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The development of a core school-based Lámh vocabulary to facilitate effective communication between children with Down syndrome and their communication partners in the first year of mainstream primary school.



Thesis presented by

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for the degree of

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Declaration

This is to certify that the work I am submitting is my own and has not been submitted for another degree, either at University College Cork or elsewhere. All external references and sources are clearly acknowledged and identified within the contents. I have read and understood the regulations of University College Cork concerning plagiarism.

Signed: Caoimhe Lyons **Date:** 21/12/20

Dedication

This thesis is dedicated to the memory of my Nana, Kathleen Madigan, who at 98 years of age was still my biggest supporter in "helping people learn to talk down in Cork".

31.08.21-26.03.20

Ar dheis Dé go raibh a h-anam dílis.

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Finally, a very special thank you to my wonderful grandparents, Maura and Pat Lyons, who were always there when I needed to get from A to B. I wish you both many more years of health and happiness.

Abstract

Background: In Ireland, the entry-level key word sign (KWS) training for teachers and school staff is the Lámh Module 1 training course, which does not contain vocabulary specifically chosen to support school-age Lámh users. However, if KWS is to be used successfully by children with Down syndrome (DS) in a mainstream school environment, it is essential that communication partners have access to a meaningful, contextually appropriate sign vocabulary.

Aim: To identify the Lámh vocabulary needs of children with DS and their communication partners over the course of the first year of mainstream primary school, with the aim of developing a core school-based Lámh vocabulary.

Method: Five key groups contributed signs to the core vocabulary: participants with DS in junior infants (n=6), their teachers (n=5), special needs assistants (n=8), and peers (n=9), and the researcher (a Speech and Language Therapist). The researcher contributed signs based on observations of the classroom, the participants with DS contributed signs during guided tours of the school environment, and the teachers, SNAs and peers contributed signs by means of structured interviews. This data collection took place at four time points over the school year. Signs were considered to be part of the core vocabulary if they were contributed five times or more over the course of the year, and by three or more of the groups.

Results: The core school-based Lámh vocabulary contained 140 words, including 132 Lámh signs and eight words that do not currently have a Lámh sign. Only 55 (39%) of the 140 signs recommended as core vocabulary for schools are part of the training currently most commonly accessed by school staff. The remaining 77 signs (55%) are part of more advanced training.

Conclusion: The current study provides new insights into the complex process of vocabulary selection for children who use Lámh in a mainstream school environment. In addition, it highlights the importance of access to a functional sign vocabulary in facilitating an inclusive approach to education, and enhanced communicative practice by all of those engaging with children with DS in mainstream primary school.

Keywords: Key word signing, Lámh, core vocabulary, inclusive education

Word count: 42,358

Chapter 1
Introduction

The transition from preschool to formal primary education marks an important developmental stage for all children, and exclusion from education can result in profound activity limitation and participation restriction (Margetts & Kienig, 2013; World Health Organization, 2007). Historically, children with intellectual disabilities (ID) have experienced significant barriers in accessing education. However, changes to law and policy, both domestically and internationally, have ensured that all children have the right to education within an inclusive, mainstream environment. While this is a positive development, the application of inclusive ideologies to practice continues to be a major challenge (Ferguson, 2008; O'Rourke, 2015). For children with Down syndrome (DS), the most common genetic cause of ID (Jackson, Cavenagh, & Clibbens, 2014), one of the most significant barriers to high quality inclusive education is speech, language, and communication difficulties. According to Engevik, Næss, and Berntsen (2018), expressive communication skills are the strongest predictor of the quality of inclusive education provided to children with DS. Typically, the language and communication strengths and difficulties experienced by children with DS follow a characteristic profile. Difficulties are most significant in areas such as phonology, syntax, and expressive vocabulary, with strengths in receptive vocabulary and visual modalities, particularly visual memory skills (Martin, Klusek, Estigarribia, & Roberts, 2009). One method of augmentative and alternative communication (AAC) that capitalises on these strengths is Key Word Signing (KWS), which involves supplementing the key words in spoken language using manual signs (Grove & Dockrell, 2000). In Ireland, the KWS system used by children and adults is called Lámh. In order to support Lámh users within the mainstream school environment, a suitable and meaningful sign vocabulary must be available to all communication partners (Dark et al., 2019). This study presents an investigation into the vocabulary needs of children with DS and their communication partners in the first year of mainstream primary school, with the aim of developing a core school-based Lámh vocabulary to facilitate effective communication. The current chapter introduces the research topic and provides the background to the study in terms of DS, KWS, and inclusive education. Reviews of previous core vocabulary studies for AAC users are presented in Chapter 2. Chapter 3 outlines the methodology of the current

study, with the subsequent results presented in Chapter 4. The thesis concludes in Chapter 5 with a discussion of the study findings, strengths and limitations, implications for practice, and opportunities for future research.

1.1 Down Syndrome and communication

Down syndrome (DS) is the most common genetic cause of ID (Jackson et al., 2014; Laws & Hall, 2014; Sherman, Allen, Bean, & Freeman, 2007). Approximately 85% of people with DS present with a mild to moderate ID, however IQ scores can span from those in the average range to those with a severe ID (Cleland, Wood, Hardcastle, Wishart, & Timmins, 2010; Roizen, 2007). DS is caused by abnormalities that affect the 21st chromosome. In the vast majority of cases (approximately 95%), DS is the result of complete trisomy 21, whereby an error in cell development results in an extra copy of the chromosome, so there are three copies instead of two (Devlin & Morrison, 2004; Patterson & Lott, 2008). In more rare instances, DS can be caused by translocation, where part of chromosome 21 attaches to another chromosome, or mosaicism, where only some cells include an extra copy of chromosome 21 (Patterson & Lott, 2008). In Ireland, one child per approximately 550 live births is born with DS, one of the highest prevalence rates in Europe (Ni She & Filan, 2014). Down Syndrome Ireland, an organisation which provides information, support, and services for people with DS and their families, estimate that there are approximately seven thousand people in Ireland with DS (DS Ireland, n.d.). The language profiles of people with DS have been well documented in the literature, typically following a pattern of stronger receptive language skills than expressive, and stronger vocabulary than syntax, although considerable amounts of individual variation do exist (Martin et al., 2009). In recent years, it has become more and more apparent that the language difficulties experienced by children with DS are disproportionate to their level of intellectual disability (Cleland et al., 2010; Frizelle, Thompson, Duta, & Bishop, 2019b). The following sections present a summary of the language development and communication profiles of children with DS, including speech, language, hearing, and memory skills.

1.1.1 Speech, fluency, and voice characteristics of children with DS. Many children with DS experience significant speech difficulties (Kent & Vorperian, 2013). According to Martin et al. (2009), the small oral cavity and narrow high arched palate associated with DS can lead to reduced speed, range of motion and co-ordination of

articulators. Many studies investigating speech refer to speech sound disorders, a term which encompasses both speech and phonological difficulties. A review of these studies by Kent and Vorperian (2013) indicate a profile of delayed and disordered patterns in children with DS by about 3 years of age. Wong, Brebner, McCormack, and Butcher (2015) investigated the articulation and phonology of 32 adolescents with DS using a standardised assessment, the Diagnostic Evaluation of Articulation and Phonology (DEAP) (Dodd, Zhu, Crosbie, Holm, & Ozanne, 2002). Many of the features which impacted intelligibility were related to atypical and unusual phonological errors, which will be discussed in more detail below, but the researchers also concluded that some of the observed articulation errors were associated with attempts to compensate for poor oral motor skills and anatomical differences (Wong et al., 2015). According to Kumin (2006), although it is rarely diagnosed, features of childhood apraxia of speech, a motor speech disorder, are present in the majority of children with DS.

Speech intelligibility in DS is also negatively impacted by dysfluency and dysphonia. The incidence of stuttering and cluttering in individuals with DS is much higher than that of the general population. Studies estimate that approximately 10-45% of people with DS present with stuttering or cluttering, compared to around 1% of the general population (Guitar, 1998). While much of the available literature investigates the prevalence of dysfluency in adults with DS, Eggers and Van Eerdenbrugh (2018) estimate the prevalence of stuttering in young children with DS (aged between 3;01 and 13;00) to be 30%. This figure is, however, based on a relatively small sample of 26 mono-lingual Dutch speaking children. The difficulty associated with establishing a precise incidence rate is reinforced by Van Borsel and Vandermeulen (2009), who investigated the occurrence of cluttering in in a sample of 76 adults with DS (aged 22-56). Using the Predictive Cluttering Inventory (Daly, 2006) it was found that 73 of the 77 participants (94%) were classified as either clutterer, or clutterer-stutterer, despite only 27 of the inventories being fully completed. Two possible explanations are offered for this high incidence rate: sampling errors with regard to participants, and the ambiguity that persists with the diagnostic definition of cluttering (Van Borsel & Vandermeulen, 2009). None of the young children with DS investigated by Eggers and Van Eerdenbrugh (2018) met diagnostic criteria for cluttering, however it was noted that several of the participants displayed features. Although often only to a mild

degree, dysphonia is also a common feature of the speech of people with DS (Kent & Vorperian, 2013). When combined, these difficulties in voice, speech sounds, and fluency result in reduced speech intelligibility (Kent & Vorperian, 2013). Research indicates that these difficulties are exacerbated by increased length of utterance and nonfamiliarity of the listener (Kumin, 1994). The combined effect of speech sound disorders, dysfluency and dysphonia can result in reduced intelligibility, which exacerbates the communication difficulties experienced by children with DS. This reduced intelligibility can persist throughout life for many individuals, negatively affecting communication and interfering with a wide range of social and vocational activities (Kent & Vorperian, 2013). This reinforces the importance of the availability of alternative and augmentative communication methods.

1.1.2 Language characteristics of children with DS. Phonological errors are common in the language of children with DS, particularly at pre-school and school age (Martin et al., 2009). There has been much debate as to whether these difficulties are the result of a delay, or disorder (Cleland et al., 2010). This debate is complex, as many of the phonological errors demonstrated by children with DS resemble those made by younger typically developing children (Dodd & Thompson, 2001). On the other hand, the phonological errors of children with DS are more likely to be atypical, or inconsistent than those of typically developing children. Cleland et al. (2010), carried out a study which aimed to investigate the relationship between speech, oromotor, language, and cognitive abilities in children with DS. In order to determine if the severity of speech difficulties was related to cognitive and language abilities, fifteen young people with DS (aged 9-18) completed a battery of speech, language, and cognitive assessments. All participants completed the phonology subtest of the DEAP (Dodd, Zhu, Crosbie, Holm, & Ozanne, 2002), and while the majority of phonological errors recorded were developmental in nature, all fifteen participants displayed at least one atypical or non-developmental pattern. While this study would benefit from a larger sample size, the results add further evidence to the profile of individuals with DS having a combination of phonological delay with aspects of disorder.

The typical profile of language skills in people with DS refers to strengths in vocabulary, both receptive and expressive (Zampini & D'Odorico, 2013). Despite this, research indicates that the expressive vocabularies of young children with DS are

delayed beyond expectations based on cognitive ability (Martin et al., 2009). While the prognosis for spoken language is encouraging, with 90% of three-year olds producing one or more words, first word acquisition and expressive vocabulary development are delayed compared to typically developing children (Martin et al., 2009). The expressive vocabularies of 18 children with DS were documented by Zampini and D'Odorico (2013), using the Italian version of the MacArthur-Bates Communication Development Inventories (CDI), which is a parent report measure. When compared to a control groups of children matched on cognitive ability, the children with DS produced significantly fewer words at each interval of the study (at 18, 24, and 30 months). Loveall, Channell, Phillips, Abbeduto, and Conners (2016) compared the receptive vocabulary skills of 50 participants with DS (aged 10-21) and other 29 individuals with ID, in the same age group. The participants with DS had significant difficulties, particularly in the area of verb comprehension, and overall did not perform as well as the group with ID on any of the measures, which also included understanding of verbs and attributes. Receptive vocabulary skills were also investigated in the study by Cleland et al. (2010), using The British Picture Vocabulary Scales (Dunn et al. 1997). Results indicated that although receptive vocabulary was better than expressive, it was still not in line with expectations based on non-verbal ability.

Syntax presents a particular challenge for children with DS, both receptively and expressively (Martin et al., 2009). Expressively, the emergence of two-word combinations is delayed (Iverson, Longobardi, & Caselli, 2003). Caselli, Monaco, Trasciani, and Vicari (2008) report that as they get older, children and adolescents with DS continue to use shorter sentences and less complex clauses than typically developing children matched on nonverbal mental age. Price et al. (2008) report that children with DS produce fewer complex sentence structures, questions, and noun and verb phrases than typically developing children matched on non-verbal age. According to Caselli et al. (2008), the expressive syntax difficulties that children with DS experience cannot be accounted for by cognitive abilities alone. Studies investigating comprehension of syntax are more limited. Additionally, much of the available research relies on standardised assessment measures, which may not provide an accurate picture given the unrelated demands associated with assessment tasks (Frizelle, Thompson, Duta, & Bishop, 2019a). In a recent study, Frizelle et al. (2019b)

found that children with DS performed at a significantly lower level than two control groups matched on non-verbal cognitive ability (children with cognitive impairment and typically developing children), on a task designed to specifically investigate comprehension of complex sentences. Literature increasingly indicates that the language difficulties experienced by children with DS cannot be explained in terms of ID alone, and are essentially a 'specific' impairment, or a developmental language disorder associated with DS (Cleland et al., 2010; Frizelle et al., 2019b).

1.1.3 Hearing and DS. Hearing, especially in early childhood, is an essential prerequisite for later language and communication development (Martin et al., 2009). The prevalence of congenital hearing loss in babies with DS is approximately 15%, much higher than the 0.25% prevalence reported in the general neonatal population (Tedeschi et al., 2015). As well as congenital hearing loss, the vast majority (96%) of young children with DS experience otitis media with effusion (OME), or middle ear infections, which cause temporary or fluctuating conductive hearing loss (Shott, Joseph, & Heithaus, 2001). According to Barr, Dungworth, Hunter, Mcfarlane, and Kubba (2011), at least half of these infections can cause severe conductive hearing loss, with many children with DS requiring treatment with tympanostomy tubes or hearing aids. Overall, the majority of children with DS, estimated at two thirds, experience either conductive or sensorineural hearing loss, and in some cases, a combination of both (Roizen, 2007). Similar to the relationship between language ability and level of ID in children with DS, one might assume that hearing is a core mediating factor in the language and intelligibility difficulties. However, the research to support links between language difficulties and hearing loss is not clear. This issue is further complicated by the fact that participants with moderate to severe hearing loss are often excluded from research. Martin et al. (2009) link hearing loss to comprehension difficulties, more specifically comprehension of grammatical morphemes. Laws and Bishop (2004) report that while hearing loss may contribute to language outcomes, it is not the cause of language difficulties. A more recent study by Laws and Hall (2014) compared children with DS who had experienced hearing difficulties between the ages of 2-4 to those who were reported to have normal hearing at that time. Significant differences between the two groups were reported on measures of expressive and receptive language, including speech accuracy and narrative tasks. While this research strengthens the evidence for the links between early hearing loss

and later language abilities in children with DS, more research, especially longitudinal, is needed to explore the nature of this relationship (Martin et al., 2009).

1.1.4 Memory and DS. When discussing the language skills of children with DS, the area of memory also warrants exploration. Memory impairment is a core feature of the cognitive impairment associated with DS, and given the high incidence of early onset Alzheimer's disease (AD) that has become associated with DS, the nature and development of memory impairments is a growing research area (Godfrey & Lee, 2018). Godfrey and Lee (2018) carried out a systematic review of memory abilities in people with DS across the lifespan, including long-term, short-term, and working memory, which were further divided into verbal and visual domains.

In relation to verbal long-term memory, there is reliable evidence of significant impairment in children and adolescents with DS, when compared to both mental-age matched controls and other groups with ID (Godfrey & Lee, 2018). On verbal short-term memory tasks, such as immediate word recall or digit span, studies have shown that children and adolescents with DS consistently score lower than mental age matched peers (Jarrold, Baddeley, & Phillips, 2002). Verbal short-term memory is also more significantly impaired in children with DS relative to other groups with ID (Costanzo et al., 2013). Conversely, children and adolescents with DS have been shown to perform better than other groups with ID with respect to visual memory tasks (Godfrey & Lee, 2018). On long-term visual memory tasks, such as deferred imitation tasks or object location recall, studies at preschool age report that children with DS perform comparably to control groups matched on mental-age when there is a 24-hour delay between the initial task and recall (Roberts & Richmond, 2015). However, there is data to suggest that performance is negatively impacted if the period of delay between the initial task to the time of recall is extended, for example from 24 hours to one month (Milojevich & Lukowski, 2016). In relation to short-term visual memory tasks, Carney et al. (2013) report the performance of individuals with DS is comparable, if not stronger than other groups with ID. Working memory, the ability to simultaneously store, manipulate and process information, is also significantly impaired in individuals with DS (Lanfranchi, Jerman, & Vianello, 2009). Again, non-verbal domains are thought to be less impaired than verbal, however Godfrey and Lee (2018) report that these discrepancies are not as consistent as with short- and long-term memory.

