resources once at the beginning of the year. An educator who was recently hired to the school indicated they hadn't had the opportunity to access ASL rhyme/rhythm resources yet.

 Two educators responded to the "other" category and indicated they had not considered sharing ASL resources before for different reasons. One stated that ASL was not used by caregivers, so they had not considered sending home ASL resources. Another shared, "Honestly, I have never considered it. Now, I will :) YouTube will be my source."

Research Question 2 Summary

In summary, the findings related to the second research question demonstrate that some educators across educational settings are sharing ASL resources with caregivers through technology to some extent but vary in which resources they share and the frequency of sharing these resources. The reasons for not sharing ASL resources are largely due to caregivers' (and a few educators') limited knowledge of ASL resources and the lack of use of ASL as a language modality for students in their homes with their caregivers. Another reason educators indicated

they did not share ASL resources with caregivers was due to not having enough time to find, compile, and share reputable ASL resources through technology.

Research Question 3 Results

What are educators' perceptions of the challenges and benefits of using technology in early childhood Deaf education for communication with caregivers and how do they vary by educational setting?

Educators were asked a series of questions related to their perceptions of technology and questions about what they considered to be the biggest challenge and biggest benefit of utilizing technology to communicate with caregivers. This included asking educators about their perceptions of technology for increasing caregiver knowledge and communication with their Deaf child, their improvement of communication and connection with caregivers, and their general perceptions about the efficiency of the technology.

Educators' Perceptions of Technology on Caregiver Knowledge and Communication with Child. Educators were asked to report if they perceived caregivers' knowledge about classroom language and literacy activities to increase as a result of educators' use of technology to communicate. Approximately 52% of educators indicated that they perceived caregiver's knowledge about classroom language/literacy activities to slightly/moderately increase. Thirty three percent indicated their communication greatly increased. Others indicated they did not agree (6.5%), or they were unsure (8.7%) if technology increased caregiver's knowledge of classroom language/literacy activities (see Table 10).

A similar question was asked if educators perceived caregivers' communication with their Deaf child increased at home due to the use of technology for communication between

school and home. Again 52% reported they thought communication at home slightly/moderately increased, while 37% reported it greatly increased caregivers' communication with their Deaf child. Less than 5% disagreed and 6.5% were unsure if it increased caregivers' communication with their Deaf children in the home (see Table 11, p. 100).

Educators' Perceptions on Their Communication and Connection with Caregivers. Educators' perceptions related to the improvement of their connection and communication with caregivers about language and literacy activities were analyzed. Educators responded that their communication and connection with caregivers was slightly/moderately (37%) or greatly (63%) improved. A small percentage (6.5%) of educators reported technology did not improve their connection or understanding of Deaf children and their caregivers (see Table 12, p. 102).

Educators' Perceptions on the Efficiency of Technology. Educators reported the extent they agreed with various statements about the efficiency of technology for communication with caregivers. These questions were on a unipolar Likert-type scale of agreement about whether the technology was easy to use, a time saver, reliable, convenient, secure, or accessible for users whose first language was not spoken English and/or Deaf ASL users. Most educators strongly agreed that technology was easy to use (85%), reliable (76%), convenient (85%), and a time saver (17%). Other educators somewhat agreed across the categories (easy to use [15%], reliable [23%], convenient [15%], a time saver [17%]). Only a very small percentage (6.5% or less) perceived the technology to be inaccessible for non-English speakers or Deaf ASL users. These findings were analyzed as individual counts of educators across educational settings (Table 13, p. 104).

Table 11

Educators' Perceptions on the Degree Technology Can Increase Caregivers' Knowledge and Communication by Educational Settings

Technology Increases…	Degree of increase	Residential/ Day Programs *n=14*	Itinerant/ Mainstream Programs *n=23*	Self-contained/ Resource Programs *n=6*	Outreach/ Consultant *n=3*
Caregivers' knowledge about classroom language activities.	Does not increase	-	3	-	-
	Slightly/moderately increases	7	12	4	1
	Greatly increases	6	6	2	1
	I am not sure.	1	2	-	1
Caregivers' knowledge about classroom literacy activities.	Does not increase	-	2	-	-
	Slightly/moderately increases	8	13	4	1
	Greatly increases	5	6	2	1
	I am not sure.	1	2	-	1

Caregivers' knowledge about their child's language development.	Does not increase	-	1	1	-
	Slightly/moderately increases	4	14	4	1
	Greatly increases	9	7	2	1
	I am not sure.	1	1	-	1
Caregivers' knowledge about their child's literacy development.	Does not increase	-	1	1	-
	Slightly/moderately increases	7	16	3	-
	Greatly increases	6	6	2	2
	I am not sure.	1	-	-	1
Caregivers' communication with their child at home.	Does not increase	-	2	-	-
	Slightly/moderately increases	7	12	4	1
	Greatly increases	6	8	2	1

I am not sure.	1	1	-	1

Table 12

Educators' Perceptions on Whether Technology Improves Their Communication and Connection with Caregivers by Educational Settings

Technology Improves…	Degree of improvement	Residential/ Day Programs $n=14$	Itinerant/ Mainstream Programs $n=23$	Self-contained/ Resource Programs $n=6$	Outreach/ Consultant $n=3$
My communication with caregivers.	Does not improve	-	-	-	-
	Slightly/moderately improves	3	9	3	2
	Greatly improves	11	14	3	1
My motivation to communicate with caregivers.	Does not improve	-	3	-	-
	Slightly/moderately improves	6	9	4	2
	Greatly improves	8	11	2	1
	Does not improve	2	3	-	-

My connection with caregivers who use a different language than ASL or English.	Slightly/moderately improves	6	13	3	3
	Greatly improves	6	7	3	-
My understanding of the Deaf child and their family in the home context, including home language(s).	Does not improve	-	1	1	1
	Slightly/moderately improves	6	13	2	1
	Greatly improves	8	9	3	1

Table 13

Extent Educators Agree to Statements About Technology for Caregivers Across Educational Settings

Perceptions of technology	Extent of Agreement	Residential/ Day Programs *n=14*	Itinerant/ Mainstream Programs *n=23*	Self-contained/ Resource Programs *n=6*	Outreach/ Consultant *n=3*
Easy to use	Somewhat agree	2	3	1	1
	Strongly agree	12	20	5	2
Reliable	Somewhat agree	1	5	3	2
	Strongly agree	13	18	3	1
Convenient	Somewhat agree	3	2	1	1
	Strongly agree	11	21	5	2
Time saver	Somewhat agree	2	4	1	1
	Strongly agree	12	19	5	2
Secure and protects privacy	Somewhat agree	2	13	4	2
	Strongly agree	12	10	2	1
	Do not agree	-	3	-	-

Accessible for caregivers whose first language is not spoken English	Somewhat agree	9	14	5	2
	Strongly agree	5	6	1	1
Accessible for Deaf people who use ASL	Do not agree	-	2	-	-
	Somewhat agree	7	11	4	1
	Strongly agree	7	10	2	1

Note. Do not agree responses only appeared from educators for the questions that asked if they perceived the technology to be accessible for caregivers whose first language was not spoken English or Deaf people who use ASL.

Challenges and Benefits of Utilizing Technology. Educators responded to open-ended questions about what they perceive as their biggest challenge and biggest benefit of utilizing technology for communication with caregivers. The benefits and challenges were grouped into thematic categories based on the frequency of the benefits and challenges that appeared in the responses. The findings are displayed in Tables 14 and 15 (p. 120) across the early childhood educational settings.

Challenges. Six themes emerged from analyzing the challenges educators shared about utilizing technology and the results were organized by frequency across settings. Some of the challenges identified were (a) language/literacy barriers, (b) caregivers' lack of access to technology, (c) lack of technology proficiency (which some educators reported was true for themselves), (d) inconsistent or lack of responses from the caregivers through the technology, (e) time, (f) infringement on boundaries.

Language and literacy barriers were reported by educators who indicated some caregivers are not fluent in English or ASL often making communication difficult. One educator said, "Sometimes they (caregivers) struggle with reading and writing so communicating through written messages isn't always convenient." Another had a similar statement, "I have some families who do not have a written form of their home-spoken language." Two educators perceived "low parent literacy" to be a challenge when they were sending lengthy written forms of communication through technology. One educator indicated limitations of being able to explore technology options that fit the needs for caregivers and the educator "due to district policy". Some educators indicated they relied on technology for language translations or third-party interpreters and that the inaccuracy of language translations in some of the technology

made it difficult for messages to be accurately conveyed. They mentioned that when using third party interpreters, caregivers would sometimes not answer calls from unrecognized numbers.

Caregivers' lack of access to technology and lack of proficiency with technology made it difficult for some educators to use technology to communicate with these families. Some families did not have internet/Wi-Fi access or phone service at all or their access to these technologies was inconsistent. Many educators indicated that they perceived caregivers to not be proficient with technology, and thus did not use it to respond. One educator indicated that they were unsure if messages were being received by caregivers. Some also reported technology glitches which made smooth communication difficult between home and school.

Time and boundary infringement were two other challenges reported. Many educators reported simply, "time!" in their responses. Others expanded a bit more indicating they did not have enough time to draft meaningful messages or resources to respond or communicate with caregivers. Some educators stated the accessibility of the technology also "blurred work/life balance" as it is available 24/7. For one, they recognized the risk of being easily accessible through technology to caregivers after contract hours, thus infringing on the boundaries of the educator. Educators also shared they had limited time to reply to caregivers, to become familiar with the technology and to help caregivers familiarize themselves with the technology.

Some additional challenges reported by educators (not included in Table 14) were that they perceived the technology to not be personable, caregivers' preferences for technology varied, and technology was frequently being changed. It is unknown if the frequent technology changes were due to educators adapting to different technology due to caregivers' preferences or

if they were being instructed to change their methods of communication through technology by administrators or other entities.

Table 14

Frequently Reported Challenges Across Educational Settings

Challenges of Technology for Communication with Caregivers	Residential/ Day Programs *n=14*	Itinerant/ Mainstream Programs *n=23*	Self-contained/ Resource Programs *n=6*	Outreach/ Consultant *n=3*
Language/literacy barriers	x	x	x	x
Lack of access to technology	x	x	x	x
Lack of technology proficiency	x	x	x	-
Caregivers' inconsistent use or lack of response, unknown if messages are received	x	x	x	-
Time	x	x	-	x
Infringement on boundaries	x	-	x	-

Table 15

Frequently Reported Benefits Reported Across Educational Settings

Benefits of Utilizing Technology for Communication with Caregivers	Residential/ Day Programs *n=14*	Itinerant/ Mainstream Programs *n=23*	Self-contained/ Resource Programs *n=6*	Outreach/ Consultant *n=3*
Sharing information through multiple languages and modalities	x	x	x	x

Technology efficient for communication	x	x	x	x
Establishes a home-school relationship	x	x	x	x
Sharing information/resources expands learning and communication at home	x	x	x	-

Benefits. Educators identified numerous benefits of utilizing technology to communicate with caregivers. A summary of the benefits is presented in Table 15. Four main categories emerged from educators' responses of what they perceived the biggest benefit of technology to be: (a) sharing information through multiple languages and modalities, (b) efficiency of the technology, (c) relationships between home and school, and (d) increasing and expanding learning in the home.