It is clear that across long-term, short-term and working memory, children with DS experience significant difficulties, especially in terms of verbal memory tasks. This pattern is particularly relevant in terms of language, as verbal short-term memory, or phonological memory, is one of the cognitive skills that serves as a foundation for language development (Martin et al., 2009). According to Laws (2004), the impairments in phonological memory experienced by children with DS can be linked to poorer receptive language skills, reduced mean length of utterance (MLU), and at school-age, difficulties with literacy. On the other hand, visual memory, both long and short term, is an area of relative strength (Godfrey & Lee, 2018).

1.2 Key Word Signing and DS

The speech, language, and communication difficulties experienced by children with DS can result in participation restrictions in social, educational, and vocational activities (Kent & Vorperian, 2013). As such, Speech and Language Therapists (SLTs) play a vital role, providing intervention for people with DS of all ages and providing support and education for families (Meyer, Theodoros, & Hickson, 2017). For people with DS, the focus of SLT intervention is to promote inclusion and independence at an individual, environmental and community level, taking each person's specific needs and strengths into account (Royal College of Speech and Language Therapists (RCSLT), 2009). One approach which can provide support for the challenges associated with verbal memory difficulties, hearing impairment, and reduced intelligibility while capitalising on strengths in visual memory is Key Word Signing (KWS). In the Irish context, it is reported that KWS is the second most widely used intervention by SLTs in disability services (Byrne, Pyne, & Sheehan, 2019).

Key Word Signing (KWS) involves using manual signs alongside speech to support the key words in spoken utterances (Byrne et al., 2019). KWS systems have been developed all over the world, and the signs used in each system correspond to those of the natural signing system of the deaf community, such as British Sign Language (BSL), American Sign Language (ASL), or Irish Sign Language (Frizelle, 2019). Lámh is the KWS system used by people with communication difficulties in Ireland, with signs rooted in Irish Sign Language (ISL), the native sign language of the deaf community (Glacken et al., 2019). Although the two are linked, Lámh is used as an accompaniment to speech, with signs highlighting the key aspects of a message (Frizelle, 2019). In contrast, natural sign languages have their own grammatical forms

and are predominantly visual, rather than spoken (Cologon & Mevawalla, 2018). Furthermore, KWS sign vocabularies are devised, rather than developing naturally over time, and efforts are made to simplify complex hand positions (Lámh, n.d.). Less emphasis is also placed on finger spelling. In this way, KWS has a higher iconicity than natural sign languages, which makes it more accessible for people with ID (Rombouts, Maessen, Maes, & Zink, 2020). This section presents an overview of KWS under the umbrella term of AAC and outlines the advantages of signing compared to spoken word modalities for children with DS.

Augmentative and alternative communication (AAC) is used when speech alone cannot accommodate for some, or all, of a person's communication needs (Beukelman & Mirenda, 2013). AAC encompasses a range of strategies that provide communication options and interventions for a diverse range of people (International Society of AAC (ISAAC), 2014). In the last four decades, AAC as an area of clinical practice has grown and evolved rapidly, and today there are more AAC options available than ever (Light & McNaughton, 2012). This increase in options, in combination with increased expectations for people with complex needs means that AAC services are now considered for a much broader population of people (Light et al., 2019). Many factors influence the choice of AAC system. These include individual considerations, such as cognitive, language, and motor abilities, as well as external considerations, including family attitudes, and access to funding, and professional support (Marshall & Goldbart, 2008). Furthermore, people who use AAC commonly communicate using a range of supports and systems, which can change over time depending on capacities, demands, and user preference (Iacono, Lyon, Johnson, & West, 2013). AAC is most frequently categorised into aided and unaided systems, and aided systems can be classified further into low or high-tech (Beukelman & Mirenda, 2013). Under the umbrella term of augmentative and alternative communication (AAC), KWS is an unaided system, meaning it involves no physical or external aids (Smidt et al., 2019).

KWS is well-established as an AAC intervention for children with DS, and Lámh is used extensively by children and adults with DS in Ireland (DS Ireland, 2014; Wright, Kaiser, Reikowsky, & Roberts, 2013). For children with DS, KWS capitalises on a number of key strengths, including visual memory skills and gesture (Launonen, 2019; Wright et al., 2013). In relation to short-term, long-term, and working memory,

the research outlined in Section 1.1.4 demonstrates that people with DS have stronger nonverbal than verbal skills (Godfrey & Lee, 2018). In this regard, one of the clearest advantages of KWS is that it augments spoken language with a visual support, in the form of a sign (Launonen, 2019). KWS also places fewer demands on working memory than other more high-tech AAC systems, which can involve scrolling through multiple pages of interface to select a target word or phrase, slowing down message preparation (Thistle & Wilkinson, 2013; Wilkinson & Madel, 2019). Developmentally, gestures such as pointing appear earlier than spoken words, and as such are thought to be less challenging than speech alone (Rombouts, Maes, & Zink, 2017). Gesture is also a relative strength for children with DS, with, Zampini and D'Odorico (2009) reporting that at 36 months, children with DS produce the same gesture types at the same frequency, or even higher frequencies than their typically developing peers.

Overall, evidence suggests that in contrast to spoken language, children with DS tend to do better in manual modalities, acquiring both iconic gestures and signs at rates comparable to typically developing children (Launonen, 2019). Furthermore, KWS has advantages for both receptive and expressive language development. When key words are accompanied by a sign, it provides both auditory and visual cues to help decode the message, and it is this multimodality that is thought to support receptive language development (Rombouts et al., 2017). The visual element of KWS is also a key advantage given the higher prevalence of both congenital and conductive hearing loss in children with DS, particularly the fluctuating hearing loss caused by otitis media (Roizen, 2007). According to Emmorey (2002), signs are produced approximately 1.5 times more slowly than speech, which slows down the overall rate giving more time to decode information. Although there has been some debate in recent years, the iconicity of signs mean they are often more straightforward than words alone in terms of form-content meaning (Woll & Grove, 2019). Rombouts, Maessen, Maes & Zink (2020) compared the iconicity of signs in the Belgian Dutch KWS system to their equivalent sign in Flemish Sign Language. The iconicity continuum of transparent, translucent, obscure, or opaque was used to categorise signs, with transparent signs being the most iconic, and opaque signs the least. Overall, the signs in the KWS lexicon were found to be more iconic than their Flemish Sign Language counterparts, which the authors concluded may support sign learning for

people with ID. Furthermore, word boundaries become more perceptible when signs are used to support speech, and signing only the key words within a sentence reduces the complexity of the message (Rombouts et al., 2017). Expressively, the acquisition of early signs is considered an easier task than acquiring early spoken vocabulary for children with DS. Historically, there was a fear of using KWS, in that many people believed that it would hinder the development of speech. However, there is now sufficient evidence to show that KWS can promote the development of spoken language, with most children eventually using a combination of speech and sign (Launonen, 2019; Vandereet, Maes, Lembrechts, & Zink, 2011; Wright et al., 2013). KWS is also beneficial in terms of language learning in that signing partners must first gain eye-contact, which ensures joint attention, an essential pre-requisite for language learning opportunities (Clibbens, Powell, & Atkinson, 2002). In terms of articulation, KWS helps to overcome the oromotor difficulties that are intrinsic to DS in that involves using the hands and body, which are much larger articulators (Woll & Grove, 2019). It is these characteristics of KWS that have ensured its continued effective use with people with DS, even in the context of ever-increasing high-tech AAC options (Frizelle, 2019).

Research investigating the efficacy of KWS dates back to the late 1970's, to the time when Makaton, one of the earliest KWS systems, was developed in the UK (Byrne et al., 2019). In some ways, this has led to a paucity of research, with many of the original studies conducted over 30 years ago and with small cohorts (Wright et al., 2013). A more contemporary intervention study was carried out by Wright et al. (2013). This study investigated the impact of a naturalistic sign intervention programme on the expressive language skills of toddlers with DS, aged 23-29 months. Results indicated that the programme, which involved a combination of verbal models and manual signs, facilitated the development of both spoken and signed communication. In addition, at the end of the study all participants had used signs to communicate outside of the context of the study (in the home), and with a new communication partner (their parent). This implies that the benefits of the intervention transferred to the home environment. While these results are promising, it must be taken into account that the study involved only four participants, with limited research involving larger cohorts of children. Longitudinal studies investigating the long-term impact of early KWS intervention for children with DS are also relatively sparse,

however a series of studies are detailed in Launonen (2019). The first took place between 1988 and 1993, involving a KWS intervention program for children with DS between 6 and 48 months (Launonen, 1996). The effects of this intervention programme were then investigated five years later (Launonen, 1998). All children involved in the first intervention study successfully acquired signs. The mean age of first sign use was 17 months, and by 36 months, all children were speaking and signing. A follow up at age three revealed that the children in the research group used a wider range of communicative means and were ahead of the control group in terms of both language and general development, especially cognitive and social skills. Five years post intervention there were still significant differences between the two groups, in terms of both language and social skills. Overall, the evidence shows that as an AAC intervention, KWS can have significant positive long-term effects on the communication competency of children with DS (Launonen, 2019).

1.2.1 Parent attitudes towards KWS. Communication partners have an important role to play in establishing a supportive KWS environment. The attitudes of communication partners towards KWS are reported to impact a child's learning, as well as the acceptance and use of KWS within the environment (Dark et al., 2019). Glacken et al. (2019) interviewed parents of Lámh users aged 18 months to 11 years regarding their attitudes towards Lámh. Eighteen parents, including 14 individual parents and two sets, all of whom had completed formal Lámh training, were asked about their perception of Lámh, encompassing topics such as training, impact of Lámh on family life, and barriers and facilitators to sign use in everyday life. Overall, parents had a positive attitude towards Lámh, and found that it gave their child more opportunities to participate in home and community life. Parents did however report the challenge of sustained commitment and promotion of KWS, and while this commitment was necessary from all communication partners, it was found that the burden predominantly rested with the mother. In contrast with more dated research, parents were happy to use Lámh in public, and did not experience negative reactions from communication partners or members of the wider community. However, it was reported that when it came to signing in school, parents were typically given limited support, especially if their child was enrolled in a mainstream primary school (Glacken et al., 2019).

In recent years, there has been an increased recognition of parent's rights with respect to educational provision for their children, especially in relation to children with special education needs (SEN) (Lindsay, Ricketts, Peacey, Dockrell, & Charman, 2016). In the UK, Kendall (2019) investigated parent's perspectives on the mainstream education provided to their child with DS. Five parents of children with DS (aged between three and 12 years old) were interviewed about their perceptions and experiences of their child's education. Overall, reports indicated that parents were satisfied with their children's schools, however increased support for speech and language therapy services was highlighted as an area of importance. Of particular concern to the parents involved in the study were issues such as the willingness of staff to learn how to communicate using KWS, long waiting lists for SLT services, and limited SLT contact within the school environment. The parents of Lámh users interviewed by Glacken et al. (2019) outlined similar concerns. Outside the home environment, parents reported that Lámh use was largely dependent on the commitment of individuals, and that this commitment could vary even within a single setting. Parents recognised the challenges for school communication partners, such as frequent staff turnover, and stressed the importance of school-based SLT support, including access to Lámh training for all teachers and support staff. While these issues were present across education, leisure, and community environments, Glacken et al. (2019) report that they were particularly pertinent to mainstream schools. The current study, which aims to develop a core Lámh vocabulary for use in mainstream primary schools, serves as an important first step in identifying the needs of these school age Lámh users and their communications partners.

1.3 Inclusive Education and KWS

In Ireland, all children with DS have the right to an inclusive education within their local mainstream primary school. Although the term is widely used, what is meant by 'inclusive education' is difficult to define (Banks & McCoy, 2017). Inclusion, which aligns with the social model of disability, is a broad and complex concept that relates to much more than classroom attendance alone (Rose, Shevlin, Winter, & O'Raw, 2010). Peters, Johnstone, and Ferguson (2005) propose four assumptions inherent to the concept of inclusive education for all children. The first is that all children present with unique strengths and weaknesses, so no student is fundamentally different. Second, the responsibility to respond to the needs of students lies with the general

education system. Third, an inclusive education system has high expectations and standards, one of which is to ensure a high-quality, accessible curriculum, led by teachers who are equipped to facilitate all students to reach their academic potential. The fourth assumption relates to achievement, which is demonstrated by schools working in partnership with the wider community to ensure that students are full members of a progressive society. Children who are educated in an inclusive setting should be equipped to enjoy the benefits and experience of life, while also having the resilience to cope with the challenges it presents.

Historically, children with ID, including children with DS, have experienced significant barriers in accessing education. In the past 50 years, however, educational provision for children with ID in Ireland has changed considerably, moving away from historical models of institutional care (Kelly, Devitt, O'Keeffe, & Donovan, 2014). Since the 1970's, education for children with ID in Ireland has been provided in three separate settings: special schools, mainstream schools, and special classes within mainstream schools (Banks & McCoy, 2017). These three streams are still in operation, but the last twenty years have seen a major shift towards inclusive education within mainstream schools for all children (Banks & McCoy, 2017). This shift was brought about by changes in policy and legislation, both domestically and internationally. Legally, the right to education for all children has been enshrined in the United Nations Convention on the Rights of the Child (1989), and the Rights of Persons with Disabilities (2006) (McConkey, Kelly, Craig, & Shevlin, 2016). UNESCO (2002) advocated for inclusive education in working towards a vision of basic education for all children, one of the Millennium Development Goals (Peters et al., 2005).

In Ireland, inadequacies in the provision of education for people with ID were highlighted in the report of the Special Education Review Committee (1993), and Commission on the Status of People with Disabilities (1996) (Rose et al., 2010). In 2004, the Education for Persons with Special Needs (EPSEN) Act was enacted (Oireachtas, 2004). This ground-breaking legislation guaranteed access to mainstream school for children with ID, stating that 'children with special educational needs have the same right to avail of, and benefit from, appropriate education as do their peers who do not have such needs' (article 3b). Figures from the National Institute for Intellectual Disability (NIID) illustrate the changes that these policy shifts have

brought about. In 1996, 703 children with ID attended mainstream school in Ireland, and by 2014 this figure had increased to 2,106 (Kelly, 2015). According to a survey of members carried out by DS Ireland, over 90% of children with DS attend their local mainstream primary school (DS Ireland, n.d.).

With the right to education within a mainstream setting now set out in law, the focus of research has turned to investigating factors that affect the quality of inclusion practices. Research suggests that the application of inclusive education ideology to practice remains a major challenge in Irish schools (Ferguson, 2008; O'Rourke, 2015). For children with DS, expressive language skills are reported to be the strongest predictor of teacher ratings of classroom inclusion (Engevik et al., 2018). This is based on the results of a study which investigated teacher ratings of inclusion, and the expressive language abilities of their students. The teachers, both general and special education teachers (n=38) completed an online survey which aimed to measure quality of inclusion, classroom presence, and teacher collaboration. These markers of inclusion were compared to the expressive language skills of 43 8-year-old students with DS, measured using a battery of standardised tests, including Picture Naming (Wechsler, 2002), Grammatic Closure (Kirk, McCarthy & Kirk, 1967), and Past Tense (Ragnarsdottir, Simonsen & Plunkett, 1999). While inclusion is a complex phenomenon to measure, Engevik and colleagues (2018) concluded that expressive language skills have a longitudinal influence on the quality of inclusive education children with DS receive, with the continued segregation of pupils with DS during academic activities also posing a significant barrier to inclusion. According to Cologon and Mevawalla (2018), limited knowledge and use of KWS in early education settings creates serious barriers to inclusion for children who use KWS to communicate. However, findings of a thematic analysis carried out on the journal entries of early childhood teachers who completed entry level KWS training (n=196) demonstrated that the teachers had an overall positive view of KWS, identifying that it could reduce barriers to participation and demonstrate that diversity is valued in the early education setting (Cologon & Mevawalla, 2018). The importance of communication skills for inclusive education is reinforced by UNESCO (1994), who state that the ability to exercise agency within a democratic community is a prerequisite for high-quality inclusion. In this context, knowledge and use of KWS by

communication partners in the mainstream school environment is paramount for successful inclusion of children with DS who use KWS.

Fox, Farrell, and Davis (2004) propose that the quality of inclusive education practices for children with DS can be measured broadly by the following four indicators: presence, acceptance, participation, and achievement. Presence refers to all children being afforded the opportunity to attend their local mainstream primary school. Acceptance encompasses factors that relate to how children are welcomed into the school community, as full and active members. Participation relates to the extent to which students are involved in school life and the final indicator, achievement, refers to positive outcomes for all students across all aspects of education, including academic achievements and social and behavioural outcomes (Fox et al., 2004). Effective communication is an essential prerequisite for each of these indicators (Engevik et al., 2018). If teachers had access to a functional school-based sign vocabulary, it would facilitate greater access to the curriculum. If Lámh was accepted and encouraged as a method of communication in the school environment, children with DS could actively participate in classroom activities such as group work and discussions. In terms of social participation, if peers had access to relevant Lámh signs that were motivating to learn it would contribute to an increased sense of belonging for children with DS within the environment. To summarise, it is clear that the speech, language, and communication difficulties experienced by children with DS have the potential to impact the quality of the inclusive education they receive, which highlights access to a functional sign vocabulary as a fundamental condition for high-quality inclusion.

1.4 Barriers and facilitators to the use of KWS in schools.

The status of KWS in schools has undergone a radical shift in the last fifty years, from being viewed as a method of communication reserved for children deemed ‘ineducable’, to being considered an example of good classroom practice around the world (Rombouts, Sheehy, Buchanan-Mellon, & Grove, 2019). Sheehy and Duffy (2009) investigated the attitudes of teachers in the UK towards Makaton, comparing them with attitudes that were reported 25 years earlier. Significant changes in attitudes towards KWS were reported, largely indicative of the cultural shift towards inclusive education which took place over that time. In the late 1980’s, Makaton was seen as

something that would stigmatise children if it were used in mainstream schools, and the overall goal was that KWS should be used to support language skills to the point where it was no longer needed (Sheehy & Duffy, 2009). This was in line with the concept of 'mainstreaming' which was prevalent at the time, whereby the responsibility to 'fit in' to a mainstream environment rested largely with the child with ID, rather than those they interacted with in the school (Meegan & MacPhail, 2006). In their more recent follow-up interviews with teachers, Sheehy and Duffy (2009) found that KWS was more highly valued as a communication and pedagogical tool. Difficulties with consistent use of KWS did persist however, with most teachers acknowledging that the use of KWS at all times within the mainstream classroom environment was an ideal rather than a reality. Rombouts et al. (2018) compared use of KWS by staff in day centres and special schools. Observations took place for up to 3.5 hours in each environment, and the KWS input provided to each of the participants with ID, eight in each setting, was recorded in real time. It was found that KWS was used significantly more by staff in the day centres. During less structured activities, such as mealtimes, school staff seldom used or reinforced signs.

For school-aged children with DS, the attitudes of peers towards KWS can serve as either a facilitator of, or barrier to, the creation of a successful signing environment. Peers play a significant role as communication partners, and research suggests that even in inclusive school settings interaction between pupils with DS and their peers can be limited (Dolva et al., 2011). Broer, Doyle, and Giangreco (2005) interviewed adults with SEN who had previously attended mainstream primary schools, and in retrospect many described feeling different, and isolated from their peers. When asked about friendships, many perceived that their assistant, with whom they spent most of their time, was their best friend. Bowles and Frizelle (2016) interviewed peers of children with DS in mainstream primary schools to investigate their attitudes towards Lámh. The peers, who were aged between 6 and 8, were able to offer valuable insights. Although a number of difficulties were reported, mainly in relation to making and remembering signs, overall towards attitudes Lámh were positive. All of the children involved understood the importance of Lámh for their classmate with DS, which indicated the presence of positive differentiation within the overall mainstream environment (Bowles & Frizelle, 2016). These results are encouraging, and appear to confirm the hypothesis put forward by Budiyanto, Sheehy, Kaye, and Rofiah (2018)

that if all pupils learned signs, stigma associated with being a KWS user would not be an issue. If mainstream schools could capitalise on the positive attitude of peers towards KWS, it would help to overcome the barriers to inclusion created by communication difficulties (Bowles & Frizelle, 2016).

Moorcroft, Scarinci, and Meyer (2019) carried out a systematic review of AAC literature with the aim of identifying environmental barriers and facilitators to the use of low-tech and unaided AAC for school-age children with complex communication needs. Of the 194 articles screened, 43 met the author's inclusion criteria and were assessed using the Qualitative Research Checklist of the Critical Appraisal Skills Programme (CASP). Environmental barriers and facilitators existed at both the level of the teacher, and the overall school. At the level of the teacher, barriers to use included misconceptions of AAC, hesitation to learn, inflexibility, unrealistic expectations of the child and a failure to recognise the AAC user's strengths. On the other hand, teachers who viewed AAC as beneficial, and were positive, realistic, and motivated to learn were identified as facilitators. Role awareness, the ability to collaborate with other staff members and professionals, and previous success with AAC were also identified as facilitators to the use of AAC. At the broader school level, the facilitators for AAC use outlined by Moorcroft et al. (2019) were largely linked with management practices. These included having a principal who was supportive and interested in AAC, who created an environment where teachers were expected to implement communication strategies and were supported with the required resources to do so.

In schools with a strong signing culture, KWS is recognised, accepted, and encouraged as a preferred mode of communication (Dark et al., 2019). However, research suggests that even in mainstream schools where KWS is used, it is likely to be used in a restricted way, with emphasis on correcting breakdowns, maintaining focus or labelling (Parkhouse & Smith, 2019). This narrow use of sign imposes limits on both the child with DS who uses KWS, and their communication partners. To support children who use KWS, teachers are increasingly instructed to model signs during classroom activities, as an indirect instructional strategy for both sign users and their peers (Dodd & Gorey, 2014; Wright et al., 2013). In order to do this, they need to be "confident, fluent and accurate signers", with more than a basic awareness of key signs (Smidt et al., 2019, pp.56). Limited availability of training, due to lack of

funding or other resources, can result in difficulties for staff to consistently use KWS in the school environment (Rombouts et al., 2018). In a recent study carried out by Norburn, Levin, Morgan and Harding (2016), staff members of a large school for children aged 2-19 years of age with complex disabilities were asked to complete a questionnaire relating to AAC use and training. Of the 72 staff members who responded, which included both teachers and support staff, 99% reported they used KWS every day, but less than half (44%) had received training. Norburn and colleagues (2016) suggested a whole-school training approach as a potential solution to this problem. Dark et al. (2019) outline four key facilitators of a successful KWS environment: communication partner training, access to resources and supports, direct and indirect instructional strategies, and finally, a functional sign vocabulary. The application of these four key facilitators to the mainstream primary school environment, in particular access to a functional sign vocabulary, serve as the background to the current study, and will be outlined in further detail below.

In the Irish context, entry level communication partner training for teachers and school staff takes the form of the Lámh Module 1 course. The Module 1 course in its current form was launched in 2007, having developed over a number of years in line with demand for an introductory level accredited Lámh training course. It is a six-hour course, typically delivered in one day, designed for communication partners and professionals who have started to work in a setting where Lámh is used (Lámh, n.d.). The content of the Lámh Module 1 course is aimed at a broad range of staff members and professionals, including but not limited to SLTs, nurses, psychologists, social care workers, preschool teachers, teachers and SNAs. These professionals may be supporting Lámh users of all ages, from babies to school-age children, teenagers, and adults, in a multitude of settings, including home, school, residential, therapeutic, community, and employment settings. The Module 1 course covers a brief history of Lámh, an introduction to AAC, the concept of a signing environment, and finally, the 100 core signs in the Module 1 Sign Book, designed to have application for a broad age range in the aforementioned settings (Lámh, n.d.).

When Lámh was developed most children with DS attended special schools, and training was never designed to serve the needs of one specific group. In the last 12 years, however, there has been a significant increase in the number of school staff attending Module 1 training courses. In 2008, the Department of Education began

funding Lámh Module 1 training for teachers through the National Council for Special Education (NCSE). In 2008, 24 teachers were funded to attend Module 1 Lámh training. Since then, the number of places allocated for teachers has increased year after year, and in 2019 the NCSE provided funding for Lámh training for 182 teachers. These figures are representative of only a proportion of school staff who access communication partner training, as many other school staff are self-funded. Given the scope of the Lámh Module 1 course, emphasis is placed on covering the foundation principles of KWS and a total communication approach. The 100 signs taught are considered to be an introduction to the overall 580-word Lámh vocabulary, and participants are supported to access further training material upon course completion. However, for many school communication partners, attending the Module 1 course is the full extent of the Lámh training they will receive. If Lámh is to be used successfully in mainstream primary schools, it is essential that communication partners are equipped with a KWS vocabulary tailored to the specific needs of the environment in which they work (Dark et al., 2019).

Unlike children who communicate primarily using spoken language, which tends to stem from significant experiences and interests, children who use KWS and other forms of AAC are reliant parents and professionals to ensure that appropriate vocabulary is available and accessible (Laubscher & Light, 2020). Across the literature, vocabulary prediction and selection for AAC users is considered a complex and time-consuming task, often left to SLTs, teachers, or other professionals who may have little experience (Trembath, Balandin, & Togher, 2007). For school-age children, vocabulary selection becomes more difficult, with vocabulary needed to support the growing, and more complex communication demands of the school environment (Boenisch & Soto, 2015). Not only are signs required to support social interactions with a range of communication partners, but also academic achievement, including classroom participation, language development, and the development of early literacy and numeracy skills (Boenisch & Soto, 2015). The final motivation for the current study stems from the need for a KWS vocabulary that is specifically focused on the communicative and educational needs of the first year of mainstream primary school. This core, school-based Lámh vocabulary would address the increased communication demands of the school environment, providing support for children with DS as they begin their formal education. Furthermore, a core vocabulary tailored specifically to

the needs of the mainstream school environment could be used to supplement Module 1 training for teachers, or to develop a further, school-specific Lámh training course, making it a valuable resource for SLTs, school-staff, and disability services alike.

1.4 Summary

It is well established that children with DS experience difficulties with speech, language and communication that are disproportionate to their level of intellectual disability (Cleland et al., 2010; Frizelle et al., 2019b). As an AAC intervention, KWS can help to overcome many of the language difficulties associated with DS, as it augments speech with a visual cue, and has benefits for both expressive and receptive language development. The status of KWS in schools has undergone a major shift since its earliest use, however it is clear from the literature that difficulties still persist. As outlined by Dark et al. (2019), the four key features of a successful KWS environment are use of direct and indirect instructional strategies, access to communication partner training, access to resources and supports, and a functional sign vocabulary. As such, a core school based Lámh vocabulary, designed specifically to facilitate communication between children with DS and their communication partners would be a valuable resource for SLTs, parents, teachers, education professionals, and most importantly, for children with DS and their peers. The process of vocabulary selection for AAC users and core vocabulary development is outlined in more detail in Chapter 2.

Chapter 2
Vocabulary Selection for AAC users: A Core Vocabulary Approach

Predicting and selecting vocabulary for children who use AAC, across all modalities, is widely regarded as a challenging and time-consuming process (Trembath et al., 2007). Essentially, the test of vocabulary selection lies in choosing a limited set of words from an unlimited number of options (Beukelman, McGinnis, & Morrow, 1991). While there may be fewer possibilities within KWS systems, it remains vital that children and their communication partners have access to a functional sign vocabulary, appropriate for the context in which communication is taking place (Dark et al., 2019). More often than not, parents, teachers and SLTs are responsible for vocabulary selection, and without previous experience they may be ill-equipped to select the words needed (Trembath et al., 2007). In a recently published chapter, Dark and colleagues (2019) propose a number of strategies for identifying meaningful, motivating, and relevant vocabulary for children who use KWS. These include 1) asking multiple informants, such as family members, teachers, and peers, to identify important words, 2) conducting assessments of the environment, also referred to as a communication inventory, and 3) consulting published vocabulary lists, such as the core vocabularies of typically developing children. The identification of a core vocabulary, a set of words that can be used with multiple communication partners across a range of contexts, is one the most widely recommended strategies to assist in predicting and selecting vocabulary for children who use AAC (Trembath et al., 2007).

In general, core vocabulary refers to the words that are the most central to a person's expressive vocabulary (Witkowski & Baker, 2012). This implies that core vocabulary has the capacity to cover a variety of topics, across a wide range activities and contexts (Boenisch & Soto, 2015). Further characteristics of core vocabularies, as outlined by Lee (2001) include the words that are the most fundamental to a language, the most frequently or commonly occurring words in a language (in general or for a particular population or group), and words that can be used widely across genres, situations, and communication partners. In terms of vocabulary selection for AAC criteria are less rigid, with core vocabulary mostly referring to a small set of words that can be used consistently across environments, to communicate with a range of people (Deckers, Van Zaalen, Van Balkom, & Verhoeven, 2017). Because core

vocabulary is relatively small in size and can offer maximum communication impact across people and locations, it is thought to be particularly useful for people who use AAC (Boenisch & Soto, 2015). The core vocabularies of a range of groups have been investigated in the literature. Although many of these core vocabularies are generated by typically developing children, they are compiled with a view to predicting and selecting vocabulary for AAC users. In terms of preschool and school-age children, these groups include toddlers (Banajee, Dicarlo, & Buras Stricklin, 2003), typically developing preschool children in the United States (US) and Australia (Fallon, Light, & Paige, 2001; Trembath et al., 2007), preschool children who speak Zulu (Mngomezulu, Tönsing, Dada, & Bokaba, 2019), typically developing school-aged children in the US (Boenisch & Soto, 2015), and young children with DS (Deckers et al., 2017). It is these core vocabularies that form the aforementioned word lists which can be used as a resource to aid vocabulary selection. This chapter presents an overview of these core vocabulary studies, followed by the methodological considerations that guided the current study. Finally, the specific research questions of the current study are addressed.

2.1 Core vocabularies of preschool and school aged-children

2.1.1 Typically developing children. With respect to very young children, Banajee et al. (2003) investigated the core vocabulary of toddlers aged between 2;00 and 3;00 years. The study took place in a preschool setting, and the aim was to develop a core vocabulary list that could inform vocabulary selection for preschool children who use AAC. In order to develop this vocabulary list, language samples were collected from 50 typically developing toddlers (34 girls and 16 boys), from five different preschools. Each child was recorded during two different activities, one child-directed, such as free-play, and one adult-directed, such as snack time, over a three-day period. While the aim of the study was to develop a core vocabulary to reflect the language of toddlers, the vocabulary collected was limited to two specific activities on each day of data collection, and it was reported that some participants contributed less than 25 words. This highlights the importance of a larger number of participants, particularly when working with very young children. To determine the core and fringe vocabulary, each word in the overall sample was given a score from 1-6. If a participant used a word in both the child and adult-directed activities it received a score of 2, and if it was used by a child in both activities across all three

days it was assigned a score of 6. Words were included in the 'core' vocabulary list if they received a score of 4, 5 or 6. Using these criteria, the core vocabulary for toddlers contained 27 words. The list contained demonstratives, verbs, prepositions, pronouns, and articles, but no nouns. In addition, only nine words were used by all fifty toddlers across both activities on all three days. The absence of nouns from this list of core vocabulary is particularly interesting in the context of AAC. Despite the evidence that nouns were not commonly used by the toddlers in this study, nouns are typically selected in early vocabulary for AAC users (Banajee et al., 2003). While nouns may be easier to teach, and have a higher iconicity than function words, it is important that vocabulary selection is age appropriate. In terms of KWS, this could involve emphasising more abstract, but functional signs, including vocabulary identified as core by Banajee et al. (2003), such as *Yes, No, Want, That,* and *More*.

Fallon et al. (2001) also addressed the challenge of selecting vocabulary for preschool children who use AAC, but with a different methodology. The study is presented in two parts: the development of a core vocabulary list, followed by the development of a vocabulary selection questionnaire intended for use by parents, teachers, and healthcare professionals. To generate the core vocabulary, five typically developing children (aged 3;9-4;9) were audio recorded while going about their daily routine within the preschool setting. Recording took place for up to two hours across four days, and was terminated when a language sample of 1000 words had been collected from each of the five participants. In terms of analysis, the 250 most frequently occurring words were determined to be 'core' vocabulary. These 250 words accounted for 89% of the 5000-word composite sample, and 65 of the words had a commonality of 100%, indicating that all five participants used them at least once. This study had a significantly smaller number of participants than the study carried out by Banajee and colleagues, with five and 50 participants respectively. However, all participants contributed a minimum of 1000 words, leading to a much larger composite vocabulary. While this larger composite vocabulary is a strength, both studies present only a snapshot of vocabulary, with recording of participants taking place over three to four days. The second part of the study detailed the development of a vocabulary selection questionnaire, also with the aim of enhancing vocabulary selection for children who use AAC. The participants in this component of the study were 15 children who were highlighted by preschool teachers as having

communication difficulties, and the vocabulary questionnaire was completed by each child's parent, teacher and SLT. Of the three groups, the SLTs contributed the most vocabulary items, but parents contributed the most unique vocabulary items (words which were not recommended by any of the other groups). Fallon et al. (2001) conclude that the vocabulary questionnaire was a more efficient way to select vocabulary, however no information is given regarding the overlap between the vocabulary items in the core vocabulary based on frequency and commonality versus those that were selected through the questionnaire. While the inclusion of the second study offers a further perspective on vocabulary selection based on recommendations from communication partners, the results are difficult to compare given the difference in participants. The inclusion of the children with communication difficulties in the first part of the study, combined with the inclusion of the parents and teachers of the typically developing children in the second part of the study would have allowed for greater comparison between groups, and strengthened the validity of the findings.