Educators shared that a benefit of communicating through technology is their ability to share messages through caregivers' preferred languages and have immediate access to communicate through different languages and modalities. They mentioned that technology provides a way for them to share information with caregivers through different modalities (e.g., photos, videos, written). These visuals "help support caregiver understanding". One educator reported the ability to share videos was the biggest benefit. "Sharing of ASL stories and activities helps with carryover of vocabulary and concepts." Another stated they could share positive information and anecdotes about their Deaf children and their capabilities with families that they may not be aware of.

Across the educational settings educators shared that another benefit was the efficiency of the technology to create fast, convenient, responsive, and consistent communication between themselves and caregivers. One educator stated, "it is quick and makes it more likely to get a response." Another educator said it reduced the amount of time needed for communication.

Another important benefit educators described was that technology facilitates relationships between the school and home setting. They indicated that technology provides a way for caregivers to feel connected to their Deaf child's education. Educators are also able to gain a better understanding of the home settings, "If both school and home are on the same page, the student is more successful". Another educator stated their perception of the biggest benefit was, "Building a strong connection between home and school, which supports strong language development."

A final benefit reported by educators was the increasing or expanding of learning in the home for both Deaf children and/or caregivers by sharing resources. Some educators indicated that technology could expand caregivers' learning of ASL and Deaf culture to support their ASL skills and communication with their Deaf children. The educators shared they believe caregivers are able to be informed about what Deaf children are learning and continue learning in the home environment. This includes general updates about their Deaf child's education, new vocabulary, and ASL stories or activities.

Research Question 3 Summary

Some of the most frequently identified benefits included the efficiency of technology for communication, the ability to share information through multiple modalities (e.g., photographs,

videos, written), the establishment of home-school relationships and the expansion of learning from the classroom into the home.

The findings of the perceptions of educators across educational settings provides some insight into educators' beliefs about their communication practices through technology with caregivers. Educators hold generally positive perceptions about how their communication through technology increases caregiver knowledge and communication. Many agreed to some extent that their use of technology with caregivers improved their communication and connection with caregivers. Only a very few educators (*n*=3) disagreed with the statement that motivation to communicate with caregivers improves due to technology. Educators also indicated they believe technology to be generally efficient for their practice of communicating with caregivers. Any disagreement indicated about the efficiency of the technology was due to the accessibility of the technology for caregivers who were non-English users or Deaf individuals who used ASL.

Identified challenges that were most apparent across all programs were language/literacy barriers. In residential/day programs itinerant/mainstream programs, and self-contained/resource programs, caregivers' inconsistent use or lack of response to communication, lack of access to technology and lack of proficiency using the technology were the next most commonly mentioned barriers. Educators from two of the four settings reported challenges related to and infringement of boundaries.

The educators' perceptions of the technology, the challenges, and the benefits were similar across almost all educational settings with some variation in the challenges that appeared between settings. For instance, educators from two of the four settings reported time and infringement of boundaries to be challenges of using technology for communication. Overall,

educators reported that they perceive technology to increase caregiver knowledge and communication with their Deaf child. They also reported positive perceptions about how technology improves their communication and connection with caregivers.

Research Question 4 Results

Do early childhood educators vary in their use of technology for communication with caregivers based on educational settings (i.e., residential/day, itinerant, and self-contained classrooms)?

Statistical analyses were conducted to examine whether educators varied across the educational settings in their use of technology for communicating with caregivers. Chi-square tests of independence were run to determine if there was a relationship between the sharing of information and ASL resources with caregivers through technology. The effect size of the relationship was also examined using Cramér's V (ϕ_c). This measures the association between two categorical variables and the strength of the association between the variables. This measure of strength of association is indicated by a value between 0-1 (Kearney, 2017, McHugh, 2013).

Table 16

Cramér's V Index Table with Degrees of Freedom

Degree of freedom	Small	Medium	Large
1	0.10	0.30	0.50
2	0.07	0.21	0.35
3	0.06	0.17	0.29
4	0.05	0.15	0.25
5	0.04	0.13	0.22

Note. The guidelines of V√df* = .1 represents a small effect, = .3 represents a moderate effect and = .5 represents a large effect.

Some results showed statistically significant differences between residential/day and itinerant/mainstream settings. An assumption of Chi-square test requires a minimum value of 5

data points (McHugh, 2013) or 10 (Turhan, 2020). Self-contained settings had (n=6) and outreach/consultant had (n=3). No significant relationships were indicated for either setting.

A statistically significant relationship with large effect size between residential/day programs and educators regularly sharing videos was found ($X^2 = 8.74$, $p = .03$, $\phi_c = .436$). This was also true for educators sharing photographs more often than educators from other settings ($X^2 = 10.7$, $p = .01$, $\phi_c = .481$). In itinerant/mainstream settings, some educators did not share weekly photographs and was found to be statistically significant for that setting. These results are represented in contingency Table 17 and Table 18 (p. 115).

The same analyses were run to determine if there was a relationship between educational settings and educators' responding to caregivers about language and literacy at least once per week. Residential/day programs were statistically different from other settings with a large effect size in educators regularly viewing messages from caregivers ($X^2 = 15.6$, $p = 0.001$, $\phi_c = 0.582$) with itinerant/mainstream setting results showing educators were not regularly viewing messages (see Table 19, p. 116).

There was a significant relationship with a large effect size between the itinerant/mainstream setting and educators never sharing information with caregivers about language and literacy ($X^2 = 13.7$, $p = .003$, $\phi_c = .546$) or asking questions about information caregivers share in regard to language and literacy ($X^2 = 11.5$, $p = .009$, $\phi_c = .5$). This was captured in Table 20 (p. 116).

An analysis of educational settings and the use of language translations was conducted for both residential/day settings and itinerant/mainstream settings. Both settings showed a statistically significant difference with a large effect size ($X^2 = 8.51$, $p = .003$, $\phi_c = .430$).

Residential/day settings used language translations more frequently while itinerant/mainstream

settings used language translations much less frequently (see Table 21, p. 117).

In regard to determining if there were differences between educational settings and

educators sharing different types of ASL resources (e.g., ASL rhyme/rhythm) with caregivers

regularly, the analyses showed only two statistically significant results. There was a strong

statistical relationship with large effect size between educators from residential/day programs

sharing ASL read alouds regularly with caregivers (X^2= 8.76, p = 0.03, ϕ_c = 0.436). This is

displayed in Table 22 (p. 117). Another statistically significant relationship with a large effect

size also appeared for sharing literacy activities in ASL (X^2= 12.3, p = 0.006, ϕ_c = .518) which is

captured in Table 23 (p.118). Itinerant/mainstream settings showed high statistical significance

for how infrequently educators shared literacy activities in ASL through technology. Results

indicated no other statistically significant relationships for educators across settings sharing ASL

resources or there were not enough data points for some to detect statistically significant

evidence.

Table 17

Contingency Table of Chi-Square Test: Educators' Sharing Videos

Note. The arrows on the table indicate statistically significant findings.

Table 18

Contingency Table of Chi-Square Test: Educators' Sharing Photographs

Note. The arrows on the table indicate statistically significant findings.

Table 19

Contingency Table of Chi-Square Test: Educators' Viewing of Caregivers Messages

39: What type o...Selected Choice	23_20: How frequently do you utilize technology...y in their home? | View messages from caregivers	
	Never	At least once per week
Residential/Day Program	5.0%	50.0%
Itinerant/Mainstream	75.0%	30.8%
Self-Contained/Resource	20.0%	7.7%
Outreach/consultant	0.0%	11.5%
Total	100.0%	100.0%

Note. The arrows on the table indicate statistically significant findings.

Table 20

Contingency Table of Chi-Square Test: Educators' Asking Caregivers Questions about Language and Literacy

39: What type o...Selected Choice	23_27: How frequently do you utilize technology...rmation caregivers share about language/literacy	
	Never	At least once per week
Residential/Day Program	26.5%	41.7%
Itinerant/Mainstream	58.8%	25.0%
Self-Contained/Resource	14.7%	8.3%
Outreach/consultant	0.0%	25.0%
Total	100.0%	100.0%

Note. The arrows on the table indicate statistically significant findings.

Table 21

Contingency Table of Chi-Square Test: Educators' Using Language Translations

23_24: How frequently do you utilize technology...eracy in their home?	Use language translations		
39: What type o...Selected Choice	**Never**	**At least once per week**
Residential/Day Program	23.1%	71.4%
Itinerant/Mainstream	56.4%	14.3%
Self-Contained/Resource	15.4%	0.0%
Outreach/consultant	5.1%	14.3%
Total	100.0%	100.0%

Note. The arrows on the table indicate statistically significant findings.

Table 22

Contingency Table of Chi-Square Test: Educators' Sharing Read Alouds in ASL

25_1: How often, on average, do you share the fo...f Deaf children (ages 3-8)?	Read alouds in ASL		
39: What type o...Selected Choice	**At least once per week**	**Less than once per week or never**
Residential/Day Program	63.6%	20.0%
Itinerant/Mainstream	27.3%	57.1%
Self-Contained/Resource	0.0%	17.1%
Outreach/consultant	9.1%	5.7%
Total	100.0%	100.0%

Note. The arrows on the table indicate statistically significant findings.

Table 23

Contingency Table of Chi-Square Test: Educators' Sharing Literacy Activities in ASL

25_3: How often, on average, do you share the fo...hildren (ages 3-8)? | Literacy activities in ASL		
39: What type o...Selected Choice	**At least once per week**	**Less than once per week or never**
Residential/Day Program	62.5%	23.7%
Itinerant/Mainstream	12.5%	57.9%
Self-Contained/Resource	0.0%	15.8%
Outreach/consultant	25.0%	2.6%
Total	100.0%	100.0%

Note. The arrows on the table indicate statistically significant findings.

Research Question 4 Summary

The chi-square test of independence was used to determine if there were any relationships between the type of educational setting and how educators utilized technologies in these settings to share ASL resources. Cramér's V was run to determine what the effect size of these relationships were (e.g., small, medium, or large). Results for residential/day settings often showed statistically significant relationships with large effects in educators' use of technology to share ASL resources, For example, educators from these settings more frequently shared videos and photographs with caregivers than other settings weekly. While itinerant/mainstream settings showed relationships with large effects that used technology infrequently for sharing information with caregivers. Self-contained/resource and outreach/consultant settings did not reveal any significant relationships as there were likely too few educator responses from those settings to meet the assumptions of the statistical analysis.

Chapter 5: Discussion

The advancement and proliferation of technologies may have influenced the ways in which educators can communicate with caregivers in early childhood education. For educators of Deaf children, findings in this study provide foundational evidence that technology plays an important role in supporting communication between school and home.

Educators and caregivers of Deaf children can become the creators of a community within a CoP. These communities are formed when there is a shared interest in a domain or area of interest or concern (E. Wenger-Trayner & B. Wenger-Trayner, 2015; Wenger-Trayner et al., 2023). As previously mentioned, in early childhood Deaf education, language acquisition and literacy development of Deaf children is the domain and area of interest for community members (i.e., educators and caregivers). The community members take action through the "practice" of utilizing technology for communication to support the premise of the domain. In this study, the practices of early childhood education CoPs began to be unveiled.