Trembath et al. (2007) developed a core vocabulary for Australian preschool children who use AAC. Although intended to aid selecting vocabulary for AAC users, similar to the studies outlined above the vocabulary was generated by typically developing children. In this instance, a 3000-word language sample was collected from six children (aged 3-5 years) in three different preschools. The time taken to collect this sample ranged from two to seven hours across two to six days, and efforts were made to ensure that all participants were recorded across a range of activities. The resulting 18,000-word data set contained 1,411 different words, and each word was given a commonality score between 1 and 6. A commonality score of 6 indicated that a word was used by all 6 participants. To separate these words into core and fringe vocabulary a combination of frequency and commonality criteria were applied. Core vocabulary was defined as "words with a frequency of at least 0.5 per 1000 words, that were used by at least three (50%) of the participants" (Trembath et al., 2007, pp. 294). When these criteria were applied, 263 words emerged as core vocabulary, and these words accounted for 79.8% of the total sample. The larger composite vocabulary, and inclusion of both frequency and commonality criteria strengthen the findings of this study. However, as with the studies discussed above, the authors caution against the application of core vocabularies of typically developing children to those of children with language difficulties. Furthermore, the rules applied during data

treatment meant that repetitive words used in songs, games, and rhymes were not analysed. While this decision was made in an attempt to ground the core vocabulary in conversational speech, this vocabulary plays an important role in the lives of school-age children. Similar to the findings of Banajee et al. (2003), the core vocabulary was reported to predominantly contain 'structure' words, such as conjunctions, prepositions, auxiliary verbs and articles, which were typically used by all of the participants. Only 30 nouns met the frequency and commonality criteria for core vocabulary. The remaining 1,148 words in the data set were classified as fringe vocabulary. As is typical for fringe vocabulary (Trembath et al., 2007), these comprised of more information carrying words such as nouns, verbs and adjectives, and were highly individualised, with 770 words recorded only once. The absence of 'content' words in the core vocabulary is particularly pertinent in the context of KWS systems, which typically do not emphasise 'structure' words. This highlights potential differences in the optimum method of choosing core vocabulary for KWS compared to other AAC systems.

Given that core vocabularies generated from typically developing children appear to reflect the structural aspects of language, the core vocabulary of English speakers may not be applicable to AAC users of another language (Mngomezulu et al., 2019). This was the rationale for a study carried out by Mngomezulu et al. (2019), who aimed to determine a Zulu core vocabulary for AAC users. The study mirrored the one carried out by Trembath et al. (2007) in terms of research design, data collection, and analysis. Participants, however, were slightly older, aged between 5;1 and 5;9, and were attending a preschool where the main language of instruction was Zulu. What is most interesting about the findings of this study is that although a similar number of words met the criteria for core vocabulary, 238, these words accounted for only 51.9% of the total sample (Mngomezulu et al., 2019). As stated above, the 263 words that were classified as core for the English-speaking children in the Trembath et al. (2007) study accounted for 79.8% of the total sample. Mngomezulu et al. (2019) credit this difference largely to the structure of the language, rather than the actual language use of the children involved.

The studies reviewed thus far involved participants in a preschool setting. Boenisch and Soto (2015) analysed the core vocabulary of typically developing school-age children, aged 7 to 14 years old. They included 30 participants, 22 of whom

were native English speakers, and eight who spoke English as a second language (ESL). The goal of the study, similar to those outlined above, was to inform vocabulary selection for school-age children who use AAC in the US. All students were recorded for between one and three hours, over the course of at least two typical school activities. These activities included classes and the transitions between them, as well as mealtimes and field trips. Some students were recorded on two occasions, which resulted in a total of 37 language samples. In terms of analysis, rather than explicit frequency or commonality criteria Boenisch and Soto (2015) based the core vocabulary on the assumption that core vocabulary can encompass up to 80% of all words used in a specific communication context. While the studies discussed thus far have shown that many methods can be employed to generate a core vocabulary, the introduction of a second metric, such as commonality, in separating core and fringe vocabulary may have improved the rigour of the findings. For the native English speakers, the 200 most frequently used words accounted for 80% of the total sample (98,053 words), and for the ESL speakers this number was slightly lower, with 141 words accounting for 80% of the total sample (19,319 words) (Boenisch & Soto, 2015). No marked differences were found between the core vocabularies of the two groups, and for both the most frequently used word was 'To Be' and its variants (am, are, is, was, were). In total, the word 'To Be' was recorded a total of 9,775 times. Sixty-one of the top 100 words in the core vocabularies were 'structure' words, which in this instance were referred to as 'function words'. Only 7 of the 100 most frequent words were nouns. Sixty-five percent of the words recorded were used less than 10 times, and 35% less than three times, again indicating the discrepancy between use of core and fringe vocabularies.

2.1.2 Children with DS. To the best of our knowledge, only one study has investigated the core vocabulary of school-age children with DS specifically. Deckers et al. (2017) investigated the core vocabulary of 30 children with DS (14 boys and 16 girls), and in contrast to the studies outlined above, participants were both preschool and school-aged, ranging from 2-7 years old (M = 4;09). The context of communication was also broader, with language samples collected in multiple settings: at home and school, during free play and at snack time, and at a speech and language therapy session. This meant that while participants did interact with multiple communication partners, including parents, teachers and SLTs, less emphasis was

placed on peer interaction. One notable strength of this study was that language samples were collected by video recording, which allowed for analysis of both signed and spoken language modalities. A sample of 100 words was collected per child, roughly 33 words from each setting, which resulted in a total sample of 3000 words. Similar to Trembath et al. (2007), criteria for core vocabulary included both frequency and commonality. However, rather than combining them, Deckers and colleagues (2017) presented two separate lists; one containing the 50 most frequently used words, and one containing the words which were used by at least half of the participants (i.e. had a commonality score greater than or equal to 15).

The 50 most frequently used words accounted for 67.2% of the total sample, and 22 of these words were both spoken and signed by the participants. Sixteen words, 10 of which were both spoken and signed, met the commonality criteria, and these words accounted for 47.1% of the total sample. The study concluded that once signed modalities were taken into account, in terms of communicative functions (syntactic, semantic and pragmatic), the core vocabulary of young children with DS closely resembles that of typically developing children. However, the core vocabulary contained notably fewer words, and content words were over-represented when compared with the findings of other studies. Eleven of the 50 most frequently used words were nouns. The most likely reasons for this were the inclusion of signed modalities, in which key words only are accompanied by manual sign, and the expressive language skills of the participants, many of whom were reported to communicate primarily with one-word utterances.

2.2 Methodological considerations for the current study

It is clear that the development of a core vocabulary is an established approach to aid vocabulary selection for children who use AAC, and the studies discussed above provide a valuable insight into this process. While most research cautions against the use of published core vocabulary lists alone, they remain a valuable resource for SLTs, teachers and parents (Fallon et al., 2001). The literature reviewed above indicates that overall, a relatively small core vocabulary of frequently and commonly used words can facilitate effective communication across a range of interactions within preschool and school environments (Trembath et al., 2007). However, consideration of the methodologies chosen by these authors is warranted. The need for the current study arises from the nature of KWS as a method of communication, and the need to reflect

the vocabularies of multiple communication partners within the context of the first year of mainstream primary school. These key differences between spoken language and KWS have implications for the overall study design.

Core vocabularies based on spoken language samples contain large amount of 'function' or 'structure' words (Banajee et al., 2003; Boenisch & Soto, 2015; Trembath et al., 2007). These structure words, such as conjunctions, auxiliary verbs, and articles, largely provide connections between content words, and as such, do not always carry meaning when used in isolation (Boenisch & Soto, 2015). KWS, on the other hand, emphasises supporting the key words in a sentence with manual signs. While function words are essential for effective communication, more often than not the key words in a sentence are the information carrying concepts, typically nouns, pronouns, verbs and adjectives (Dark et al., 2019). This is one of the crucial differences between spoken language and KWS, and therefore, between vocabulary selection for children who use aided AAC and children who use KWS. While the purpose of the studies outlined above was to develop core vocabulary lists that would aid vocabulary selection for school-age AAC users, no study was explicitly focused on KWS systems. Deckers et al. (2017) included children with DS who used KWS in their study design, but the presented core vocabulary list was a combination of words used in speech and sign. Within contemporary AAC research, greater attention is devoted to aided systems, particularly high tech, rather than unaided systems (Iacono et al., 2013). This is reflected in the core vocabulary studies reviewed above, with several (Banajee et al., 2003; Mngomezulu et al., 2019; Trembath et al., 2007) referring to the programming of devices with core and fringe vocabulary items. The goal of the current study was to develop a core vocabulary explicitly for KWS users in mainstream school, focusing primarily on vocabulary items that if supported with a Lámh sign would facilitate effective communication.

Integrating the perspectives of children with communication disorders, especially young children, presents unique challenges for researchers (Carroll & Sixsmith, 2016). Despite these challenges, it has become increasingly important that children's experiences in their everyday lives are taken seriously in research (Clark, 2005). In terms of participants, although the core vocabulary lists outlined above were developed as a resource for AAC users, children who use AAC were largely not involved. With the exception of Deckers et al. (2017), all participants were typically

developing children. This poses two key considerations for the methodological design of current study. The first is applying the vocabularies of typically developing children to children who use AAC. It is widely acknowledged vocabulary selection is difficult, particularly if the AAC user is young and cannot contribute to the process (Banajee et al., 2003). However, the study carried out by Deckers et al. (2017) demonstrated that children with DS as young as two could make meaningful contributions once the methodology of the study was designed to accommodate their language skills. In the current study, it was a priority that children with DS who use Lámh would be involved in the development of the school-based Lámh vocabulary.

The second methodological consideration with regard to participants is the role of the communication partner in KWS. KWS has both an expressive and receptive function as a method of AAC (Rombouts, Maes, & Zink, 2017). Clearly it is important for signs to reflect the expressive language of the children with DS, however in order for KWS to play a role in comprehension it must also reflect the expressive language of the communication partners in the environment. Dark et al. (2019) suggest that signs are learned best through a combination of direct and indirect instructional strategies. Therefore, if the core school-based vocabulary takes the vocabulary needs of a range of communication partners into account this will not only facilitate effective communication, but also promote the acquisition of new signs. In order for a core school based Lámh vocabulary to serve the needs of all communication partners within the environment, it is essential that teachers, peers, and SNAs are included in the study design, as well as the children with DS themselves.

Regarding procedure, the studies reviewed above demonstrate that recording and analysing language samples is the most commonly used method for developing a core vocabulary list. In most cases these language samples were audio recorded, then transcribed verbatim for subsequent analysis. In the case of Deckers et al. (2017), language samples were video recorded to allow for transcription of both spoken and signed language. Given the range of participants involved in the current study, this type of data collection methodology was not applicable. Furthermore, while Deckers et al. (2017) demonstrated that signs can be included in language samples if they are video recorded, this is based on the assumption that signs are already being used within the environment. Children with DS in junior infants may be ‘early signers’, or may be reluctant to use signs in a new environment. As outlined in Chapter 1, not all teaching

staff have access to Lámh training, and research suggests that even in mainstream schools where KWS is used, it is likely to be used in a restricted way (Parkhouse & Smith, 2019). In a separate study, staff in adult residential services reported supporting around 8% of their spoken utterances with KWS, however when observed, findings indicated the production of almost no signs (Bradshaw, 2001). In this sense, it was important that the current study had scope to be aspirational, reflecting Lámh vocabulary that could potentially serve the needs of the participants, rather than providing an objective account of all the words used within the school environment. As such, the procedure followed in the current study more closely resembles the strategies for KWS vocabulary selection outlined by Dark et al. (2019): asking multiple informants (including sign users themselves) and carrying out an 'ecological assessment'. The participants with DS recommended vocabulary through guided tours of the school environment, more detail on which will be provided in Chapter 3. Teachers, SNAs, and peers were asked to recommend Lámh signs that would be important to understand and use at school. This is similar to the vocabulary questionnaire created by Fallon et al. (2001), however interviews were chosen to allow for the possibility that school communication partners would not be familiar with KWS as a method of communication. Dark et al. (2019 pp.216) recommended observing "receptive and expressive communication needs and opportunities" around the environment, and this was how the SLT researcher proposed Lámh vocabulary for the school context.

For AAC to be used successfully, children and their communication partners must have access to vocabulary that is comprehensive, appropriate to age and group membership, and tailored to the context of communication (Dark & Balandin, 2007). This gives rise to a number of methodological considerations for the current study. Firstly, in terms of context, none of the studies reviewed above were carried out in a mainstream primary school environment. Four (Banajee et al., 2003; Fallon et al., 2001; Mngomezulu et al., 2019; Trembath et al., 2007) took place in a preschool setting. The study by Deckers et al. (2017) encompassed three separate environments: home, preschool and an SLT clinic. With regard to age and group membership, while Boenisch and Soto (2015) developed a core vocabulary for school-age children, these participants were older (aged 7-14), and in both elementary and middle school. It is unlikely, therefore, that the core vocabulary lists generated from these studies would

apply to the language needs of communication partners within the specific environment of the first year of mainstream primary school in Ireland. A further methodological consideration with regards to context is the fact that all countries have their own KWS system. In this sense, a core Lámh vocabulary is likely to be different to a core Makaton vocabulary, because Lámh uses signs only while Makaton contains a combination of signs and symbols (Frizelle, 2019). As previously stated, Lámh has a total vocabulary of 580 signs, 100 of which are part of the Module 1 training course, the training most commonly accessed by school communication partners. Having the Lámh vocabulary provide the background for the study allows for comparisons to be made between this vocabulary and the vocabulary needed in a school environment, as well as highlighting the need for any new Lámh signs.

The final methodological consideration that arose from the literature reviewed was the duration of the data collection period. In the studies outlined above, data collection was largely determined by the number of words collected, for example a language sample of 100 words per participant (Deckers et al., 2017), 1000 words per participant (Fallon et al., 2001), or 3000 words per participant (Mngomezulu et al., 2019; Trembath et al., 2007). The reported time taken to record these language samples ranged from one to seven hours, over the course of two to six days. The transition to primary school, however, is a social process which involves changes, actions, and interactions, unfolding over the course of the full school year (Villeneuve et al., 2013). A core vocabulary needs to address the changes that occur during the year both from an educational and communicative perspective. A more longitudinal design was therefore adopted in the current study, to ensure that the Lámh vocabulary needs of all communication partners were captured as they emerged and evolved in the first year of school.

2.3 Summary and research questions

The aim of this study was to identify the Lámh vocabulary needs of children with DS and their communication partners over the course of the first year of mainstream primary school, through a series of classroom observations and interviews. By including a range of communication partners, (i.e. the people most likely to frequently interact with a child with DS in school), the goal was to ensure that the core vocabulary would be informed by the those who would use it on a daily basis. The five distinct groups that contributed to the vocabulary were 1) the Speech

and Language Therapist (SLT)- researcher, 2) children in junior infants with DS who use Lámh, 3) their peers, 4) their teachers and 5) their special needs assistants (SNAs).

The specific research questions were:

1. In the development of a Lámh vocabulary for mainstream primary schools,
    a. How many different signs were contributed by each of the five identified groups over the course of the school year?
    b. What was the breakdown of these signs with respect to Lámh word categories?
2. What Lámh signs were uniquely contributed by each group?
3. What Lámh signs were most frequently and commonly contributed to the school-based vocabulary?
4. What words for which there is currently no Lámh sign were contributed to the school-based vocabulary?
5. Based on frequency and commonality, what signs can be recommended to form a core Lámh vocabulary for mainstream primary schools?
    a. What words with no Lámh sign meet the criteria for inclusion in the core school-based Lámh vocabulary?
6. How does the recommended core school-based Lámh vocabulary compare to the vocabulary currently taught in the Lámh Module 1 training?

Chapter 3
Methodology

The current study sought to investigate the vocabulary needs of children with DS and their communication partners in the first year of mainstream primary school, in order to develop a core school-based Lámh vocabulary. A subsequent goal was to compare the resulting school-based vocabulary to the vocabulary taught in the Lámh Module 1 course, the current entry level training for teachers and school staff. Triangulation, the process of combining data from a number of sources in order to develop a more comprehensive and balanced understanding of the phenomenon being researched (Patton, 2002), was a key feature of the methodological design of the study. In terms of triangulation of participants, the school-based Lámh vocabulary was generated by five groups: an SLT-researcher, children with DS in junior infants (the first year of mainstream primary school), and their peers, teachers, and special needs assistants (SNAs). Methodological triangulation, the use of several data collection methods to address a research question (Noble & Heale, 2019) was addressed through the use of observations, interviews, and guided tours of the school environment led by the participants with DS. This chapter outlines the methodology by which the aims of the study were achieved, including a description of the participants, the procedure, and ethical considerations.

3.1 Ethical considerations

The protection of participants from any harm, and ensuring their well-being and dignity is central to ethical research (Willig, 2013). This study received ethical approval from the Social Research Ethics Committee of University College Cork (SREC) (Appendix A). While ethical approval is essential prior to beginning any study, a commitment to upholding the highest ethical standards must be present throughout the research process (Willig, 2013). As a priority, steps were taken to ensure that informed consent was obtained from everyone who participated in this study. Consent was first obtained from the parents of the participants with DS. For the adults who took part in the study (teachers and SNAs), informed consent was obtained in writing and discussed face to face. For the children who took part (participants with DS and their peers), steps were taken to facilitate ongoing, informed assent, as well as obtaining written consent from their parents. The age and level of ability of a child dictates how their assent and participation is negotiated (Ireland & Holloway, 1996).

For the peers who took part, at each data collection point the researcher took time to explain what would be expected of them. This was followed by a series of 'thumbs up or thumbs down' questions supported with visuals, to check understanding. Finally, peers were invited to 'sign' the assent sheet or mark it with a tick. For the participants with DS assent was an ongoing, dynamic process. The researcher adopted a total communication approach, where a combination of spoken language, Lámh, and visual supports were used to explain the nature of tasks, and the child's verbal and non-verbal signals were observed to determine their willingness to participate (Carroll & Sixsmith, 2016). Participation was completely voluntary, and participants were advised in writing and throughout the research interactions that they could withdraw at any time (Braun & Clarke, 2013).

Confidentiality, in relation to how data is collected, accessed, and used was also an important ethical concern in conducting this research (Crow, Wiles, Heath, & Charles, 2006). Gatekeepers were employed at each level of recruitment through voluntary organisations, the school principals, and the class teachers. Confidentiality was assured both in the study information letter and verbally at each data collection point. Throughout data collection, the researcher was vigilant to not disclose the location of the other schools involved in the research. Measures were also taken to ensure confidentiality of the collected data. Names were not recorded in observation records or interview transcripts, and all data which was stored electronically was anonymised. Transcripts of classroom observations and interviews were stored on a password protected computer to which only the researcher had access. Interviews were recorded on an iPhone 5SE, and the same device was used to take the photographs for the participant guided tours. After each school visit these files were transferred to a password protected computer in a locked office in UCC and deleted from the recording device. All physical data, including consent forms and participant vocabulary checklists were stored in a locked cabinet in the same office. In line with the UCC Code of Research Conduct all data will be securely held for a minimum of ten years after completion of the project, before being destroyed. Further ethical considerations, such as those relating to data storage, will be discussed in more detail as they became relevant to each aspect of the methodology.

3.2 Participants

The current study involved a total of 28 participants: six children with DS, five teachers, eight SNAs and nine peers. All of the teachers, SNAs and peers that took part in the study were connected to the six participants with DS, who attended five different primary schools. As the author, the SLT-researcher is not included in the total number of participants. The following section will outline the process of participant recruitment, the distribution of participants across the five schools, and a description of participant demographics.

3.2.1 Participant recruitment. The objective of this study was to develop a core Lámh vocabulary for the first year of primary school. This required a sampling method that would enable an in-depth understanding of the Lámh vocabulary needs of children with DS over the course of this first year, which in Ireland is referred to as junior infants. As such, a purposive sampling approach was employed, ensuring the selection of participants with relevant experiences, who could provide a rich insight into the topic of KWS in school (Patton, 2002). Children with DS who use Lámh were the core participants in the study. In order to reflect vocabulary needs from the start of the year, recruitment took place in the months leading up to the 2019 academic year. The other participants in the study were the class teachers, SNAs, and peers of the children with DS. Given the changeable nature of school timetables and student numbers, recruitment of these groups took place once the school year had started, in the first weeks of September 2019. In line with best practice guidelines, initial contact with potential participants was facilitated by gatekeepers at each stage of recruitment (Braun & Clarke, 2013). The recruitment procedures for each group that contributed to the school based Lámh vocabulary will be outlined in more detail below.

3.2.1.1 Participants with DS. Recruitment of the participants with DS took place in three main stages in the months leading up to the 2019 academic year. First, a representative from a regional branch of a disability service organisation was asked to distribute an information sheet to parents of children who met the inclusion criteria for the study (see Appendix B). The specific inclusion criteria for the participants with DS in the current study were: 1) the child was a Lámh user at the time of recruitment, and 2) the child was enrolled in junior infants at a mainstream primary school and was due to commence in September 2019 (i.e., the following academic year). Parents who

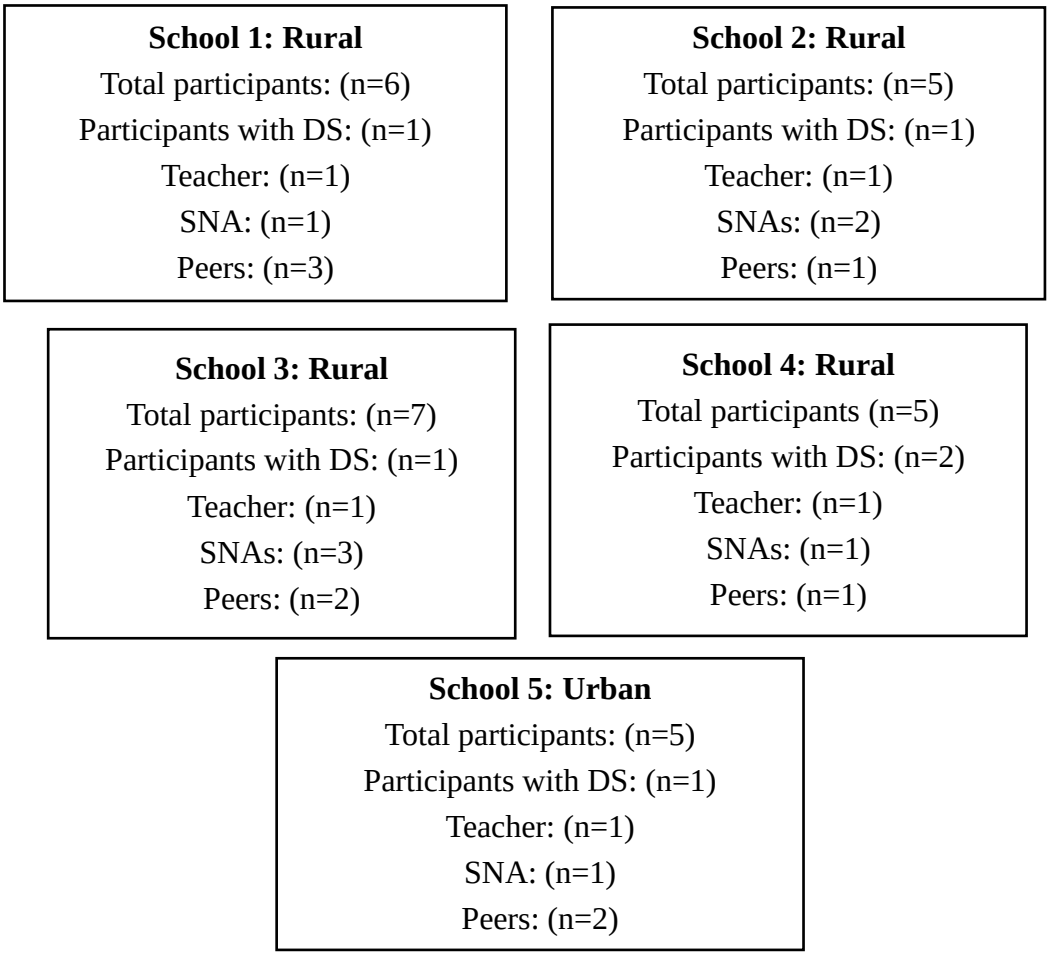
were interested in their child participating were given information to contact the researcher directly. Four families responded to the initial call, however only two met the inclusion criteria for the study. The children who did not meet the criteria were enrolled in special schools. A second representative from the same disability organisation then distributed the study information sheet to families who were taking part in a school readiness programme at the service. From this, one further family expressed interest in taking part. In the case of one participant snowball sampling occurred, whereby one parent passed the study information to another who subsequently contacted the researcher to become involved. Finally, the study information sheet was distributed by a different branch of the organisation, also in Munster. Two parents whose children met inclusion criteria responded to this call, resulting in the final total of six participants with DS.

3.2.1.2 Teachers and SNAs. With parents' consent, the researcher then contacted the principal of each child's school. Two of the participants with DS were enrolled in the same school, so a total of five school principals were contacted. Once the principal confirmed that the school was willing to take part, they shared the study information and consent forms with the child's class teacher and SNA. Teachers and SNAs were asked to contact the researcher to discuss the project in more detail and confirm that they were willing to take part. Initially, this resulted in a total of five teachers and five SNAs. However, as the year progressed some participants had a number of different SNAs, so in total there were five class teachers and eight SNAs involved in the study.

3.2.1.3 Peers. The final group of individuals to inform the school-based Lámh vocabulary were the peers of the children with DS. Once the teachers and SNAs had confirmed they wished to take part, they were asked to distribute the study information among the parents of peers in the class who may be interested in participating. Teachers were advised that "up to three" peers could be involved. In some cases, the recruitment of peers was a collaborative process between teaching staff and the participants' parents, if parents were already in contact with the other children's parents. Parents of the chosen peers were given consent forms, and were also given information to contact the researcher directly. This final stage of recruitment resulted in a total of nine peers across the five schools, all of whom were also in junior infants.

3.2.2 Distribution of participants across schools. The distribution of participants across the five schools is outlined in Figure 1. There was one participant with DS in each of the schools, and two in School 3. Each school also had a class teacher and SNA. In Schools 1 and 5 the participant with DS was assigned to one SNA. In School 2, two SNAs shared the role, and both were interviewed over the course of the school year. In School 3, SNAs rotated on a five-weekly basis, so a total of three SNAs were involved over the course of the year. The teacher and SNA in School 4 were interviewed on behalf of the two participants with DS that attended the school. The number of peers who participated also varied between schools. There were three peers in School 1, two in Schools 3 and 5, and one in Schools 2 and 4. Schools 1-4 were in rural areas, and School 5 was in an urban area.

Figure 1
Distribution of participants across the five schools



3.2.3 Description of participants in the current study.

3.2.3.1 Participants with DS. The participants with DS were aged between 5;03-6;02 at the beginning of the study. Of the six children, five were female and one was male. The ages of each of the participants with DS at the beginning of the study (September 2019) are outlined in Table 1. Given the individual variation that exists in language development in children with DS (Deckers, Van Zaalen, Van Balkom, & Verhoeven, 2019), parents were asked to complete a measure of expressive and receptive vocabulary in the early stages of the project. The Down Syndrome Education (DSE) Vocabulary Checklists 1 and 2 (Down Syndrome Education International, 2012) were the measures used. Vocabulary Checklist 1 and 2 account for the first 120 and second 340 words acquired by typically developing children, respectively (Down Syndrome Education International, 2012). The DSE checklists were chosen as they can be completed by parents, and document both receptive and expressive language learning. A further advantage, particularly for children with DS is that both KWS and spoken language are included as indicators of expressive vocabulary. Table 2 presents a summary of the participants' receptive and expressive vocabulary skills , as per their parent report.

The DSE checklists offer an insight into the vocabulary skills of the participants with DS. Overall, the typical profile of strengths in receptive vocabulary (Martin et al., 2009) is reinforced. In keeping with this characteristic profile, expressive vocabulary, and to a certain extent intelligibility, were highlighted as areas of relative weakness. All six parents reported the lowest number of vocabulary items to be "understood by an unfamiliar listener". Three of the six participants were reported to use less than ten words spontaneously. When compared to spoken language, the number of vocabulary items that the participants were reported to "understand and sign" was higher. The six participants were reported to understand and sign between 17 and 118 words from Checklist 1 (the first 140 words), and between four and 118 words from Checklist 2 (the second 340 words). As expected, Checklist 2 showed a greater range of ability. However, the highest and lowest scores both represent outliers, with the remaining four participants reported to "understand and sign" between 30 and 55 words. The profile of receptive and expressive vocabulary skills, in terms of both spoken language and sign highlight the importance

of KWS as an accessible form of communication to the participants with DS within the school environment.

Table 1
Participants with DS: Age and Gender

School	Participant with DS	Gender	Age (as of September 2019)
School 1	Participant 1	Female	5;03
School 2	Participant 2	Female	5;09
School 3	Participant 3	Female	5;10
School 4	Participant 4	Female	5;08
	Participant 5	Male	6;02
School 5	Participant 6	Female	5;03

3.2.3.2 Teachers and SNAs. All of the teaching staff who took part in the current study were female. At the start of the study the teachers and SNAs involved were asked if they had completed formal Lámh training. Four of the five teachers had completed Module 1 training in preparation for the year, and the remaining teacher completed Module 1 training over the course of the study. Of the eight SNAs that were involved, three had completed Module 1 training, and one had also attended the Module 1 Add-On Course. The remaining five SNAs reported they were 'familiar' with Lámh but had not completed any formal training. Table 3 outlines the level of Lámh training completed by each of the school staff involved in the study.

Table 2
Participants with DS: Expressive and receptive language skills.

Participant	First 120 Words					Second 340 Words				
	Under-stands	Understands and signs	Says word in imitation	Uses word spontaneously	Understood by unfamiliar listener	Under-stands	Understands and signs	Says word in imitation	Uses word spontaneously	Understood by unfamiliar listener
Participant 1	112	64	12	9	4	237	55	2	0	0
Participant 2	73	61	18	7	2	50	30	3	1	0
Participant 3	131	17	133	114	91	259	4	229	143	90
Participant 4	125	118	121	124	48	215	142	225	151	19
Participant 5	87	49	2	1	0	76	35	2	0	0
Participant 6	105	100	95	91	92	202	44	54	46	61

Table 3

Teachers and SNAs: Lámh training completed

School	Teaching Staff	Lámh Training Completed
School 1	Teacher 1	Module 1
	SNA 1	Module 1, Module 1 Add-on
School 2	Teacher 2	Module 1
	SNA 2.1	Module 1
	SNA 2.2	-
School 3	Teacher 3	Module 1
	SNA 3.1	-
	SNA 3.2	Module 1
	SNA 3.3	-
School 4	Teacher 4	Module 1
	SNA 4	-
School 5	Teacher 5	Module 1
	SNA 5	-

3.2.3.3 Peers. The peers involved in the study were aged between 4:09-5:07 at the beginning of the study (as of September 2019). Of the nine peers that took part, eight were female and one was male. Table 4 summarises the characteristics of the peers in each school.