The results from this survey provide the first glimpse of evidence that technologies are being used as a practice for communication between home and school in early childhood Deaf education. Through educators' reported practice of how they share language and literacy resources with caregivers through technology to support Deaf children's development, we begin to see the potential for CoPs within early childhood Deaf education and the potential for how technology might impact Deaf children's language acquisition and literacy development. These findings provide new insights into Deaf educators' perceptions of technology, as well as the challenges and benefits they experience in using technology for communication with caregivers.

Demographics and Backgrounds of Educators and Caregivers

Findings of this study must be considered in the context of the demographics and backgrounds of the participants. The educators' identities, languages and modalities used in instruction and the Deaf children's languages and modalities in their homes has an influence on the interpretation of the data for how technology is used to share language/literacy and ASL resources.

The small sample size of educators (*N*=46) in this study is on par with previous research studies (*N*= 62; Golos et al., 2018; Moses et al., 2018) and was in line with the predicted number of educators who would respond. While there were similarities to the national data based on the respondents, there was not equal representation across the regions of the United States. For instance, the races and gender identities reported by the educators were consistent with those reported in previous national surveys (Golos et al., 2018; Luckner & Ayantoye, 2013; Moses et al., 2018) with white, hearing, females making up the majority of respondents. This overwhelming representation of white, hearing females in early childhood Deaf education, however, is not reflective of the identities of Deaf children and their caregivers. In recent years, researchers have been noting the steady increase of Deaf children who are from different racial, cultural, and linguistic backgrounds (Cannon et al., 2016; Gallaudet Research Institute [GRI], 2013; Gárate-Estes et al., 2021).

A higher proportion of Deaf educators (>20%) responded to this survey in comparison to the estimated population of Deaf educators (~10%; GRI, 2011; Luckner & Ayantoye, 2013) in early childhood Deaf education. Although the number of Deaf participants is similar to the number of Deaf participants (37.1%) in Golos et al. (2018) it contrasts with that of Luckner and Ayantoye (2013) national study which had a small percentage of Deaf respondents (10%) and

GRI (2011) reported 7% of educators were Deaf. A possible reason for this higher number of Deaf educators who responded to the survey may be that the survey was accessible in both ASL and English. It also may be that this study was advertised through more pathways such as social media in addition to the AAD directory, listservs, national organizations and other channels compared to other studies (e.g., Luckner & Ayantoye, 2013; Moses et al., 2018) that did not use social media to advertise the study.

It is possible the use of social media in this study to share recruitment materials with potential participants was helpful in being able to reach more educators who work in early childhood. In the past, studies (e.g., Moses et al., 2018) have shared recruitment materials through the AAD directory or professional listservs. However, the action of sharing through these pathways does not mean study recruitment materials are always shared directly with early childhood educators, but rather it may reach administrators and service professionals which requires a reliance that the administrators/service professionals will forward or share the study information with the necessary early childhood educators. By targeting specific social media groups for educators in Deaf education, this could potentially increase the likelihood that early childhood Deaf educators who are members of the professional groups and follow the content posted groups see survey information and choose to participate or share information about the research with those who may qualify. Understanding how social media influences recruitment of participants may be important to examine further in Deaf education to increase sample sizes in future research.

The unequal representation of educators across settings makes it difficult to gain a balanced picture of exactly what is happening with technology utilization in each setting and how it varies across settings.

Respondents who participated represented different early childhood educational settings and demographic backgrounds. Half of the educators who participated in the survey were educators from itinerant settings with small representation in outreach/consultant and self-contained programs and moderate representation from the residential/day programs. It is unclear how educators who self-defined their roles as outreach/consultant compare in their roles to educators from the other settings.

Related to languages and modalities used by caregivers in the homes with Deaf children, the findings in this study are closely related to the GRI (2013) data. In this study, approximately 45% of educators reported caregivers use ASL, English and additional languages and modalities with their Deaf children. GRI (2013) found 36% of Deaf students' home languages were ASL, Spanish, or other languages. Educators reported only 4.3% of caregivers used spoken English only in their homes and 6.5% are using spoken English and other languages (not including ASL). This is in stark contrast to GRI (2013) data, which indicated 82.1% of homes regularly used English. Although GRI did not report the modality of how English was used, the new data in this study suggests that far fewer caregivers are using only spoken English or other spoken languages with their children in their homes.

Only 17% of educators reported using spoken English only in their instruction of Deaf children across all settings. This is similar to the findings in Golos et al., (2018) where 11.3% of educators used LSL. However, this finding is substantially lower than the findings in GRI (2013)

which reported that 51.4% of Deaf children were instructed in spoken language only. Interestingly, GRI (2013) reported that ASL was regularly used in schools for only 34.8%. Yet, the results in this current study showed 67% of educators are utilizing ASL/English in their instruction.

Some educators also indicated they were using multiple languages and modalities in their instruction of Deaf children in addition to ASL and English, however, educators (30%) from residential/day, itinerant/mainstream, and self-contained/resource programs did not report including written language as a modality of instruction for their Deaf students. This contradicts the findings in Moses et al., (2018) which found educators were including print during circle time, outdoor/gym, dramatic play, snack, art, and free choice. While it is possible, they do use written language, it is also possible that some overlooked the item on the survey or assumed that checking English as a language of instruction included written English. It may be that educators inconsistently reported the languages used in instruction and the modalities. Some may have interpreted the questions differently thinking language and modalities were similar. In this study, it is important to understand what language and modalities in classroom instruction with Deaf children as the language and modalities they use may impact the language and literacy resources educators are sharing with caregivers through technology.

Types of Technology, Frequency of Use, and Variations Across Educational Settings

Educators of the Deaf named a plethora of technologies that they used for communication with caregivers of Deaf children between school and home. The wide variety of technologies used by educators likely serves many different purposes for educators depending on their topic of

communication with caregivers and frequency of communication. There were also some variations in the extent the technology was used across educational settings.

Types of Technology

The types of technology utilized by early childhood educators of the Deaf with caregivers mirrors the findings in the review of literature for early childhood hearing populations such as email (Higgins & Cherrington, 2017; Penman 2014), text messaging (Özkan Yıldız & Yılmaz, 2021), apps/websites accessible through phones (e.g., e-Portfolios or digital portals; Beaumont-Bates, 2017; Chen & Lin, 2022; McFadden & Thomas, 2016; Oke & Butler, 2020; Plumb & Kautz, 2014). The use of mobile phones, email, and apps/websites were the technologies most frequently utilized by educators of the Deaf in early childhood. Most educators utilized more than one technology for communication with caregivers which aligns with the findings in Higgins and Cherrington (2017) and Penman (2014).

The names of the specific technologies used by educators in Deaf education such as Class Dojo Seesaw (apps/websites) Google Voice (mobile app), Zoom (video conference), Talking Points (translation and messaging app), VP/VRS, were not found in previous studies. This may be because some studies did not list the name of the technology and only described the type of technology (e.g., digital portal, messaging app). Another reason may be that many of the previous studies examined were conducted in different countries. These countries may be utilizing similar types of technologies but are named differently based on the company that created the technology. Additionally, it is possible many new technologies have been released since previous studies were conducted. We now know that early childhood Deaf educators are

utilizing a wide variety of technology in different formats (e.g., mobile phones, apps, video conference calls) across all Deaf educational settings.

Frequency of Technology Utilization

In addition to understanding the types and names of technology educators used to communicate with caregivers of Deaf children, it was also important to know to what extent the technology was being utilized. Roughly 47%-50% of educators reported utilizing some form of technology at least once per week to communicate with caregivers. This expands the findings of previous studies (Beaumont-Bates, 2017; Lim & Cho, 2019; McFadden & Thomas, 2016) they did not examine how frequently communication was occurring through technology between school and home. The weekly frequency in which half of educators are communicating with Deaf children's caregivers is promising evidence. It is possible that there may be additional communication occurring with caregivers in person. More research is needed to have a full picture of all the ways educators and caregivers of Deaf children communicate with one another.

Apps and websites were the most frequently used technology by educators in residential/day programs. In these settings with educators self-selecting technology and using technology selected by district/administrators, there may be additional technologies used across the entire school in these settings that educators are expected to use (e.g., school email). Educators in these settings may also be utilizing apps/websites that include more visual information or resources (e.g., videos) that are shared with caregivers. It is important to note that the apps/websites utilized by early childhood Deaf educators may have been used on mobile phones or like-devices.

In itinerant/mainstream and outreach settings, mobile phones were the technology used most frequently. One educator in particular reported not having access to the same technology as the educators in the general education setting. It is possible other educators from itinerant/mainstream settings self-select technology for a similar reason.

Importance of Sharing Language and Literacy Resources

As previously mentioned, Deaf children having early access to ASL and literacy to support their acquisition of language and development of literacy skills is paramount (Mayberry, 2011; Scott, 2022; Scott & Hoffmeister, 2017). Caregivers and early childhood educators are the main contributors to Deaf children having consistent access to visual languages, spoken languages, and literacy in the home and in educational settings. It is through the formation of their communities of practice they can provide Deaf children early access to ASL during the critical period of language acquisition and mitigate the threat of language deprivation (Gulati, 2019; Hall et al., 2017) and set Deaf children up for successful outcomes (Calderon, 2002; Golos & Moses, 2013; Kuntze & Golos, 2021; Mayberry et al., 2011).

It is essential for educators of Deaf children to provide language and literacy resources to caregivers regularly to promote Deaf children's access to ASL and literacy within the home. The practice of educator-caregiver communication through technology within their CoPs is one way these resources can be shared.

Sharing Language and Literacy Activities

In this study, how educators used technology to share language and literacy resources (including ASL resources) with caregivers was explored. Findings showed half of the educators were utilizing technology weekly for communication to engage with caregivers to communicate

about language and literacy. This can provide caregivers the opportunity to have insight into their Deaf children's learning experiences in the classroom. While findings from prior research with hearing children found that educators were regularly sharing information with caregivers (Beaumont-Bates, 2017; Goodman & Cherrington, 2015; Hooker, 2019; McFadden & Thomas, 2016; Lim & Cho, 2019), this study sheds new light on how educators share resources specific to language and literacy in early childhood Deaf education settings.

Educators in this study shared language and literacy activities through different resources such as pictures, videos, and written information with caregivers. This is similar to findings from previous studies with caregivers of hearing children (Beaumont-Bates, 2017; Higgins & Cherrington, 2017; Hooker, 2019; Oke et al., 2021; Lim & Cho, 2019; Özkan Yıldız &Yılmaz, 2021). In Hooker (2019) caregivers could access children's "learning stories' through e-Portfolios at home, look at the "learning story" together and the child would recall information from their classroom learning experience. In past studies that used e-Portfolios (e.g., Beaumont-Bates, 2017; Higgins & Cherrington, 2017; Hooker, 2019); researchers found caregivers and children could then have extended conversation about their learning, thus increasing their communication and expanding the child's learning about specific topics as the caregiver and child now had a shared information and knowledge about the child's classroom experience. Thus, sharing these resources with caregivers of Deaf children may create opportunities for caregivers' to be connected to their Deaf children's education through these varying mediums (e.g., pictures, videos).