Table 4

Peers: Age and gender

School	Peers	Gender	Age (in September 2019)
School 1	Peer 1.1	Male	5;02
	Peer 1.2	Female	5;05
	Peer 1.3	Female	4;09
School 2	Peer 2.1	Female	5;04
School 3	Peer 3.1	Female	5;04
	Peer 3.2	Female	5;07
School 4	Peer 4.1	Female	5;01
School 5	Peer 5.1	Female	4;11
	Peer 5.2	Female	4;09

3.3 Data collection procedure

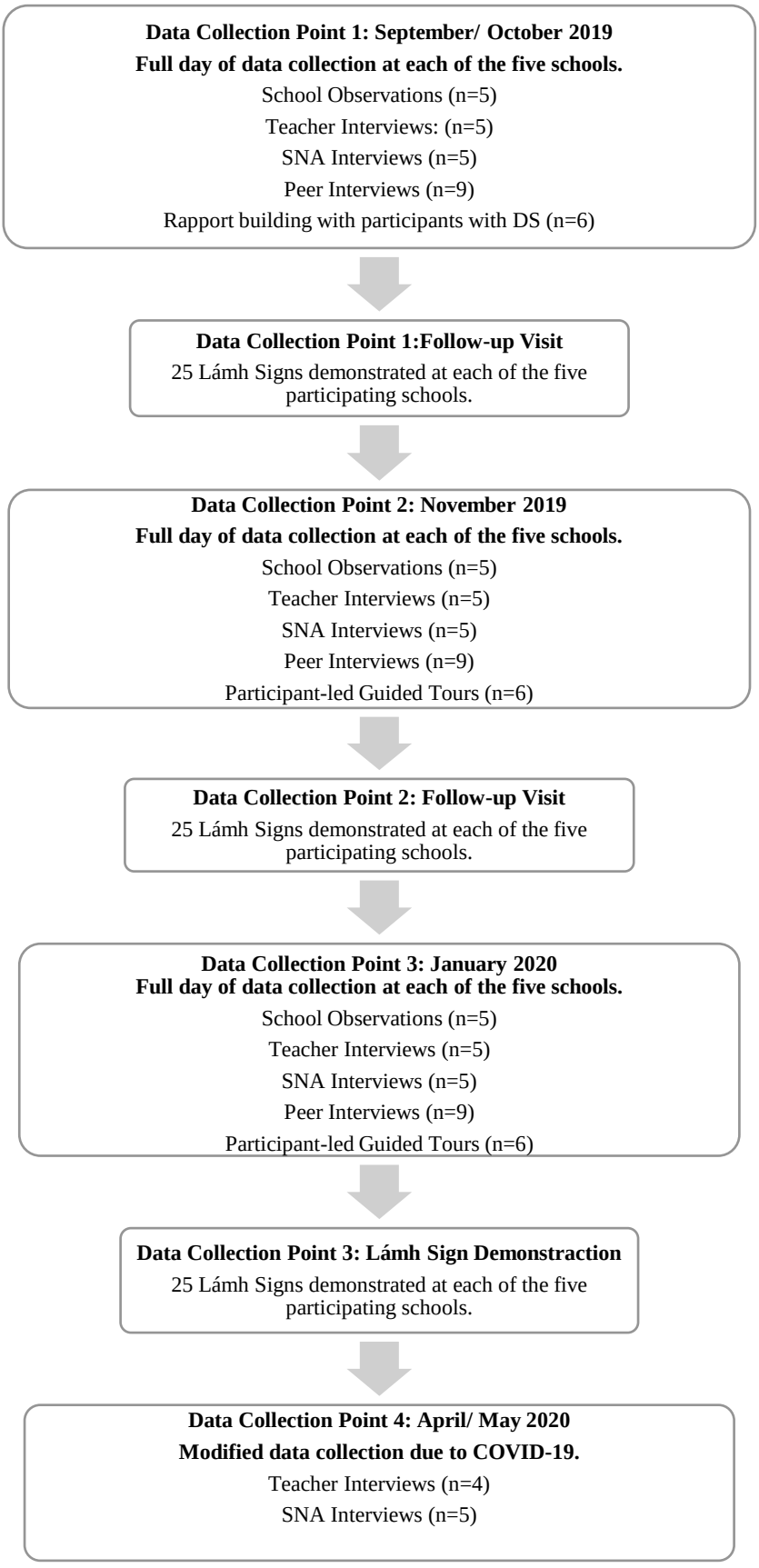
The five groups that contributed to the school based Lámh vocabulary were 1) the SLT- researcher, 2) the children in junior infants with DS, 3) their teachers 4) their SNAs, and 5) their peers, who were also children in junior infants. In order to generate a core Lámh vocabulary that would reflect the needs of all communication partners, data collection involved a number of methods (Creswell, 2014). The SLT-researcher contributed to the vocabulary through a series of school observations. The participants with DS contributed signs by bringing the researcher on a ‘tour’ of the school environment. Finally, the teachers, SNAs and peers recommended signs for the

school-based vocabulary by means of interviews. The data collection schedule, as well as the procedure followed for each group of vocabulary contributors is outlined below.

3.3.1 Data collection schedule. The transition to formal schooling is a significant milestone for all children (Margetts & Kienig, 2013). This transition unfolds over the course of the academic year, as children develop new skills and become adjusted to new routines (Villeneuve et al., 2013). In order to capture the ongoing changes in vocabulary needs throughout this transition, a longitudinal study design was adopted. Data collection was carried out at four time points in the school year: the beginning of Term 1 (September/ October 2019), midpoint of Term 1 (November 2019), the beginning of Term 2 (January 2020), and the beginning of Term 3 (April/ May 2020). The study was designed such that a 'data collection point' involved five school visits, one to each of the schools involved. This visit, which took place over the course of a full school day, allowed for data collection from each of the contributing groups, across a range of activities. Throughout the day, time was allocated for the participant-led guided tour, and individual interviews with the participating teacher, SNA, and peers of the participant with DS. For the remainder of the school day, the SLT-researcher carried out observations within the classroom, and in the wider school environment. The second point of contact with the five schools at each data collection point was a follow up visit, approximately one hour long. The purpose of this shorter visit was for the SLT-researcher to demonstrate a number of Lámh signs for the whole class. This shorter visit will be outlined in more detail in Section 3.3.5. At the time of the fourth data collection point all primary schools in Ireland were closed due to the COVID-19 pandemic. This meant that the SLT-researcher observations, participant led guided tours, and peer interviews were not possible. In order to facilitate data collection at the final time point, remote interviews were carried out with participating teachers and SNAs. The data collection schedule is summarised below, in Figure 2.

Figure 2

Data collection schedule



3.3.2 SLT-Researcher. The SLT-researcher contributed signs to the school based Lámh vocabulary through observations. These observations took place at each of the five participating schools, at three of the four data collection points. This resulted in a total of 15 SLT-researcher school observations. Observation is an important clinical skill, and this form of data collection was chosen for the SLT-researcher because it enabled better understanding of the communication context, and the needs and opportunities for sign use throughout the school day (Dark et al., 2019). Furthermore, observation data can give a valuable insight into things which other participants may not deem relevant (Patton, 2002). The goal of the researcher observations was to record the communication that took place between the participants with DS and their communication partners in the school environment in real time. Transcribing descriptions of these communication attempts meant that the researcher could then analyse the data and recommend Lámh signs that had the potential to either enhance the communication that took place or prevent a communication breakdown that occurred. An observation protocol was developed with this goal in mind. Figure 2 presents an extract from a completed observation record form. Appendix C contains a further sample (20%) of the SLT-researcher observations and vocabulary recommendations.

Figure 3

Extract from a completed SLT-Researcher observation protocol.

Development of a Core Lamh Vocabulary for Mainstream Primary Schools: Observation Form

School: School 1 **Visit Number:** 2 **Date:**------ **Setting:** Classroom, School Support Room, Yard

Communication Partner	Initiated by	Activity Description	Outcome Lámh sign used?	Lamh Sign To enhance communication/ Prevent breakdown
Teacher/ SNA	Teacher (whole class)	Morning Routine: Hang up coats, take out lunches, put bags in a box	No signs used PPT1 facilitated by SNA	Coat Bag Box Lunch
SEN Teacher	SEN Teacher	Instruction: "Will you put your books up on the desk?"	No signs used PPT1 nodded "no"	Morning Put (to) Books Table
SEN Teacher	SEN Teacher	Visual Schedule: First/ Then	No signs used, PPT1 supported with the visuals	First Next
SEN Teacher	SEN Teacher	Lacing activity: Going through pictures of animals Question words, colours, giving praise.	Animal noises used as a semantic cue No signs used	Colours: pink, purple, yellow. What Picture Pull (to) Good Girl Help (to)
SEN Teacher	SEN Teacher	Doing a jigsaw (reward for lacing work). Looking for corners "where are those pieces, I need more"	Signs used: Sand Yellow Blue PPT1's words used: Yeah No	Jigsaw Where More Sand Yellow Blue

Observations were conducted in a range of environments, including the classroom, the school yard, and the PE hall. If the participant with DS went to a breakout room with a different member of staff, such as the special educational needs (SEN) teacher, observations continued there. In relation to each communication attempt observed, the researcher made note of the communication partner, and who initiated the communication. Following this, the interaction was described and the outcome, including whether or not a Lámh sign was used, was noted. Finally, the researcher recommended signs that could have potentially enhanced the communication or prevented a breakdown in communication, where one occurred. At each data collection point, the SLT-researcher carried out these observations for a minimum of two hours. This allowed for observation of all of the routines that make up a typical day in mainstream primary school, including free play, academic work, lunchtime, and routines around morning and home time. Carrying out observations in a range of environments, throughout the day, ensured that Lámh signs recommended by the researcher focused on facilitating effective communication between all communication partners, in all aspects of the school day.

According to Patton (2002), the extent to which an observer is a participant or an onlooker does not necessarily require a distinct choice, and can exist on a continuum. This was taken into consideration in the planning and conducting of the school observations in this study. At the first data collection point the researcher introduced herself to the class and outlined the purpose of the visit. In the classroom and other structured environments, the researcher was positioned primarily as an onlooker. In less structured environments, such as the school-yard, the researcher participated to a larger extent, allowing the children to explain the games they played and demonstrate the Lámh signs they knew. This degree of participation was chosen in order to yield more meaningful data around the selection of the most useful vocabulary (Patton, 2002).

3.3.3 Participants with DS. It has become increasingly important to conduct research with children rather than about them, acknowledging and taking seriously their insights and perspectives on their everyday lives (Clark, 2005). Despite this, facilitating the participation of young children with disabilities in research continues to present challenges for researchers, with lack of appropriate data collection methods highlighted as one barrier to inclusion (Carroll & Sixsmith, 2016). In order to facilitate

the active participation of the children with DS in contributing to the school-based Lámh vocabulary, photography and participant-led tours, elements of the Mosaic approach (Clark & Moss, 2011), were employed. The Mosaic approach is a multi-method, participatory approach which focuses on children's lived experiences (Clark, 2005). The approach is adaptable, and can include a variety of methodological elements including observation, child interviewing, photography, tours, and map making (Clark & Moss, 2011). The Mosaic approach was used by Clark and Moss (2005) in a study investigating children's experiences of their outdoor play environment. They used participant led tours and photography, among other methodological approaches, to explore the question 'What's important here?'.

In keeping with the procedure followed by Clark and Moss (2005), the focus of the participant led tours was to ask, 'What's important here?'. These tours took place at either one designated time in the school day, or as part of movement breaks throughout the day. The participant was introduced to the activity by the researcher, using simple instructions supported with Lámh signs and a visual schedule. The researcher followed the child's lead, and at each stop on the tour asked, "Show me what you like here?". This was followed by the instruction "Let's take a picture". In some cases, the participant helped the researcher to take the picture, and care was taken to ensure no identifying information was included. The degree of independent participation varied, depending on the child's needs, and level of ability. In some cases participants were accompanied by their SNA, who made comments on where the child brought the researcher, or the objects they chose to play with. In other cases, the participant brought the researcher by the hand to a place or item of interest by themselves. The goal was to capture a minimum of five pictures on each guided tour across at least three environments, but this was not prescriptive and varied depending on the interests of the children. One participant, for example, showed a strong preference for a particular library book, and the teacher and SNA reported this was the activity they chose at all periods of free time. As was the case in all interactions, a total communication approach was used, whereby spoken language, Lámh, vocalisations and non-verbal behaviours were accepted as equally valid forms of communication (Fargas-Malet, McSherry, Larkin, & Robinson, 2010).

A total of 12 participant-led guided tours took place: six at data collection point two, and six at data collection point 3. The tours were not carried out at the first data

collection point as the initial priority was to meet the children with DS, build rapport, and become familiar with their communication styles. It was intended that the participant-led tours would take place at the final data collection point, but this was not possible due to the closure of schools. The tours were primarily documented using the photographs taken, but the researcher also took field notes, recording other observations about the place, activities and items shown by the children with DS. After each school visit, these photographs and notes were compiled into a larger document, which stood as a record of the whole tour. From here, the researcher made a note of any Lámh vocabulary that was relevant to the photographs. While this did involve a level of interpretation on behalf of the researcher, the context for the vocabulary came directly from the participants with DS. An extract from one of the participant-led guided tour documents is presented in Figure 3. Further examples of the guided tour documents (25%) are available in Appendix D.

Figure 4
Extract from a participant-led guided tour

4. Sandpit



Description:

In the morning, PPT3 brought the researcher to a sandpit behind her table. The SNA reported that these sandpits were new since the last visit.

After lunch, the researcher observed PPT3 playing with the sand pit as part of a stations activity. PPT3 and two of her peers scooped the sand into trailers, making "birthday cakes" for the researcher. One of the peers added numicon shapes as "candles".

Lámh Signs:

Sand, Cake, Birthday, Candle, Spoon, More, Friend.

3.3.4 Teachers and SNAs. The teachers and SNAs contributed signs to the school based Lámh vocabulary through structured interviews. Although these interviews were carried out individually, the same schedule was used, so for the purpose of this section they will be discussed together. Interviews, both structured and semi-structured, are typically associated with more qualitative study designs (Braun & Clarke, 2013), but asking relevant communication partners to suggest words that

they consider to be important for AAC users has been recommended as a tool for vocabulary selection by several researchers (Dark et al., 2019; Fallon et al., 2001). Fallon et al. (2001) demonstrated that an open-ended questionnaire can be used to generate vocabulary. However, because not all of the teachers and SNAs had completed Lámh training, there was a possibility that a questionnaire would generate largely academic vocabulary, rather than signs that would facilitate better communication across all aspects of school life. Structured interviews were particularly suited to the current study for a number of reasons. Firstly, the interview process allowed time for the researcher to build rapport with the teachers and SNAs (Braun & Clarke, 2013). A further advantage was that while each of the participating teachers and SNAs were asked the same set of questions, ensuring consistency, there was also scope for topics to be brought up unplanned, and the teachers and SNAs had the freedom to raise issues which may not have been anticipated (Braun & Clarke, 2013). Overall, the aim of the teacher and SNA interviews was to generate a rich, holistic school-based Lámh vocabulary.

Interviews were carried out with teachers and SNAs at all four data collection points. There were five teachers involved in the study, and each teacher was interviewed four times. One teacher was not available to participate at the final data collection point, which left a total of 19 teacher vocabulary interviews. While there were eight SNAs involved in the study, only one SNA from each school was interviewed at each time point. An SNA from each of the five participating schools was interviewed at all four time points, resulting in a total of 20 vocabulary interviews. The interviews from time points one to three took place in a quiet space within the school setting, and the fourth interview took place remotely, via Zoom.

The interviews with teachers and SNAs covered a range of topics relating to KWS in school. These topics included learning and using signs, and barriers and facilitators to using Lámh within a school environment. For the purpose of this study, however, only the questions that specifically addressed vocabulary were analysed and reported. The original interviews were between 10 and 45 minutes long. The final virtual interviews lasted up to 90 minutes, given the constraints on other methods of data collection at that time. The specific questions designed to generate Lámh vocabulary items from the teachers and SNAs at each data collection point are outlined below. These questions largely focused on what signs the teachers and SNAs had been

using themselves, and what signs they would recommend for themselves, the children with DS and their peers.

Data Collection Point 1

1. What Lámh signs would be most important for you to know to communicate with _____ in the classroom?
2. What Lámh signs do you think would help _____ to communicate with you?
3. What Lámh signs do you think would help _____ to communicate with their peers in the school environment?

Data Collection Point 2

1. What vocabulary has been the most useful for you since the last visit?
2. What signs do you find yourself using the most?
3. Are there any differences between the signs that you find yourself using the most compared to other people using Lámh in the environment?
4. Has any situation come up where you would find a new Lámh sign helpful?

Data Collection Point 3

1. What Lámh signs have been the most useful for you so far in the school year?
2. What signs do you find yourself using most often?
3. Are there any differences between the signs that you find yourself using the most compared to other people using Lámh in the environment?
4. What new Lámh signs do you think would be the most helpful for you at this stage in the school year?
5. Are there any other signs that you think it would be useful for _____'s peers to learn?

Data Collection Point 4

1. Were any of the new signs particularly helpful for you at the time before the schools closed?
2. Were there any new activities or new big topics in the classroom?
3. What new Lámh signs do you think would have been the most helpful for you at this stage in the school year?
4. Are there any new signs that you think it would be useful for _____'s peers to know?

5. Were there any Lámh signs that we hadn't covered that you feel would have been helpful?

3.3.5 Peers. The peers of the children with DS were the final group that contributed to the school based Lámh vocabulary. Nine peers from the five schools were interviewed at data collection points one, two, and three, resulting in a total of 27 individual peer interviews. While the peer interviews were similar to those carried out with the teachers and SNAs in many respects, a number of considerations were taken into account, given that the children involved were aged 4:09-5:07 at the beginning of the study. Interviewing children for research purposes requires careful consideration, as children are considered to be more vulnerable than adult participants (Braun & Clarke, 2013). Interviews took place in a quiet space, removed from the busy classroom environment. In an attempt to balance the adult-child power relationship, the researcher and the peers sat at the same level on child-size chairs or on the floor (Curtin, 2001). Rapport was developed through playing a game that the child selected, and by beginning each interview by discussing the peer's own interests (Spratling, Coke, & Minick, 2012). Finally, it was important that the interview process was engaging and enjoyable for the peers involved in the project (Carter & Ford, 2013; Clark, 2005).

The first interview was exploratory in nature, allowing the researcher to meet the peers for the first time and get an overall sense of their understanding of Lámh. At the second and third data collection points, a puppet character, 'Patch the dog', was introduced. Children tend to view puppets as peers rather than teachers (Keogh, Naylor, Maloney, & Simon, 2008), and interviews became an opportunity for the peers to 'get to know Patch'. Puppets are a widely used tool in education settings and research suggests that they can help to put children at ease, increasing and improving communication (Kröger & Nupponen, 2019). According to Hackling, Smith, and Murcia (2011), children are likely to explain things more thoroughly to a puppet than to an adult. Subsequently, throughout the data collection process peers, were encouraged to adopt the role of Patch's Lámh teacher. This was prompted by 'Patch' asking them questions about learning Lámh and using Lámh in school.