Additionally, if educators are sharing language and literacy resources and information with caregivers, this may indicate that caregivers may in fact be utilizing written language as a

modality with their Deaf children at home. Yet, few educators reported caregivers' utilizing written language as a modality with their Deaf children. It may be important in future research to gather more information about how written language(s) are or are not utilized in Deaf children's homes with their caregivers.

Sharing ASL Read Alouds and Educational Media. Some educators shared read alouds in ASL and new vocabulary in ASL at least once per week with caregivers. While only 13 educators shared new vocabulary words in ASL, this was the most frequently shared resource in a week. ASL read alouds was the second most shared resource but was only shared by approximately 24% of educators weekly. Past research (Moses et al., 2018) indicates most educators are discussing new words and reading books daily or several times a week with Deaf children. In this study, it is unknown if the shared vocabulary words in ASL and the ASL read alouds were the same language/literacy activities used in their instruction of Deaf students, but it is encouraging to see at least some educators sharing these resources with caregivers.

Similarly, educators reported sharing educational media in ASL, but few do so at least once a week. This aligns to the findings in Golos et al., (2018) where only a small portion of educators were engaging Deaf children in watching educational media in ASL weekly.

Sharing ASL Stories and Songs. We know (Golos et al., 2018) that ASL stories and songs (e.g., ASL rhyme/rhythm, ABC/number/handshape stories in ASL) are only utilized by a small number of early childhood Deaf educators in their classrooms (Golos et al., 2018). These activities support the acquisition of ASL and the development of literacy skills (Holcomb, 2023; Holcomb et al., 20223; Moses et al., 2015). However, prior to this study, it was unknown if these ASL resources were being shared with caregivers to support language and literacy in the home.

ASL resources such as rhyme/rhythm in ABC/number/handshape stories in ASL were shared by four educators at least once a week. This low number resonates with findings in Golos et al., (2018) where only a few educators were engaging children with ASL stories and songs in the classroom weekly. More information is needed to better understand the extent to which these resources promote language acquisition in ASL and literacy development in the home and why educators are not sharing ASL resources. However, some educators did report that they did not share ASL resources due to caregivers' lack of proficiency in ASL, vocabulary, grammar, and background knowledge about Deaf culture.

Responding to Caregivers About Language and Literacy

This study expands on prior research by exploring the frequency educators in early childhood Deaf education respond (i.e., viewing messages, making comments, and asking questions about language and literacy) to caregivers and how they vary by educational setting. The data from educators working in residential/day programs showed they responded to caregivers more frequently than educators working in other settings (i.e., at least once per week) compared with educators in the itinerant/mainstream settings (i.e., less than once per week). More information is needed to understand why this is occurring. Oke et al. (2021) found particular barriers such as environmental, attitudinal, structural, cultural and others hindered school-home connections and caregiver involvement. It is possible that barriers similar in nature exist in early child Deaf education between home and school, which could impact how educators working in different settings are responding to caregivers.

Sharing Language and Literacy Activities Across Settings

Across educational settings, educators varied to some extent on how frequently they shared language and literacy classroom information and activities (e.g., photographs/videos, read alouds, ASL stories and songs) with caregivers. In these variations, it is important to note the low number of educators sharing these language/literacy activity resources across settings. The number of educators frequently sharing these resources weekly was never higher than 15% of educators, a very small portion of the respondents.

There were no educators in self-contained/resource settings who reported sharing language/literacy activities with caregivers weekly. Half of educators in residential/day shared read alouds in ASL most frequently followed by shared vocabulary being the next most frequently shared activity. Read alouds were only shared by one educator in outreach/consultant settings weekly. New vocabulary in ASL was shared the most by itinerant/mainstream educators, followed by residential/day programs, and outreach/consultant. Educational media in ASL was only shared by educators in residential/day and mainstream/itinerant settings at least once per week. ASL stories and songs were shared by educators in all settings least frequently in one week.

While there was variation by educational settings, most educators across settings were not sharing language and literacy activities through technology weekly. This could be due to the limited ways they may be engaging in language and literacy activities in their classrooms (Golos et al., 2018; Moses et al., 2018), which may be why these resources are not being shared with caregivers frequently. However, it is also possible some of these activities are being shared in other ways by educators.

In regard to the sharing of ASL read alouds with caregivers, residential/day programs again showed a statistically significant higher frequency of sharing these resources than educators from other settings. This may be due to more educators who use ASL in their instruction often being employed in residential/day programs (Golos et al., 2018) and they may utilize more visual languages and visual resources for communication with caregivers about language and literacy.

The results of the statistical analyses by educational setting may not provide a full picture of what is occurring due to the small number of respondents from self-contained and outreach/consultant programs. Additionally, there are varying perspectives on the minimum assumptions that need to be met with the chi-square test of independence in order to determine if there are associations between two variables. McHugh (2013) indicated there is a need for the value of the cells to be a minimum of five while Turhan (2020) suggests the value should be no less than ten. Neither of the recommended minimum number of respondents was met for outreach/consultant settings, (n=3). However, self-contained settings had (n=6) which is on the cusp for the recommendations by McHugh (2013), but below that of Turhan (2020). The analysis indicated no statistical significance for educators from the self-contained setting for sharing language and literacy and ASL resources. It is possible that this might be due to the number for this setting being too low to meet the assumption of the chi-square test.

If educators are or are not regularly engaging Deaf children in these language and literacy activities in their classroom (Golos et al., 2018; Moses et al.; 2018), this may be one reason that educators share language and literacy activities less frequently with caregivers. The low frequency in which information and resources about language and literacy classroom activities

are shared requires further investigation as to why this is happening in varying settings. Utilizing and having these resources readily available and accessible to caregivers through technology can allow caregivers the opportunity to use information and resources about Deaf children's classroom experiences to extend learning and communication in the home with their child.

Deaf children who are at-risk for language deprivation due to lack of early exposure need their caregivers to have access to high-quality resources, research-based information, and strategies in a caregiver-friendly format that can support the Deaf child's acquisition of a visual language and literacy in the home alongside their caregivers and with their home languages. Educators who utilize technology in a multimodal way have the potential to provide caregivers with information, resources, and opportunities in an efficient way that may not be otherwise possible. For example, some educators stated caregivers live far from the school setting or are unable to connect with the teacher in-person. Technology provides an alternative pathway for communication, information, and resources to be shared with caregivers.

If ASL is not a language used by the child or caregivers, this is a probable reason for educators not sharing ASL resources for language acquisition and literacy development. We know about the importance of early access to ASL and the implications for Deaf children who do not have early access to ASL in early childhood (Gulati, 2019; Hall; 2017). While caregivers' needs for information and resources may vary slightly depending on the educational settings, too often ASL is not shared because it is not the selected language for the child to use. However, educators can change the problematic binary "this *or* that language" narrative in early childhood Deaf education by using ASL with Deaf children and sharing language and literacy resources in

ASL (and other languages) with caregivers to support Deaf children's acquisition of language and literacy development.

To summarize, only a few educators are sharing language and literacy resources with caregivers across educational settings. Due to the wide variety of technology and differences in how it is utilized by educators, more research is needed on what types of language and literacy resources are being shared with caregivers and how that information is received and used in home settings. Early childhood educators of Deaf children and caregivers likely vary in the practices of sharing information based on the educational settings and the languages and communication modalities utilized in those settings and the homes of caregivers. Additionally, if educators are not utilizing technology to communicate with more than half of their students' caregivers, more information is needed to understand if educators and caregivers of Deaf children are communicating and sharing language and literacy resources with caregivers to support the early acquisition of visual language and literacy development outside of the use of technology. Likewise, it would be of interest to know and understand why they are not communicating through technology, though the challenges of utilizing technology allude to these possibilities.

Benefits and Challenges of Technology for Communication with Caregivers

Numerous challenges and benefits about using technology were identified in previous literature with hearing populations (Beaumont-Bates, 2017; Higgins & Cherrington, 2017; Penman, 2014; Stratigos & Fenech, 2021). These benefits and challenges guided content within the survey questions to determine educators' perceptions and beliefs about what technology

could improve or increase relative to educator-caregiver communication, caregiver knowledge, and their communication in their homes with their Deaf children.

This study provides preliminary evidence that early childhood Deaf educators generally hold positive perceptions about technology. The responses to open-ended questions about educators' biggest challenge and benefit in utilizing technology for communication allowed for a closer look to see if there were any similarities or differences between these responses and their perceptions about technology and communication. There was considerable overlap between the findings of educators' perceptions and the benefits/challenges reported in the open-ended questions. This information provides a better understanding of how technology contributes to CoPs within early childhood Deaf education as well as the differences by educational settings.

Benefits and Challenges of Technology Improving Educator Communication and Connection with Caregiver

Technology provides a pathway for educators and caregivers to connect and communicate in effective ways that would otherwise not be possible for some. All educators indicated technology improved their communication with caregivers either slightly/moderately or greatly. Most educators indicated technology improved their understanding of caregivers whose first language was not ASL or English and the understanding of the Deaf child within the context of their home. Educators' reported improvement in communication and connection with caregivers due to technology relates to the community component of CoPs. Technology provides the opportunity for connection and partnership with caregivers. This may be key in establishing CoPs in early childhood Deaf education.

Establishes home-school relationships. Similar to findings in past studies about home-school relationships (Beaumont-Bates, 2017; Goodman & Cherrington; 2017; Higgins & Cherrington; 2017; Hooker, 2019) educators in this study reported utilizing technology for communication established home-school relationships was a benefit. This benefit affirms the notion that educators and caregivers in early childhood Deaf education can be creators of their community in CoPs. In these established relationships, communication between educators and caregivers can occur through technology and is an opportunity for language and literacy resources to be shared. It is not yet known the extent to which these relationships between school-home exist, and leaves much to be explored.

Although many educators indicated the technology improved communication, some educators reported challenges related to their communication with caregivers who were not ASL or English users. Some educators also did not agree with the benefit that communicating through technology improved their understanding of the Deaf children and their families in their homes.

Language and literacy barriers. The challenge educators reported regarding barriers to language and literacy barriers stemmed from educators not sharing a common language with caregivers and may be why some educators disagreed about improved connections or understanding of Deaf children in their home. Some educators expressed that they were reliant on translation tools within the technology or third-party interpreters. However, the translation tools were not always accurate in the translation of messages or the option to translate to particular home languages was not an option. The selected technology's translation tools (of lack of) may have impacted educators' ability to effectively and accurately communicate with

caregivers, thus impacting their ability to connect and develop an understanding of the family communication in their home.

Educators also shared some families did not have written home languages or that caregivers were limited in their literacy skills. These language and literacy barriers were not identified in previous research related to the use of technology; however, these barriers were found to exist in early childhood outside of technology (e.g., cultural barriers) in Oke et al. (2021).

Inconsistent use and lack of response. Technology used as a practice of communication in CoPs between educators and caregivers is dependent on how both utilize the technology. Substantial differences in utilizing the technology may impact how two-way communication occurs. Similar to previous studies (Lim & Cho, 2016; McFadden & Thomas, 2016; Penman, 2014; Stratigos & Fenech, 2021), the "lack of caregiver response" was a recurring challenge. The lack of responses from caregivers may be a reason some educators disagreed that their connection with caregivers and understanding of the Deaf child in the home context did not improve. A lack of response from caregivers impedes the opportunity for establishing home-school relationships and communication. These challenges related to the establishment of school-home relationships warrants continued investigation.

Benefits and Challenges of Technology Increasing Caregiver Knowledge and Communication with their Deaf Child

In hearing populations, educators are sharing children's classroom learning experiences with caregivers through technology (Beaumont-Bates, 2017; Goodman & Cherrington; 2017; Higgins & Cherrington; 2017; Hooker, 2019) such as through videos on e-portfolios (Hooker,

2019). Through this practice, Hooker (2019) and others (Higgins & Cherrington, 2017) have demonstrated that caregivers learn about their children's classroom experiences and engage their children in conversations that expand their learning in the home (Higgins & Cherrington, 2017; Hooker, 2019). In Deaf education, prior to this study, there was evidence that educators engaged children in language and literacy activities and had extended conversations in the classroom (Moses et al., 2018) but little was known about how these impacted interactions in the home. This study provides a first look at educators' perceptions about whether communication through technology may increase caregiver knowledge, and communication with their Deaf children.

  Sharing information through multiple languages and modalities. One of the benefits reported consistently by educators was that technology provides different avenues for educators to share information and resources and for caregivers to receive information through different forms such as pictures, videos, and translated messages. If caregivers are able to access information and resources within their preferred language and/or modality, this may increase their knowledge about classroom learning experiences and resources and provide caregivers opportunities to communicate and/or utilize the resources to increase their communication with their Deaf child.

  Almost all educators agreed technology was accessible for caregivers whose first language was not spoken English and for people who are Deaf. The different ways information could be communicated through technology may have made it easier for caregivers who did not use ASL or English as first languages to access information through visual means rather than written communication, thus potentially helping them to have a better understanding of their Deaf child's learning. Only a few educators from itinerant/mainstream settings disagreed that

technology accessible for caregivers whose first language was not ASL or English and/or for Deaf people who use ASL. It is unknown why a few educators disagreed with this benefit.

Educators who share language and literacy resources in ASL through technologies with features that include visual information, such as videos, may be helpful in making Deaf children's learning visible to caregivers. Oke et al., (2021) found the same benefit of visibility of student learning when it was shared with caregivers through technology. Communicating through technology solely through writing (i.e., without additional visuals) may not be as effective when communicating with caregivers who have preferred languages other than written English.

Expansion of learning and communication. Most educators across all settings agreed to some extent that a benefit of using technology to communicate was that it increased caregiver knowledge about language/literacy classroom activities and/or language/literacy development and increased their communication in the home with their Deaf child. Similarly, educators reported that utilizing technology allowed them to share information and resources that support language, literacy, communication. They believed this increased caregiver engagement in their Deaf child's education. These echoes findings of technology benefits in previous studies (Beaumont-Bates, 2017; Higgins & Cherrington; 2017; Goodman & Cherrington; 2017; Hooker, 2019) with hearing populations.

Although there is not yet evidence on how caregivers are utilizing technology to expand learning and communication in the home with their Deaf children, educators' responses related to benefits of the technology allude to the opportunity. Much more information is needed from

both educators and caregivers to determine the extent of this benefit about communication and learning being expanded in the home through access to resources shared by educators.

Only a few educators working in itinerant/mainstream settings did not agree that a benefit of technology was that it increased caregiver knowledge and communication with their Deaf child. Though it is unclear as to why itinerant/mainstream educators do not agree with this statement, two challenges arose from educators across settings that may be relevant.

Lack of access to technology and lack of proficiency. Two prominent challenges were reported by educators, which were caregivers' lack of access to technology and lack of proficiency in utilizing the technology. These may be reasons why some educators disagreed that technology increased caregiver knowledge and caregiver-child communication. Caregivers without access to technology or proficiency with it may be missing key information being shared by the educator that can support language/literacy in the home.

Several educators in itinerant settings mentioned they utilized technology based on caregiver preferences, to accommodate caregivers and the technologies they already have access to and are proficient in. This requires educators to be flexible and familiar with a wide array of technology.

The educators' disagreement with expanded learning and communication raises a question on whether the challenges (e.g., lack of/inconsistent response, caregivers' lack of access or proficiency with technology) may all contribute to reasons why educators disagreed that technology increases caregiver knowledge and communication with their Deaf child. This variation of some educators agreeing and some disagreeing about if and what technology can increase for caregivers and Deaf children is important to consider and requires a deeper

understanding as to why this variation exists. Having a better understanding of caregivers' perspectives may help determine the extent technology can increase caregiver knowledge and/or communication with their Deaf child. It would also be important to know what it is about educators' (and caregivers') practice of utilizing technology for communication that is not increasing caregivers' knowledge and communication with their Deaf children.

Benefits and Challenges of Technology for Efficiency of Communication

All educators believed technology to generally be a benefit in regard to being easy to use, a time saver, secure, etc. which was also found in previous studies (Beaumont-Bates, Higgins & Cherrington, 2017; Hooker, 2017). The efficiency of using technology may contribute to the establishment and maintenance of school-home relationships so educators can effectively communicate and engage with caregivers to share their knowledge about and communicate shared interests related to the Deaf child's language and literacy development. This also may provide a pathway for educators to equip caregivers with resources to support their Deaf child's acquisition of language and literacy skills in the home.

Time. Time appeared as both a benefit and a challenge in this study, although all educators agreed with the statement that technology was a "time saver.". Beyond educators' agreement that technology for communication is a time saver, the extent of the benefit is unknown. However, many open-ended responses stating "quick and easy" may be associated with the benefit of time.

Time was also reported as a challenge by some educators. One of the challenges educators mentioned across educational settings was the lack of time they had to compile resources and craft messages for caregivers, respond to caregivers, and even learn the

technology. Time was also a reason some educators did not share ASL resources. Educators reported they need time to ensure they can gather the most high-quality resources and share these with caregivers in ways that are applicable to the Deaf child's home setting.

Educators in previous literature also indicated challenges with time related to communicating with caregivers through technology. For some, the technology required time to upload items (Beaumont-Bates, 2017). For others, communication with caregivers through technology required more time (Higgins & Cherrington, 2017). Time may be both a benefit and challenge depending on the context of how technology is being used. Further exploring the benefits and challenges associated with time for educators and caregivers may be important in understanding how time can influence educator-caregiver communication.

Additional Challenges of Technology for Communication

Infringement on boundaries. Some educators reported utilizing technology led to an infringement on boundaries for educators. Evidence of boundary infringement appeared in prior studies as well (Beaumont-Bates, 2017; Hooker, 2017) and particularly when educators used educational apps in early childhood to communicate (Stratigos & Fenech, 2021). While technology may be beneficial and convenient in many aspects for communication with caregivers, this may be an important challenge for educators to be aware of when utilizing technology and require educators to consider ways to prevent boundary infringement when selecting and using technology.

To summarize, there is a glimmer of evidence that the practice of communication through technology may support the domain in educator's-caregivers' CoPs in early childhood. Digging further into the educators' perceptions of the challenges and benefits they experience in using

technology for communication may provide further evidence for how educators' practices contribute to the domain in their CoPs.

Supporting Access to ASL in Early Childhood CoPs

Prior to this study, there was minimal evidence about how educators in early childhood Deaf education were communicating with caregivers of Deaf children through technology as well as their perceptions about the benefits and challenges of this practice. However, research on educator-caregiver communication through technology in early childhood for hearing populations has repeatedly shown promising evidence of benefits. One benefit in particular was children having increased communication and extended learning opportunities in the home with caregivers (Beaumont-Bates, 2017; Chen & Lin, 2022; Hooker, 2019; Higgins & Cherrington, 2017; Penman, 2014). This benefit as well as the others found in the literature provided insight into how technologies may contribute to the engagement of educators and caregivers in their CoPs and how this practice supports children in their learning and development within their school and home settings which led to this current research in early childhood Deaf education.

From this study, we have evidence early childhood Deaf educators are using technology as a practice for communication with caregivers across educational settings to varying degrees and frequencies. Some educators are creating and extending learning opportunities by sharing ASL resources to support Deaf children's early access to ASL and literacy development in the home, which is the domain. This is a compelling finding as it means there are likely more educators in early childhood Deaf education who are also extending learning opportunities into home settings to support language and literacy for Deaf children.

Many of the challenges educators (e.g., language/literacy barriers, lack of access and proficiency with technology) identified were similar across educational settings regardless of the languages and modalities they used to communicate with caregivers. Despite the challenges of utilizing the technology, the similarities in the benefits (e.g., sharing information through multiple modalities, establishing home-school relationships) across educational settings are promising. These benefits support the practice of educators utilizing technology to build connections between the school and home and share language and literacy-specific resources in ASL.

It is through the practice of regularly communicating using technology that both educators and caregivers can have a more consistent and better understanding of home-school settings and can promote ongoing communication and caregivers' contribution to their children's education and language development. Educators and caregivers who have developed a community based on their interests, concerns, or goals related to Deaf children's language acquisition and literacy development (the domain) must interact regularly in order to share their knowledge and experiences relative to the Deaf child.

The new knowledge from the findings leads to more questions about educators' current practices and utilization of technology for communication and relationships between home and school. We need to delve deeper into educator-caregiver practices in order to build on this new evidence of how they are using technology to support early access to ASL for Deaf children's acquisition of language and literacy development, the benefits, challenges, and how communication practices vary across educational settings in early childhood Deaf education.

Limitations

There are several limitations to this study. Attrition and non-response errors are natural occurrences to this method of research. There were 89 individuals who started the survey, while only 46 educators completed the entire survey. This small sample size (N=46) was similar to the Moses et al. (2018) study which had N=62 early childhood educators of the Deaf. The responses from the study were also not equally representative of all educational settings or regions with almost half of the respondents reported serving in itinerant settings and a greater percentage of respondents from the Midwest region. Larger samples representing all early childhood Deaf educational settings and all regions of the United States are necessary to better understand how early childhood educators are utilizing technology for communication with caregivers across the various settings in Deaf education.

Another limitation was that the participants in this study self-identified and screened themselves through the eligibility criteria for the survey. The reliability of the data is dependent on respondents accurately identifying themselves as educators of Deaf children ages 3-8 years old and as users of technology for communication with caregivers. Self-identification could have led to some errors in the screening process. This was evident when three participants who were not eligible based on the study's exclusion criteria and screening description took the survey. Due to this error, they were removed from the final results. It is also possible educators who already actively use technologies for communication with caregivers were more inclined to respond to the survey.

Some educators may have had differences in how they interpreted the questions, and their responses were reflective of their perspectives and experiences. Additionally, the responses to

the survey questions may not fully capture how educators utilized technology for communication with caregivers across early childhood educational settings for the Deaf. These limitations lead to the next steps of future research in early childhood Deaf education.

Implications for Practice

Based on the challenge related to caregiver lack of access and proficiency for technology, it may be important for educators and administrators/districts to consider what technologies caregivers of Deaf children have access to when selecting technologies for communication. If technology is being selected by educators and administrators/districts for educator-caregiver communication, it is essential these programs ensure caregivers have consistent and equitable access to Wi-Fi/mobile data and devices for accessing technology platforms that allow for communication in their preferred languages. This is especially essential if there is an expectation of two-way communication within a CoP. Adopting technologies for communication that do not take into consideration accessibility (especially for caregivers who use languages other than ASL or English) and caregiver proficiency may be unhelpful in creating a connection between school and home.