Similar to the interviews with teaching staff, the peers involved in the study were also interviewed on a range of topics relating to Lámh, including learning Lámh,

using Lámh in school, and Lámh vocabulary. The interviews with peers ranged in length from 5 to 18 minutes. For the purpose of the current study, only questions that focused on generating vocabulary will be reported. Peers were largely asked about signs they knew, and signs they were using within the school. At data collection points two and three the peers were asked to "show Patch" the Lámh signs that they knew. The interview guides for the peers at data collection points one, two and three are presented below.

Data Collection Point 1

1. Do you know what Lámh is?
2. Do you know any Lámh signs?
3. What Lámh signs would you like to know to help you play with _____?
4. What Lámh signs would you like _____ to learn to help them play with you?

Data Collection Point 2

1. Tell Patch what you know about Lámh?
2. Can you show Patch some Lámh signs that you know?
3. What Lámh signs do you use in the classroom?
4. What Lámh signs do you use in the yard?
5. Are there any new signs you would like to know for school?

Data Collection Point 3

1. Just in case he's forgotten everything, can you remind Patch what Lámh is? (Tell Patch what you know about Lámh)
2. Can you teach (show) Patch some of the Lámh signs that you know?
3. What Lámh signs do you use the most when you're at school?
4. If you could pick any new words to have a Lámh sign for, what would you like to know?

3.3.6 Lámh teaching visits. As evidenced by the research questions, the objective of this study was to develop a core vocabulary of Lámh signs for use in mainstream primary schools. KWS intervention, or Lámh training, were beyond the scope of the study. However, in the initial planning stages of the study, it was unknown if the teachers and SNAs involved in the study would have any prior knowledge of Lámh, or have completed any formal Lámh training. This could have potentially resulted in

a situation whereby research into the optimal signs to use with children in the school was being carried out, without the school participants having sufficient knowledge of Lámh to use it in the school. It was considered unethical to carry out the research without providing participants with training in the relevant Lámh signs to facilitate communication over the course of the year. In order to overcome this, the study design included a second follow up school visit at each data collection point, during which the researcher would demonstrate 25 signs for the class. In keeping with the principles of transparent research, the procedure followed in these Lámh teaching visits will be outlined below.

At each data collection point, the Lámh teaching visits took place 1-2 weeks after the full day school visit. These visits were shorter, from an hour to an hour and half long. Twenty-five signs were chosen and demonstrated by the researcher at each time point, with the aim of demonstrating 100 signs by the end of the school year. This number was chosen based on the Lámh Module 1 vocabulary, which contains 100 signs, however it was made clear in the study information letter that this training would take place for the duration of the research only, and was not a substitute for completing a certified Lámh training course. The researcher was a qualified SLT who had completed Lámh Module 1 and Quality and Qualifications Ireland (QQI) Level 5 training, but was not a Lámh tutor. Signs were chosen following initial analysis of the data that had been collected at that time point, reflecting the signs that had been most frequently contributed by the five groups. The teaching visits took place during school hours with the participant, their classmates, and the teacher and SNAs present. An open invitation was extended to any other staff within the school who were interested in learning some Lámh signs.

The Lámh teaching visits after each data collection point followed a similar format, adapting the procedure employed in formal Lámh training courses. Each visit began with an introduction and a recap of the Lámh signing rules. Following this, the researcher demonstrated the chosen vocabulary, five signs at a time. At each interval of five signs there was an activity that focused on the production and use of signs. These activities varied as the participants became more familiar with Lámh, including guessing games, teaching Patch (the puppet used in peer interviews), combining signs in sentences, and asking questions using Lámh. Songs from the Lámh-a-song DVD were also played at intervals throughout the training. This allowed time for movement,

and more exposure to signs. The activities and songs chosen varied depending on the time of year and the signs being taught, for example "Old MacDonald" was played for the class when the researcher demonstrated animal Lámh signs. At the end of each sign demonstration visit, the children in the class were given a sticker as a reward, and the class teacher was presented with a manual that contained written instructions on how to make the chosen 25 signs. To further facilitate accurate sign usage within the school, all teachers and SNAs were given access to Lámh Signs Online for the duration of the study. Lámh Signs Online is an online index with videos demonstrating each of the signs in the 580-word Lámh vocabulary. Typically, this resource can only be accessed if you have completed a Lámh training course and registered for the service.

3.4 Data analysis

3.4.1 Data extraction. Following data collection, the total data set was comprised of SLT-researcher observations (n=15), guided tours led by the participants with DS (n=12), teacher interviews (n=19), SNA interviews (n=20) and peer interviews (n=27). The goal of the data extraction process was to compile the vocabulary recommended by each group into a single format, to enable further analysis and address the research questions outlined in Chapter 2. For the SLT-researcher, the signs that were recommended to enhance communication, as per the final column of the record form (See Figure 2), were removed from each observation form and transferred to one SLT-researcher master excel file. For the participants with DS, the sign recommendations from each of the 12 guided tour documents were compiled in one master file. The process of extracting the signs recommended by the teachers, SNAs and peers was more complex, because the raw data consisted of interview extracts which were transcribed verbatim. Similar to the initial phases of the coding process in qualitative research (Saldaña, 2015), the researcher went through each interview line by line. However, rather than extracting phrases or sentences, a record was made of all of the Lámh signs contributed during the interview. This facilitated making a master file for each of the three interviewed groups that contributed signs to the school-based vocabulary. Figure 5 presents a worked example of data extraction from an interview with a teacher, and Figure 6 presents a worked example from a peer interview. Further samples of data extraction from teacher, SNA and peer interviews (25%) are presented in Appendices E through G. To ensure rigour, inter-rater

reliability was completed on all data extraction from interviews and the participant-led guided tours. This process is outlined in more detail in Section 3.5.

Figure 5

Data extraction from teacher interview

School	Interview Extract	Lámh Signs
School 1	I: Ok, so I suppose moving on to talk about signs in the classroom, what signs would be most important, do you think for yourself to know communicate with (child's name). T1: So I suppose as we're going on there's more signs coming in and I: mmm T1: So even like, I suppose we do know finished but things like y'know get your lunchbox y'know I: Ya T1: Tidy up, amm I'm trying to think of other ones I: It's tough to think off the top of your head T1: Ya, like y'know tidy up, y'know come in, we're going outside, line up I: Yep T1: Amm those kind of routine ones I suppose I: In routines, things that happen every day, T1: Line-up. get your lunch, and we do have a few, I suppose with the Lámh, we were using the Lámh-a-rhyme, we've a few from that, y'know wash your hands, you know all those kind of things, we have play, but I suppose it's just even specific ones like yknow you're playing with the play-dough, we don't have a sign for that, you're playing with the blocks. I: Ya, ya, so so sometimes action words? T1: Ya I: And sometimes things to make the play, the sign more specific? T1: Yes, ya.	Finish, to Get, to Your Lunchbox Tidy up, to Come in We Go, to Outside Line up, to Wash, to Your Hand Play, to Play dough Blocks

Figure 6

Data extraction from peer interview

Peer 2.1	I: Ok, let's start off, will you tell Patch, tell Patch what you know about Lámh? P2: I know play game, I: play game P2: I know home time I: home, great signing P2: time I: two signs together! P2: I know am, jigsaw. This one's kind of hard I: Look Patch! Look! Wow P2: and I know ahh, circle time I: wow P2: and I know sleep I: sleep, oh Patch loves going to sleep, he's a sleepy dog! P2: and I know morning I: morning P2: and I know, that's all I: that's all. (child) knows loads of signs doesn't she!	Play, to Game Home Time Jigsaw Time Sleep, to Morning Juice Tree

3.4.2 Data treatment. In all core vocabulary studies, data is subject to a set of transcription or treatment rules. Trembath et al. (2007) included a list of 17 rules for orthographic transcription in their vocabulary selection study, and these rules were also used as a guide in the study carried out by Mngomezulu et al. (2019). Some of these rules applied to the current study, for example, names were represented by codes and colloquial substitutions in interviews (e.g., y'know) were transcribed as such. However, not all of the rules were relevant or applicable, for example the treatment of 'fillers', such as "oh", or "am", or transcribing different forms of a verb as different words. This is because while Trembath et al. (2007) relied on large samples of recorded speech to generate a core vocabulary of spoken language, the current study employed a range of data collection methods to generate a core sign vocabulary. The data treatment rules in this study, outlined below, were largely applied during the data extraction phase.

1. Different forms of a word were coded as one word, in the format contained in the Lámh sign books. For example, 'Jumping', 'Jumped' and 'Jumps' were coded as 'Jump, to'. Similarly, the words 'Mam', 'Mom' and 'Mum' were coded as the sign 'Mother'. The words 'Sing', and 'Song' are represented by the same sign in Lámh, so these words were merged as one vocabulary item.
2. Vocabulary items that referred to a specific game, for example 'Duck Duck Goose', were coded as a single recommendation, rather than three separate words.
3. References made to full groups or categories of signs in interviews (e.g. 'Feelings', 'Colours'), were not coded as signs. However, if reference was made to a specific feeling (e.g. 'Happy'), or a specific colour sign (e.g. 'Red'), these were included. This rule applied to all items recommended that referred to a group or category of words, rather than a specific sign. Other examples include 'Days of the week', which collectively would refer to seven signs, and 'Numbers', which would encompass a minimum of ten individual signs.
4. Words that were contributed by the five groups that do not currently have a Lámh sign were not added to the master 'sign' document for that group. These words were added to a different document and analysed separately.

3.4.3 Data analysis. Following the process of data treatment and extraction, the data set was comprised of five distinct school-based Lámh vocabularies, one from each of the five contributing groups. The subsequent analysis of these vocabularies, as outlined below, served as the basis to address the research questions outlined in Chapter 2.

3.4.3.1 Number of different signs contributed by each group. The first research question asked, 'How many different signs were contributed by each of the five identified groups?'. To address this question, it was necessary to first calculate the total frequency of each sign. The total frequency of a sign was the number of times it was contributed by the group in question. For example, if the SLT-researcher recommended the sign *Bus* eight times, the total frequency of that sign was eight. The number of different signs contributed by each group was the number of signs contributed when total frequencies had been calculated. Therefore, the total number of signs and total number of different signs were separate, in that the total number of signs contributed by each group was the sum of the total frequencies of all of the different signs.

3.4.3.2 Lámh classification. The second part of this research question addressed the breakdown of the signs contributed by the various groups with regard to Lámh classification. Lámh signs are classified into five groups: Actions (verbs), Modifiers (adjectives, adverbs), Objects (nouns), People (nouns, pronouns), and Social signs (greetings, questions etc). The classification of each sign can be found in the index of the Lámh sign books. Once the total frequencies of the signs contributed by each group had been calculated a record was made of the Lámh classification of the sign.

3.4.3.3 The overall school-based Lámh vocabulary. The overall vocabulary, or total data set, was established by combining the five separate vocabulary lists. This overall vocabulary served as the basis for addressing the remainder of the research questions, including the most frequently contributed signs, the most commonly contributed signs, and the unique signs contributed by each group.

3.4.3.4 Most frequently contributed signs. The overall total frequency of each sign was calculated by summing the number of times it was contributed across each of the five groups. Signs were then ranked in order of frequency, from highest to lowest. For the purpose of this study, the most frequent signs were defined as those

which were contributed to the school-based vocabulary a minimum of 20 times (i.e. had a total frequency ≥20).

3.4.3.5 Most commonly contributed signs. When the signs contributed by the five groups were combined to establish an overall school-based vocabulary, each one was given a commonality score. The commonality score, ranging from one to five, was an indicator of how many of the groups had contributed the sign. A commonality score of 5 indicated that the Lámh sign had been contributed to the vocabulary by each of the five groups (the SLT-researcher, the participants with DS, and the teachers, SNAs, and peers). Conversely, a commonality score of 1 indicated that the sign had only been contributed by one of the groups. The most commonly contributed Lámh signs, i.e. those with a commonality score of five are presented in Chapter 4.

3.4.3.6 Unique Lámh signs contributed by each group. Unique signs were investigated as they gave an insight into the communication priorities of each group, and had the potential to highlight any specific vocabulary needs. A commonality score of 1 indicated that a sign was contributed to the vocabulary by only one group. These unique signs and the groups that they were contributed by are outlined in Chapter 4.

3.4.3.7 Words with no Lámh sign. Although the methods of data collection employed in this study were chosen in order to generate a school-based core Lámh vocabulary, it was important to include words contributed by the participants that do not currently have a Lámh sign. As outlined above, words contributed by the five groups that did not have an associated Lámh sign were added to a separate master document in the data extraction stage. These words were then analysed in a similar way to the Lámh signs recommended by the groups. Each word was given a commonality score from one to five, and the total frequency was calculated by summing the number of times it was contributed across the five groups.

3.4.3.8 Recommendations for a core school-based Lámh vocabulary. The fifth research question in the current study asked what recommendations can be made for a core Lámh vocabulary for mainstream primary schools. As evidenced by the literature reviewed in Chapter 2, the most widely reported criteria for establishing core and fringe vocabularies are frequency and commonality. Within these metrics, specific criteria vary, depending on the group being investigated and the aims of the study. The frequency and commonality criteria in the current study reflected the smaller, more focused data set, as well as the fact that recommendations came from five different

groups of participants rather than language samples from individual children. For the purpose of this study, Lámh signs were considered to be part of the core vocabulary if they had a total frequency of five or more, and a commonality score of 3 or more (total frequency ≥5, commonality score ≥3). The commonality criteria of 3 or more is based on the standard in the literature of a commonality score of 50% or more (Deckers et al, 2017; Trembath et al., 2007). In this study, however, commonality criteria applied to the groups, rather than individual participants. As five groups contributed to the vocabulary, the score of 3 was chosen (over 50%) to ensure maximum commonality in the final core vocabulary.

The frequency criteria applied to data to select core vocabulary is more variable in the literature, depending on the goal of the study and the type of data collected. For example, Fallon et al. (2001), and Deckers et al. (2017) applied frequency criteria based on two different cut-off points. While Fallon and colleagues chose the 200 most frequent words as core vocabulary, Deckers et al. (2017) designated the 50 most frequent words as core. This smaller number was more reflective of the language level of the participants, who were young children with DS. Trembath et al. (p.294, 2007), chose frequency criteria based on a percentage of the whole data set, with "words with a frequency of at least 0.5 per 1000 words" designated as core vocabulary. Given the range of participants and data collection methods in the current study, a frequency cut-off point, for example 100 signs (similar to the Module 1 vocabulary), was thought to be too restrictive. Frequency criteria based on a percentage (Mngomezulu et al., 2019; Trembath et al., 2007) were also not appropriate, given the differences between core vocabularies based on recorded language samples versus a core vocabulary which was the product of specific sign contributions from five groups of contributors. The total frequency of five or more was chosen to ensure the inclusion of signs that were contributed multiple times, without restricting the overall size of the final vocabulary. The signs that did not meet these criteria, i.e. those with a total frequency of less than five and a commonality score of less than 3, comprised the fringe vocabulary. To address the second part of this research question with respect to words for which there is currently no Lámh sign, the same criteria were applied.

3.4.3.9 Comparing the recommended core school-based vocabulary to the Lámh Module 1 vocabulary. The final research question sought to the compare the recommended core school-based vocabulary to the vocabulary that is currently taught in the Module 1 Lámh course, the training most commonly accessed by school staff. The similarities and differences between the two vocabularies were analysed in terms of the number of signs they contained, the breakdown of each one by Lámh classification and the overall overlap between the two. The number of signs in the core school-based vocabulary was calculated by adding the number of Lámh signs and number of words with no sign that met the inclusion criteria. With regard to sign classification, each sign in the recommended core vocabulary was assigned the classification it was given within the Lámh sign books, which are the printed Lámh course materials. Similar categories were applied to the words that do not currently have a Lámh sign. To calculate the overlap with the Module 1 signs, the signs in the core school-based vocabulary were cross referenced with the current 580-word Lámh vocabulary as it is presented in the Lámh sign books. There were five distinct categories: Module 1 Sign Book, Sign Books 2, 3, and 4, and finally, words with no Lámh sign. The results of this analysis are presented in full in Chapter 4.

3.5 Rigour

This study involved the use of novel methods of data collection and analysis to develop a core vocabulary of school-based Lámh signs. As detailed above, the process of data analysis was largely quantitative, but data collection and extraction involved methods more closely associated with qualitative research. While it was this flexibility that allowed for the collection of rich data, reflecting multiple perspectives, as with all qualitative research methodologies it was important to strike a balance between richness and rigour (Ashworth, McDermott & Currie, 2019). A number of steps were taken throughout the research process to ensure trustworthiness, and confidence in the methods of data collection and interpretation (Polit & Beck, 2014). Lincoln and Guba (1985) outline four criteria for trustworthiness: credibility, dependability, confirmability, and transferability. The measures taken to ensure trustworthiness of the current study, as they relate to these criteria, will be outlined below.

Credibility relates to confidence in the truth, or findings of a study (Polit & Beck, 2014). In the current study, credibility was addressed through triangulation.