It may also be important for educators to consider and reflect what types of resources are being shared in their CoPs with caregivers in regard to language, literacy, and ASL resources. ASL resources (e.g., ASL stories, songs and read alouds) are excellent resources for supporting acquisition of a language and literacy development for Deaf children. Yet it appears these resources may not be being fully tapped into. Educators mentioned the challenge of finding resources, yet there are multiple high-quality resources available. For example, Deaf creators have developed *Hands Land*, a series of rhyme/rhythm songs in ASL (Holcomb et al., 2018).

Educational media such as *Peter's Picture* (videos and app games; Golos, 2011, Golos et al., in press) incorporate ASL, vocabulary, and printed English by incorporating research-based strategies in interactive ways for Deaf children to develop language and literacy skills. These ASL resources also provide fluent language models and Deaf role models (Kuntze et al., 2021) and educators can use them with Deaf children to support language acquisition and literacy development.

It is important these ASL media resources be shared with caregivers (and ultimately Deaf children). Many of these interactive educational resources (i.e., *Hands Land*, *Peter's Picture*) are designed in a way that can be utilized both in the classroom and in Deaf children's homes by children independently as well as with caregivers (and the wider family unit). There is a need for better understanding about how education resources in ASL can be shared with caregivers through technology regularly and in turn support the acquisition of a Deaf child's language and literacy skills in early childhood, regardless of caregivers' proficiency in ASL.

In regard to the challenge of time, it may be important for educators to have time allotted within their workdays/weeks to ensure they are able to dedicate their energy into building and maintaining strong relationships with Deaf children's caregivers. Additionally, administrators could consider allocating time for teachers to find, create, locate, and share reputable ASL resources and educate caregivers on how to utilize the resources in the home for supporting language, literacy, and communication.

Implications for Future Research

Technology is a promising option as part of the communication practice within CoPs in early childhood. Based on findings from this study, educators perceive that technology can

improve educator-caregiver communication, establish home-school relationships, and has the potential to have a positive impact on Deaf children's acquisition of ASL, other languages (signed and spoken), and literacy development.

Having a larger survey sample with more equal representation of educators from all early childhood Deaf educational settings across the United States would be important in these future survey studies. Additionally, exploration of how educators and administrators/districts select, implement, and adopt technology for educator-caregiver communication in educational settings would be another area to investigate.

Currently, it is unknown if the resources shared by educators are representative of their students' language and cultures. To get a deeper understanding of what ASL resources are being utilized in the classroom and educators' practices in sharing resources with caregivers, classroom observations of Deaf children engaging with these resources may be important. Next, when educators share ASL resources through technology platforms (like apps), researchers could analyze what ASL resources are being shared, how they are being communicated, and quantify the frequency in which they are sharing these resources with caregivers.

Interviews and focus groups with educators who do share ASL resources with caregivers and those who do not share ASL resources may be another important step to help expand current knowledge about how these resources are or are not utilized to support language and literacy development. Furthermore, more information could be gathered as to how educators support caregivers who do not use or have access to technology for communication and ASL resources.

There is also a need to expand the research to include caregivers. Through technology such as apps like Seesaw or Class Dojo researchers could also analyze caregivers' responses

(e.g., viewing/not viewing, commenting/asking questions/not engaging) to ASL resources and their communication with educators. This may tell us more about the overall practice of using technology in CoPs. Additionally, researchers could observe in-home or recordings of caregivers utilizing ASL resources to engage their Deaf children. This may provide a better understanding of language and literacy interactions in the home. Similar to educators, interviews or focus groups with caregivers would be beneficial to gain a better understanding of their use of technology. This also would provide more information about what they perceive to be benefits and challenges. Having a better understanding of caregivers' perspectives may provide more information about the challenges identified in this study and why they exist. This exploration may shed light as to why caregivers are not responding. This may also help determine if the language/literacy barriers and/or lack of access and proficiency to technology mentioned by educators in this study in fact do contribute to the lack of response or if there are alternative reasons that may be new unidentified challenges. Understanding caregiver practices and perceptions in using technology for communication are critical to getting a full picture of educator-caregiver communication and CoPs in early childhood Deaf education.

Further exploring the current practices within CoPs of early childhood educators and caregivers of Deaf children can provide a better understanding of how and why they regularly utilize technology for communication. An important next step for researchers is to take a closer look at how educator-caregiver engagement and communication is centered around the development of the Deaf child and ultimately study the impact these practices have on Deaf children's acquisition of language and development of literacy skills.

A critical step in expanding future research is to ensure Deaf individuals (i.e., researchers, educators, ASL experts) are considered and included in the development and design of future research studies within the field of early childhood Deaf education. The design and development of this survey was done in collaboration with Deaf professionals in education with expertise in ASL and experience in survey design. The survey being accessible in both ASL and English provided an opportunity for those who use ASL as their first language to participate similarly to their hearing peers who use English as a first language. Based on the feedback for survey format in ASL and English, about half of the participants reported they used both ASL and English to access the survey questions. We know from this feedback that the design of the study in ASL and English was integral based on the number of participants' preferences for accessing the questions. It is important to recognize that only a small percentage of participants were Deaf or Hard of Hearing, yet almost half of the respondents indicated they accessed the survey questions using ASL and English. This indicates that designing survey questions to be accessible in a visual format like ASL may benefit more than just Deaf and Hard of Hearing people.

The feedback for the Likert scale response items format preferences were inconclusive due to potential varied interpretations of the question. Despite not having clear conclusions about the visual format of the survey, we know from the Deaf pilot participants, there was a preference for visual formats, and this should always be a consideration when developing research studies about Deaf people. This can be achieved by collaborating with Deaf experts and ensuring their views and perspectives in research are prioritized.

Conclusion

This study is one of the first in the field of early childhood Deaf education to examine the current state of educator-caregiver communication practices through technology. It complements previously established research in early childhood education with hearing populations (Beaumont-Bates, 2017, Higgins & Cherrington, 2017; Hooker, 2019, Oke et al. 2021) and expands that research to include early childhood Deaf education. Results provide evidence of the many types of technologies being utilized by educators of Deaf children for communication with caregivers and how they are being used to share information and ASL resources to promote and support early acquisition of ASL and literacy development in their homes with their caregivers. The findings of this survey study give initial insight into early childhood Deaf educators' perceptions of the technology they use for communication as well as the benefits and challenges of utilizing technology to communicate with caregivers of Deaf children.

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Appendices

Appendix A: English Version of Survey of Educators of Deaf and Hard of Hearing Children

ASL version of the survey can be viewed by reaching out to Brynn Roemen (she/her/hers) by email at roeme017@umn.edu

It is recommended you are using a laptop or computer for this survey. This survey is available in both ASL and English. You may find it helpful to increase the size of your screen as needed in sections of the survey. You will see the following sections as you navigate through the platform. Please be sure to read through each section carefully and reach out with any questions.

- Letter to Educators
- Eligibility Criteria
- Consent Statement
- Terminology Definitions
- **Survey**
- Feedback
- Future Research Information Compensation Information
- Thank You & Exit Page

Hello Wonderful Educator!

My name is Brynn Roemen and I am a doctoral candidate at the University of Minnesota studying Deaf Education/Special Education. I was an early childhood educator of Deaf children prior to starting my PhD journey. My Deaf students and their families are the inspiration for this research study!

If you are an educator of Deaf and Hard of Hearing children (ages 3-8) (e.g., early childhood, kindergarten, elementary, etc.) and use technology to communicate with Deaf students' caregivers (i.e., parents/legal guardians), I request your participation in this study.

Please read through the definitions below and the information and research information and consent statement on the next pages. Your participation and sharing of your experiences utilizing technology for communication with caregivers of Deaf and Hard of Hearing children is welcomed and greatly appreciated!

<u>Definitions To Know</u>
For the purposes of this study, I am intentionally using the term **Deaf** to encompass all individuals with varying identities, languages (signed, written, spoken), cultures, abilities, and home languages (Kurz et al., 2021).

Caregiver is defined as any adult person(s) who provides daily care, and guardianship, and is the authorized person responsible for the Deaf child. Generally, this means parents or legal

guardians.

Technology is defined as any digital tool which can be used to communicate. This can include, but is not limited to emails, texting, phone calls, video calls, apps, websites, etc.

Communication is defined as, one or more people (i.e., educators and/or caregivers) contact one another through the actions of calling, sending messages, pictures, videos, announcements, notifications, attachments/files, clicking "like", writing or signing comments, responding to questions. Communication can occur in multiple ways through:

One-way communication: the educator or caregiver contacts the other person and does not receive a response.

Two-way communication: the educator or caregiver contacts the other person and receives a response.

Non-existent communication: neither the educator nor the caregiver contacts the other person.

2. Re Please indicate your human status.
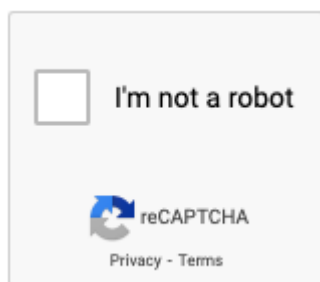
3. You must meet the following criteria to participate in the survey: You are an educator and serve children who are ages 3-8 years old and are Deaf and/or Hard of Hearing (e.g., early childhood, kindergarten, elementary, etc.). This can include ANY educational setting (e.g., residential/day programs, itinerant, self-contained, resource room, etc.)

- You utilize technology to communicate with caregivers.

In order to continue to the research information and consent statement, please indicate your role as an educator serving Deaf and Hard of Hearing children ages 3-8 years old. *Check all that apply.*

 If you do not serve in one or more of these roles that serve 3-8 year old Deaf and Hard of Hearing children, unfortunately, you **do not qualify** to participate in this survey.

☐　　　　　I **am** an **early childhood educator** of Deaf and Hard of Hearing children

☐   I **am** a **kindergarten educator** of Deaf and Hard of Hearing children.

☐   I **am** an **elementary educator** of Deaf and Hard of Hearing children.

☐   I **am** an **educator** of Deaf and Hard of Hearing children and serve across multiple ages groups (e.g., early childhood through transition ages)

☐   ⊗I **am NOT** an educator of Deaf and Hard of Hearing children between the ages of 3-8 years old.

Honeypot Question

Please list the specific grade levels you teach (e.g., Pre-K, Kindergarten, 1st grade, etc.)

_____

4. Please indicate whether you use technology to communicate with caregivers of your Deaf and Hard of Hearing children (ages 3-8).

If you do not use technology to communicate with caregivers of Deaf children (ages 3-8), unfortunately, you **do not qualify** to participate in this survey, but your consideration for participation is appreciated!

    o I **use** technology to communicate with caregivers.

    o I **do not** use technology to communicate with caregivers.

INFORMATION AND CONSENT FOR RESEARCH
You are invited to participate in this survey for early childhood educators of Deaf children. You were selected as a potential participant because you self-identified as an early childhood, kindergarten, or elementary educator of Deaf children (ages 3-8) years old and use technology to communicate with caregivers of Deaf children. We ask that you read this information form for research and ask any questions you may have before agreeing to be in the study.
This study is being conducted by Brynn Roemen, a PhD candidate under the supervision of Debbie Golos, PhD in the Department of Educational Psychology at the University of Minnesota.

Background: The purpose of the survey is to gather information about early childhood, kindergarten, and elementary educators' experiences regarding utilizing technology (i.e., apps, email, phones, websites, etc.) for communication with their students' caregivers. Educators will answer questions regarding their personal experiences using these technologies and perceptions of utilizing them for educator-caregiver communication.

Procedures: If you agree to be in this study, we will ask you to do the following:
        Complete a 30-35 minute survey about your experience using technology to

communicate with caregivers of your Deaf students (ages 3-8). The questions will be available in ASL and English.

- We recommend using a laptop or computer to take the survey
    Participants who complete the entire survey will be eligible to receive a $10 Amazon gift card.

Confidentiality: During the project, information from this study will be anonymous, kept private, and stored securely. Only the research team will have access to information that identifies you. Your identifying information will not be shared with others outside of this research study. However, organizations that may inspect and copy your information include the Institutional Review Board (IRB), the committee that provides ethical and regulatory oversight of research, and other representatives of this institution, including those that have responsibilities for monitoring or ensuring compliance (such as the Quality Assurance Program of the Human Research Protection Program (HRPP)).

If you choose to share any personal or identifiable information, this will be kept strictly confidential and will be de-identified in the final results. In order to be eligible to receive the $10 Amazon gift card for completion of the survey, you will be asked to share contact information, but this will not be used as part of the survey results. Additionally, if you are interested in being contacted in the future about research that is similar in nature to this study, you will be given the option to provide contact information. Any personal information that could identify you will be removed or changed before we publish any report or share the results or data from this study. The results from this survey will be used in Brynn Roemen's dissertation and may be submitted for publication at a later time.

Risks and Benefits of Being in the Study: There are no immediate or expected risks for participating in the survey. There are also no immediate or expected benefits for you for participating in the survey aside from self-reflection on how you utilize technology for communication and exposure to ASL. Your participation will allow the researchers to learn more about educator-caregiver communication through technology and contribute to the limited research in the field of Deaf education.

Voluntary Nature of the Study:
Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with the University of Minnesota. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

Will I be compensated for my participation?
If you agree to take part in this research study and complete the entire survey, we will pay you with a $10 Amazon gift card for your time and effort.

Contacts and Questions:
The researcher(s) conducting this study is (are): Brynn Roemen, PhD Candidate and Debbie Golos, PhD and supervisor. You may ask any questions you have now prior to completing the

survey or later, you are encouraged to email Brynn Roemen (she/her/hers) at roeme017@umn.edu and/or Debbie Golos (she/her/hers) at dgolos@umn.edu.

This research has been reviewed and approved by an IRB within the Human Research Protections Program (HRPP). To share feedback privately with the HRPP about your research experience, call the Research Participants' Advocate Line at 612-625-1650 (Toll Free: 1-888-224-8636) or go to z.umn.edu/participants. You are encouraged to contact the HRPP if:

- Your questions, concerns, or complaints are not being answered by the research team.
- You cannot reach the research team.
- You want to talk to someone besides the research team.
- You have questions about your rights as a research participant.
- You want to get information or provide input about this research.

Please keep a copy of this information from the email or social media website where you found the information for the study.

Please respond to one of the options below. If you consent you will be directed to the survey. If you do not consent, you will be directed to the exit page and will not participate in the survey.

o Yes, I wish to proceed and I give full consent to participate in this research study. I acknowledge that I have read about the purpose of the study. I am making an informed decision and assuming the potential the minimal risks and benefits of participating in the research.

o No, I do not give consent to participate in this research study.

Please watch/read the following definitions and then begin the survey by clicking the arrow.

Technology is defined as, any digital tool which can be used to communicate. This can include, but is not limited to emails, texting, phone calls, video calls, apps, websites, etc.

Communication is defined as, one or more people (i.e., educators and/or caregivers) contact one another through the actions of calling, sending messages, pictures, videos, announcements, notifications, attachments/files, clicking "like", writing or signing comments, responding to questions. Communication can occur in multiple ways through:

One-way communication: only one person is actively communicating through technology

Two-way communication: both people are actively communicating back-and-forth through technology **Non-existent communication:** neither person are actively communicating through technology

Honeypot Question
In 1-2 sentences, please briefly define technology and communication.

_____

National Survey Early Childhood Educators of Deaf and Hard of Hearing Children

Survey Questions for RQ1

6 Which of the following statements best fits your overall communication practices through technology with caregivers of Deaf children (ages 3-8)?

o I communicate with <u>all</u> of my students' caregivers using technology.

o I communicate with <u>over half</u> of my students' caregivers using technology.

o I communicate with <u>less than half</u> of my students' caregivers using technology.

o Other (please describe) _____

7 Which of the following statements do you believe best represents your overall communication through technology with caregivers of Deaf children (ages 3-8)?

o One-way communication (only one person is actively communicating through technology)

o Two-way communication (both people are actively communicating back-and-forth through technology)

o Non-existent communication (neither person are actively communicating through technology)

8 Which of the following, if any, do you **currently** use to communicate with caregivers of Deaf children (ages 3-8)? *Check all that apply.*

☐ Email (e.g., School email, Gmail, Yahoo, Hotmail)

☐ Apps or Websites (e.g., Seesaw, Remind, Facebook, school website, blogs)

☐ Video conference calls (e.g., FaceTime, Skype, Marco Polo, Google Hangouts, Zoom)

☐ Video Phone/Video Relay Services

☐ Mobile phone (calls/text/SMS)

☐ Other technologies

☐ ⊗I **do not** use technology to communicate with caregivers.

9
Please write the name(s) of the technology you use to communicate with caregivers of Deaf children (ages 3-8).

Mark whether you use **apps** _or_ **websites** to communicate using the technology. If you use **_both,_** please check both boxes.

Email (e.g., School email, Gmail, Yahoo, Hotmail) **Name of Technology**	☐	Apps	☐ Websites
Apps or Websites (e.g., Seesaw, Remind, Facebook, school website, blogs) **Name of Technology**	☐	Apps	☐ Websites
Video conference calls (e.g., FaceTime, Skype, Marco Polo, Google Hangouts, Zoom) **Name of Technology**	☐	Apps	☐ Websites
Video Phone/Video Relay Services **Name of Technology**	☐	Apps	☐ Websites
Mobile phone (calls/text/SMS) **Name of Technology**	☐	Apps	☐ Websites
Other technologies **Name of Technology**	☐	Apps	☐ Websites

10 In a given week, on average, how often do you use the following technologies to communicate with caregivers of Deaf children (ages 3-8)?

	Never	Less than once a week	1-2 times per week	3-4 times per week	At least once per day
Email (e.g., School email, Gmail, Yahoo, Hotmail) **Name of Technology**	o	o	o	o	o

Apps or Websites (e.g., Seesaw, Remind, Facebook, school website, blogs) **Name of Technology**	o	o	o	o	o
Video conference calls (e.g., FaceTime, Skype, Google Hangouts, Zoom) **Name of Technology**	o	o	o	o	o
Video Phone/Video Relay Services **Name of Technology**	o	o	o	o	o
Mobile phone (calls/text/SMS) **Name of Technology**	o	o	o	o	o
Other technology **Name of Technology**	o	o	o	o	o

11 Select the technology you use **most frequently** to communicate with caregivers of Deaf children (ages 3-8).

o Email (e.g., School email, Gmail, Yahoo, Hotmail) **Name of Technology**

o Apps or Websites (e.g., Seesaw, Remind, Facebook, school website, blogs) **Name of Technology**

o Video conference calls (e.g., FaceTime, Skype, Google Hangouts, Zoom) **Name of Technology**

o Video Phone/Video Relay Services **Name of Technology**

o Mobile phone (calls/text/SMS) **Name of Technology**

o Other technology **Name of Technology**

12 How many minutes weekly, **on average**, do you spend using technology to communicate with caregivers of Deaf children (ages 3-8 years old)?

    o Less than 10 minutes

    o 10-20 minutes

    o 21-30 minutes

    o 31-40 minutes

    o More than 40 minutes

13 How long have you been utilizing **your most frequently used technology** to communicate with caregivers of Deaf children (ages 3-8 years old)?

    o Less than 1 year

    o 1-2 years

    o 2-3 years

    o 3 or more years

14 Who determined what technology you would use to communicate with caregivers of Deaf children (ages 3-8 years old)? *Check all that apply.*

    ☐   My school district selected the technology.

    ☐   My school administrator(s) selected the technology.

    ☐   I selected the technology.

    ☐   Other (please describe)

    _____

15 Why was the technology **you use most frequently** to communicate with caregivers of Deaf children (ages 3-8) the technology of choice? Please explain.

    _____

    _____

16 Do you or have you considered using other technology other than what you currently use? If yes, please list other technology you have used or considered using and briefly describe why.

    o No, I have not considered other technology.

    _____

    o I would if my program or administrator approved it (please describe)

    _____

    o Yes, I have used or considered using...(please describe)

    _____

17 In what ways do you utilize technology when communicating about **classroom language and literacy activities** with caregivers of Deaf children (ages 3-8)? *Check all that apply.*

☐   Share photographs

☐   Share videos

☐   Share announcements/events/reminders

☐   Share language activities for the home

☐   Share literacy activities for the home

☐   Send private messages (to individual caregivers) about language/literacy development

☐   Send group messages (to all caregivers) about language/literacy development

☐   Use language translations

☐   Additional ways you use technology to communicate with caregivers about language and literacy classroom activities (please describe)

_____

18 How frequently do you utilize technology when communicating about **classroom language and literacy activities** with caregivers of Deaf children (ages 3-8)?

	Never	Less than once a week	1-2 times per week	3-4 times per week	At least once per day
Share photographs	o	o	o	o	o
Share videos	o	o	o	o	o
Share announcements/events/reminders	o	o	o	o	o

Share language activities for the home	o	o	o	o	o
Share literacy activities for the home	o	o	o	o	o
Send private messages (to individual caregivers) about language/literacy development	o	o	o	o	o
Send group messages (to all caregivers) about language/literacy development	o	o	o	o	o
Use language translations	o	o	o	o	o
Additional ways you use technology to communicate with caregivers about language and literacy classroom activities. **${17/ChoiceTextEntryValue/7}**	o	o	o	o	o

19 In what ways do you utilize technology **to respond** to caregivers of Deaf children (ages 3-8) about **language and literacy in their home**? *Check all that apply.*

☐   View messages from caregivers

☐   Click "like" on information shared by caregivers about language/literacy

☐   Make comments about information caregivers share about language/literacy

☐   Ask questions about information caregivers share about language/literacy

☐   Answer questions caregivers ask about language/literacy

☐   Use language translations

☐   Additional ways you use technology to respond to caregivers about language and literacy in their home? (please describe)

_____

20 How frequently do you utilize technology **to respond** to caregivers of Deaf children (ages 3-8) about **language and literacy in their home**?

	Never	Less than once a week	1-2 times per week	3-4 times per week	At least once per day
View messages from caregivers	o	o	o	o	o
Click "like" on information shared by caregivers about language/literacy	o	o	o	o	o
Make comments about information caregivers share about language/literacy	o	o	o	o	o
Ask questions about information caregivers share about language/literacy	o	o	o	o	o
Answer questions caregivers ask about language/literacy	o	o	o	o	o
Use language translations	o	o	o	o	o
Additional ways you use technology to respond to caregivers about language and literacy in their home? **${19/ChoiceTextEntryValue/7}**	o	o	o	o	o

Survey Questions for RQ2

21 Do you share any of the following ASL resources through technology with caregivers of Deaf children (ages 3-8)? *Check all that apply.*

☐   Read alouds in ASL

☐   Literacy activities in ASL

☐   New vocabulary words in ASL

☐   Rhyme/rhythm in ASL

☐   ABC stories in ASL

☐   Number stories in ASL

☐   Handshape stories in ASL

☐   Educational media in ASL (e.g., Peter's Picture)

☐   Educational games in ASL (e.g., Peter's Picture App)

☐   School/community classes to learn ASL

☐   Other (please describe)

Honeypot Question

How often, **on average**, do you share the following ASL (American Sign Language) resources through technology with caregivers of Deaf children (ages 3-8)?

Read alouds in ASL	o Never	o Less than once a week	o 1-2 times per week	o 3-4 times per week	o At least once per day
Literacy activities in ASL	o Never	o Less than once a week	o 1-2 times per week	o 3-4 times per week	o At least once per day
New vocabulary words in ASL	o Never	o Less than once a week	o 1-2 times per week	o 3-4 times per week	o At least once per day

Rhyme/rhythm in ASL	o Never	o Less than once a week	o 1-2 times per week	o 3-4 times per week	o At least once per day
ABC stories in ASL	o Never	o Less than once a week	o 1-2 times per week	o 3-4 times per week	o At least once per day
Number stories in ASL	o Never	o Less than once a week	o 1-2 times per week	o 3-4 times per week	o At least once per day
Handshape stories in ASL	o Never	o Less than once a week	o 1-2 times per week	o 3-4 times per week	o At least once per day
Educational media in ASL (e.g., Peter's Picture)	o Never	o Less than once a week	o 1-2 times per week	o 3-4 times per week	o At least once per day
Educational games in ASL (e.g., Peter's Picture App)	o Never	o Less than once a week	o 1-2 times per week	o 3-4 times per week	o At least once per day

School/community classes to learn ASL	o Never	o Less than once a week	o 1-2 times per week	o 3-4 times per week	o At least once per day
Additional ASL resources you share (please describe)	o Never	o Less than once a week	o 1-2 times per week	o 3-4 times per week	o At least once per day

23 If you responded that you **never** share ASL resources (e.g., ASL read alouds, ASL rhyme/rhythm) through technology with caregivers for one or more items, can you please share more about why?

_____

Survey Questions for RQ3

24 When you think about the technology you use most frequently with caregivers of Deaf children (ages 3-8), to what degree do you think it **increases**...

	Does not increase	Slightly increases	Moderately increases	Greatly increases	I am unsure.
Caregivers' knowledge about classroom language activities.	o	o	o	o	o
Caregivers' knowledge about classroom literacy activities.	o	o	o	o	o

Caregivers' knowledge about their child's language development.	o	o	o	o	o
Caregivers' knowledge about their child's literacy development.	o	o	o	o	o
Caregivers' communication with their child at home.	o	o	o	o	o

25 When you think about the technology you use most frequently with caregivers of Deaf children (ages 3-8), to what degree do you think it **improves**...

	Does not improve	Slightly improves	Moderately improves	Greatly improves
My communication with caregivers.	o	o	o	o
My communication with students.	o	o	o	o
My documentation of student language development.	o	o	o	o
My documentation of student literacy development	o	o	o	o

My motivation to communicate with caregivers.	o	o	o	o
My connection with caregivers who use a different language than ASL or English.	o	o	o	o
My understanding of the Deaf child and their family in the home context, including home language(s).	o	o	o	o

26 What do you consider to be the **biggest benefit** of using technology to communicate with caregivers of Deaf children (ages 3-8)? Please describe.

_____

27 To what extent do you think technology you use **most frequently** to communicate with caregivers of Deaf children (ages 3-8) is...

Easy to use	o Do not agree	o Slightly agree	o Somewhat agree	o Strongly agree
Reliable	o Do not agree	o Slightly agree	o Somewhat agree	o Strongly agree

Convenient	o Do not agree	o Slightly agree	o Somewhat agree	o Strongly agree
A time saver	o Do not agree	o Slightly agree	o Somewhat agree	o Strongly agree
Secure and protects privacy	o Do not agree	o Slightly agree	o Somewhat agree	o Strongly agree
Useful for my communication goals	o Do not agree	o Slightly agree	o Somewhat agree	o Strongly agree
Accessible for caregivers whose first language is not spoken English.	o Do not agree	o Slightly agree	o Somewhat agree	o Strongly agree
Accessible for Deaf people who use ASL.	o Do not agree	o Slightly agree	o Somewhat agree	o Strongly agree
Other (please describe)	o Do not agree	o Slightly agree	o Somewhat agree	o Strongly agree

28 What do you consider to be the **biggest challenge** of using technology to communicate with caregivers of Deaf children (ages 3-8)? Please describe.

_____

Survey Questions for RQ4

29 If you are comfortable, please share the gender you identify with.

    o I prefer not to share.

    o I identify as: _____

30 If you are comfortable, please share how you identify. *Check all that apply.*

    ☐   Deaf

    ☐   Hard of Hearing

    ☐   CODA (Child of Deaf Adult)

    ☐   DeafBlind

    ☐   DeafDisabled

    ☐   Late-Deafened

    ☐   Hearing

    ☐   I identify as: _____

31 If you are comfortable sharing, how would you describe your race? *Check all that apply.*

    ☐   Black or African American

    ☐   Indigenous or Alaska Native

    ☐   Asian or Asian American

    ☐   Hispanic or Latinx

    ☐   Native Hawaiian or Pacific Islander

    ☐   White

    ☐   ⊗I prefer not to share.

32 If you are comfortable sharing, what is your closest age range?

    o 22-25 years old

    o 26-30 years old

    o 31-40 years old

    o 41-50 years old

    o 50+ years old

33 If you are comfortable sharing, in what region of the country do you teach?

    o Northeast/Mid-Atlantic (PA, NY, VT, NH, MA, CT, ME, RI, NJ, MD, DE, DC)

    o Midwest (OH, IN, IL, MI, WI, MN, IA, MO, ND, SD, NE, KS)

    o South (VA, NC, GA, FL, AL, TN, KY, WV, MS, AR, LA, OK, TX)

    o West Coast (CA, OR, WA)

    o Mountain States (MT, ID, WY, NV, UT, CO, AZ, NM)

    o Pacific (AK, HI)

34 What type of school setting do you teach in?

    o Residential School for the Deaf

    o Day Program for the Deaf

    o Self-contained Program

    o Mainstream (general education)

    o Itinerant

    o Resource Room

    o Other setting (please describe)

    _____

35 Which age groups do you teach? *Check all that apply.*

    ☐   3-4 year olds

    ☐   4-5 year olds

    ☐   5-6 year olds

    ☐   6-7 year olds

    ☐   7-8 year olds

    ☐   9 years old and older

36 Which grade levels do you teach? *Check all that apply.*

    ☐   Preschool or Pre-Kindergarten

    ☐   Kindergarten

    ☐   First Grade

    ☐   Second grade & above

37 What are the mode(s) of communication used in your instruction of Deaf students (ages 3-8)? *Check all that apply.*

- ☐ American Sign Language or Signed Language(s)
- ☐ Spoken Language(s)
- ☐ Written Language(s)
- ☐ Cued Speech
- ☐ Total Communication, Simultaneous Communication (signing and speaking at the same time), Pidgin Signed English (PSE), and/or Signed Exact English (SEE)
- ☐ Gestures and home signs
- ☐ Other (please describe)

38 What are the language(s) you use when teaching Deaf students (ages 3-8)? *Check all that apply.*

- ☐ American Sign Language
- ☐ English
- ☐ Spanish
- ☐ Additional languages (please list languages)
  _____

 39 What degree and/or certifications do you have? *Check all that apply.*

- ☐ Council on the Education of the Deaf Certification (CED)
- ☐ Deaf and Hard of Hearing Teaching License
- ☐ Early Childhood Education License
- ☐ Special Education Teaching License
- ☐ MEd in Deaf Education
- ☐ Additional Endorsements (please describe)
  _____
- ☐ Other (please describe)
  _____
- ☐ I have no special certifications.

40 How many years have you been teaching Deaf students in Deaf education settings?

o Less than one year

o 1-2 years

o 3-5 years

o 6-10 years

o More than 10 years

41 How would you describe the race of the Deaf children (ages 3-8) currently in your classroom or on your caseload? See the example for guidance.

Example:

*Check all that apply and enter the **number of students** for each race category in the space provided.*

☐   Black or African American

_____

☐   Indigenous or Alaska Native

_____

☐   Asian or Asian American

_____

☐   Hispanic or Latinx _____

☐   Native Hawaiian or Pacific Islander

_____

☐   White _____

42 What are the language(s) used in the homes of your current Deaf students' (ages 3-8)? *Check all that apply.*

☐   American Sign Language

☐   English

☐   Chinese

☐   Hmong

☐   Somali

☐   Spanish

☐   Other (please list languages)

_____

☐   I am not sure.

43 What are the mode(s) of communication used by caregivers in their home with their Deaf child (ages 3-8)? *Check all that apply.*

    ☐   American Sign Language or Signed Language(s)

    ☐   Spoken Language(s)

    ☐   Written Language(s)

    ☐   Cued Speech

    ☐   Total Communication, Simultaneous Communication (signing and speaking at the same time), Pidgin Signed English (PSE), and/or Signed Exact English (SEE)

    ☐   Gestures and home signs

    ☐   Other (please describe)

       _____

    ☐   I am not sure.

End of Survey

49 You've reached the end of the survey! Please click the arrow to see some important follow-up questions and compensation information!
<u>Information you provide on the next page will not be used as part of the survey research.</u>

  Follow-up Items:
- Feedback
- Contact for Future Research
- Contact Information for Compensation

Future Research & Contact Information

50 Which language or language(s) did you use to receptively understand the survey questions and response items?

    o ASL only

    o English only

    o Both ASL and English

Honeypot Question

51 Would you have preferred an option for the survey to be provided in ASL or English only?

o Yes

o No

o I am not sure.

o Other (please describe) _____

52 Throughout the survey you viewed several formats of the ASL and English questions and response items. Please rank your preference for each format by writing 1, 2, 3, 4.
1 = most preferred, 4 = least preferred.
_____ Format #1
_____ Format #2
_____ Format #3
_____ Format #4

53 Would you like to be contacted for future research studies of this nature? If yes, please provide your name, pronouns, and preferred email. This information will remain separate from your survey responses and is strictly confidential.

o No

o Yes _____

54 Participants who answered **all** of the survey questions are eligible to receive a $10 Amazon gift card. Please include your name & preferred email in order to receive your e-gift card for Amazon. This information will remain separate from your survey responses and is strictly confidential. If you choose not to include your contact information, you will be unable to receive an e-giftcard.

_____