Triangulation is the process of combining data from a number of sources in order to develop a more comprehensive and balanced understanding of the phenomenon being researched (Patton, 2002). According to Noble & Heale (2019), triangulation increases the credibility of research, and can overcome bias that often results from narrow study designs. In the current study, two main categories of triangulation were central to the development of a comprehensive school- based Lámh vocabulary; data triangulation, and methodological triangulation. Data triangulation refers to the use of a range of data sources in a study, encompassing people, space and time (Noble & Heale, 2019). In terms of people, five groups (the SLT-researcher, participants with DS, and their peers, teachers, and SNAs) contributed to the core vocabulary, with all contributions considered equal in terms of analysis. In addition, the study was longitudinal, with data collected at four time points across the school year. Methodological triangulation in this study was addressed through the inclusion of observations, interviews with teachers, SNAs, and peers, and participant-led tours of the school environment. These tours, based on the Mosaic approach (Clark & Moss, 2001), facilitated the active participation of the young children with DS. SLT-researcher observations provided a valuable insight into communication as it happened in real time, and interview data allowed a more in-depth look at the Lámh needs of both teaching staff and peers.

In qualitative research methods, the researcher is considered the instrument for data collection and analysis (Pezzalla, Pettigrew & Miller-Day, 2012). Contextual knowledge, biases, assumptions and interpretations all have the potential to impact studies that employ qualitative methods. This highlights the importance of dependability, or ensuring that findings are consistent, and grounded in data (Korstjens & Moser, 2018). In the current study, the SLT-researcher contributed signs to the school-based vocabulary through observations, but also collected and analysed the data from the other four contributing groups. In order to uphold dependability, the researcher had a responsibility to be transparent, and communicate all relevant research processes (Tuval-Mashiach 2017). In this study, transparency was addressed through description of the research process, including the development of research questions and the process of data collection, extraction, and analysis. The researcher maintained a reflective journal throughout the research process which kept a record of what was done, as well as how and why it was done (Tuval-Mashiach, 2017). Transparency was also addressed through regular engagement with the research

supervisor. These discussions allowed for assumptions about the data and rationale relating to data collection and analysis to be challenged, with an openness to both strengths and limitations.

Similar to dependability, confirmability is concerned with ensuring that findings are grounded in data, however confirmability refers to the extent to which the findings of the research could be validated by other researchers (Korstjens & Moser, 2018). In the current study, confirmability was primarily focused on the data extraction process. Throughout the process of data analysis, the data contained in the Excel files was checked and rechecked by the SLT-researcher, contributing to the confirmability of the findings. Given the range of data collection and extraction methods employed in this study, a number of approaches were required to ensure confirmability. For ethical reasons, the observations carried out by the SLT-researcher were written up in real time as field notes, rather than being video recorded. To ensure confirmability, two additional investigators, both of whom were SLTs and Lámh tutors, accompanied the researcher on two separate school visits. Prior to the school visit, these investigators were provided with guidelines on the use of the observation protocol. On the day of the visit, the second investigator carried out observations within the classroom with the researcher for two hours. Following this period of observation, the completed protocols were compared line by line. Each investigator put forward the communication attempts they had observed, and the signs they had contributed to the school-based vocabulary based on these observations. This meeting lasted approximately one hour, and on both occasions 100% agreement on Lámh signs contributed was reached between the SLT-researcher and the additional researcher.

Confirmability for the remaining data (teacher, SNA, and peer interviews, and participant-led guided tours) was ensured through the process of inter-rater reliability, focussing again on the data extraction phase. This work involved a second researcher, a speech and language therapist, carrying out data extraction on 25% of the interviews and guided tours. Twenty-five percent of this data translated to four teacher interviews, four SNA interviews, six peer interviews, and three participant guided tours, which were randomly selected, and as such represented a range of individual participants and time points. Prior to completing this work, the second researcher was provided with 30 minutes of training, a completed example of data extraction for each of the four groups (Figures 4, 5 and 6 in this study), and guidelines for the procedure followed for

each type of data. On completion, agreement was calculated based on the number of Lámh signs agreed, compared to the original extraction carried out by the SLT-researcher. The following formula was used to calculate percentage agreement: Number of signs agreed x 100/ Total number of signs. The aggregate total agreement for the data extraction process was 85.32%. The inter-rater agreement was lowest on the participant-led guided tours, at 80.19%. This was expected, given that the tours were a relatively novel method of data collection. Disagreement was the result of differences in vocabulary contributions based around a similar theme. For example, on one occasion the second SLT-investigator contributed the sign *stethoscope*, whereas the SLT-researcher recommended the signs *doctor* and *sick*, having taken part in the tour and with greater knowledge of the participant's vocabulary level. Overall, differences in signs contributed were indicative of the active role the SLT-researcher played in the process, accompanying the participants on each tour and interacting with them at each stage. Total agreement on teacher interviews was 84.77%. Agreement was slightly higher on the SNA interviews, at 89.29%, and was the highest on the peer interviews, at 100%. In all instances, consensus was reached following discussion.

The final criterion for trustworthiness is transferability, which relates to the extent that findings of a study can be applied to other groups, contexts, or environments (Korstjens & Moser, 2018). Transferability of a study, similar to dependability, is aided by a rich description of both the data, and the context. This study was context-specific in that it aimed to develop a core vocabulary for a specific group at a specific time-point, i.e. children with DS and their communication partners in the first year of mainstream primary school. However, it was hoped that findings would be applicable to all Lámh users in the first year of mainstream primary school. The transferability of the findings of the current study was supported by providing descriptions of the five settings, inclusion and exclusion criteria, characteristics of participants, as well as the overall research process (Polit & Beck, 2014).

Chapter 4
Results

This chapter outlines the results of the analysis conducted on the data collected from the five groups that contributed to the school-based Lámh vocabulary (the SLT-researcher, children with DS, and their peers, teachers, and SNAs). Each of the research questions outlined in Chapter 2 will be discussed in turn. First, the number of different Lámh signs recommended by each of the five groups are presented, along with the signs that were unique to each group. The most frequently and commonly recommended signs will then be outlined. Following this, the words recommended by contributors for which there are currently no Lámh signs are presented. Applying the frequency and commonality criteria outlined in Chapter 3, the core school-based Lámh vocabulary will be presented. The final vocabulary list will include words that currently have a Lámh sign as well as some that do not. Finally, the recommended core vocabulary for schools will be compared to the vocabulary taught in the current Lámh Module 1 training, in terms of number of words, overlap, and breakdown of the signs by Lámh classification.

4.1 Number of different signs contributed by each of the five groups

The first research question in the current study asked how many different Lámh signs were contributed to the school-based vocabulary by each of the five groups? The Lámh signs contributed by the SLT-researcher (n=1) came from school and classroom observations (n=15). The signs contributed by the participants with DS (n=6) came from the participant-led tours of the school (n=12). The Lámh signs contributed by the teachers (n=5), SNAs (n=8) and peers (n=9), came from interviews (n=19, n=20, and n=27, respectively). In this section, the number of different Lámh signs contributed by each group will be presented, along with a breakdown of the signs by Lámh classification.

Many signs were contributed to the school-based Lámh vocabulary more than once. The SLT-researcher contributed a total of 1130 Lámh signs. When duplicates were removed by calculating total frequencies, the number of different signs contributed by the SLT-researcher was 209. Through the tours of the school environment, the six children with DS contributed a total of 420 signs, which consisted of 175 different signs. Through interviews, the teachers, SNAs and peers contributed

a total of 384, 424, and 199 signs, respectively. The 384 signs contributed by the five teachers were comprised of 154 different signs, and the 424 signs contributed by the eight SNAs consisted of 162 different signs. Finally, the 199 signs contributed by the nine peers accounted for 104 different signs. Table 5 summarises the data source for each group, the total number of signs, and the number of different signs they contributed to the school-based Lámh vocabulary.

Table 5
Total number of Lámh signs and number of different Lámh signs contributed by each group

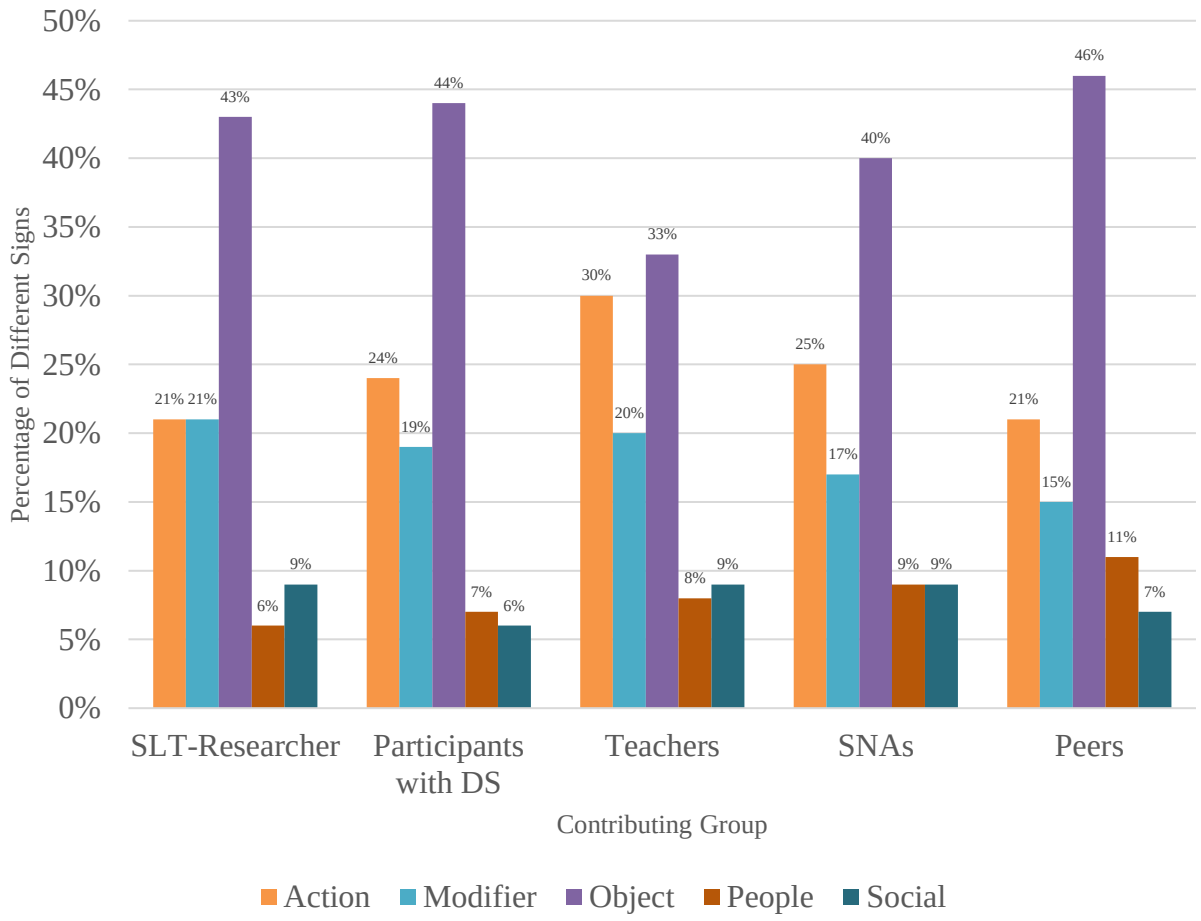
Vocabulary Contributor	Data Source	Total Number of Lámh Signs	Number of Different Lámh Signs
SLT-Researcher	Observations (n=15)	1130	209
Participants with DS	Guided Tours (n=12)	420	175
Teachers	Interviews (n=19)	384	154
SNAs	Interviews (n=20)	424	162
Peers	Interviews (n=27)	199	104

4.1.1 Classification of Lámh signs contributed by each group. Lámh signs are classified into five categories: Action, Modifier, Object, Social, and People signs. With respect to classification, all five sign categories were represented in the signs contributed to the school-based Lámh vocabulary. The 209 different Lámh signs contributed by the researcher consisted of 43 Action signs (21%), 45 Modifiers (21%), 90 Objects (43%), 13 People signs (6%), and 18 Social signs (9%). The 175 different signs contributed by the participants with DS consisted of 42 Action signs (24%), 33 Modifiers (19%), 77 Objects (44%), 13 People signs (7%) and 10 Social signs (6%). The 154 different signs contributed by the group of teachers consisted of 46 Action signs (30%), 30 Modifiers (20%), 51 Objects (33%), 13 People signs (8%) and 14

Social signs (9%). The 162 different signs contributed by the SNAs consisted of 41 Action signs (25%), 28 Modifiers (17%), 64 Objects (40%), 15 People signs (9%), and 14 Social signs (9%). Finally, the 104 different Lámh signs contributed by the peers of the children with DS consisted of 22 Action signs (21%), 16 Modifiers (15%), 48 Object signs (46%), 11 People signs (11%) and 7 Social signs (7%). Figure 6 presents the signs contributed by each group in terms of Lámh classification, by percentage.

Figure 7

Signs contributed to the school-based vocabulary by each group, in terms of Lámh classification



4.2 Unique Lámh signs

The second research question asked what Lámh signs are uniquely contributed to the vocabulary by each group. All five groups contributed unique signs, ranging from eight to 26 signs per group. Twenty-six of the 175 signs contributed by the participants with DS (15%), were not contributed by any of the other groups. Twenty-three of the 209 signs contributed by the SLT-researcher (11%), were not contributed by any other group. The teachers contributed 8 unique signs, which accounted for 5%

of their 154 different signs. Twelve of the signs contributed by the SNAs were unique, accounting for 7% of their 162 signs. Finally, the peers as a group contributed 13 unique signs to the vocabulary, which accounted for 13% of their 104 signs. The Lámh signs that were uniquely contributed to the vocabulary by each group are presented below, in Table 6.

Table 6

Unique signs contributed to the school based Lámh vocabulary by each group

Classification	**Group**				
	SLT Researcher (n=23)	**Participants with DS (n=26)**	**Teachers (n=8)**	**SNAs (n=12)**	**Peers (n=13)**
Action Signs	Kick, to	Cook, to	Roll, to	Ask, to	Brush your teeth, to
	Lose, to	Dig, to	Understand, to	Grow, to	
		Pour, to			
Modifier Signs	Late	Brown	New	Bad	-
	White	Empty	Safe		
		Black			
Object Signs	Film	Aeroplane	Road	Bread	Bird
	Glasses	Animal	Snake	Chocolate	Bowling
	One	App	Week	Now	Finger (Body Part)
	Pencil	Cake	Zoo	Rabbit	Ice-cream
	Rain	Dress		Swimming Pool	Juice
	Room	Hospital		Tomorrow	Phone
	Sandwich	iPad		Vegetable	Potato
	Scissors	Library			Town
	Sink	Monkey			Tractor

Table 6

Unique signs contributed to the school based Lámh vocabulary by each group (continued)

Classification	Group				
	SLT Researcher (n=23)	**Participants with DS (n=26)**	**Teachers (n=8)**	**SNAs (n=12)**	**Peers (n=13)**
Object Signs (cont.)	Three Tiger Two Video Wednesday	Mouse Pizza Plate Rice Sky Spoon Train Trampoline			Tuesday
People Signs	Lady	Grandmother He My/ Mine	-	She	Santa Claus Superhero
Social Signs	And Welcome Why?	-	-	Danger	-

4.3 Most frequently and commonly contributed Lámh signs

The third research question in the current study asked what Lámh signs are most frequently and commonly contributed to the school-based Lámh vocabulary. Establishing the most frequently and commonly contributed signs required combining all of the signs recommended by the five groups. When all of the signs were merged, the overall school-based Lámh vocabulary contained 305 different signs, many of which were contributed multiple times. The total number of signs in the overall school-based vocabulary was 2557.

4.3.1 Most frequently contributed Lámh signs. The total frequency of each sign was calculated by summing the number of times it was contributed across each of the five groups. Signs were then ranked in order of frequency, from highest to lowest. The frequencies of the signs in the combined vocabulary ranged from 1-82. Figure 7 presents the distribution of signs in the school-based vocabulary based on total frequency. Of the 305 different signs, 239 (78%) had a total frequency of less than 10, meaning they were recommended, across the groups, between one and nine times. Thirty-four Lámh signs had a total frequency between 10 and 20. Sixteen Lámh signs had a total frequency between 20 and 30. Seven signs had a total frequency between 30 and 40, and six had a total frequency between 40 and 50. Only three signs contributed to the school-based vocabulary had a total frequency higher than 50. With respect to the research question, separate to the criteria for core vocabulary, we defined those which were contributed a minimum of 20 times to be the most frequent signs (i.e., had a total frequency ≥20). Thirty-four different Lámh signs, 11% of the overall vocabulary, fulfilled this criterion. These 34 Lámh signs and their total frequencies are presented in Table 7.

Figure 8

Distribution of signs contributed to the school-based Lámh vocabulary by total frequency

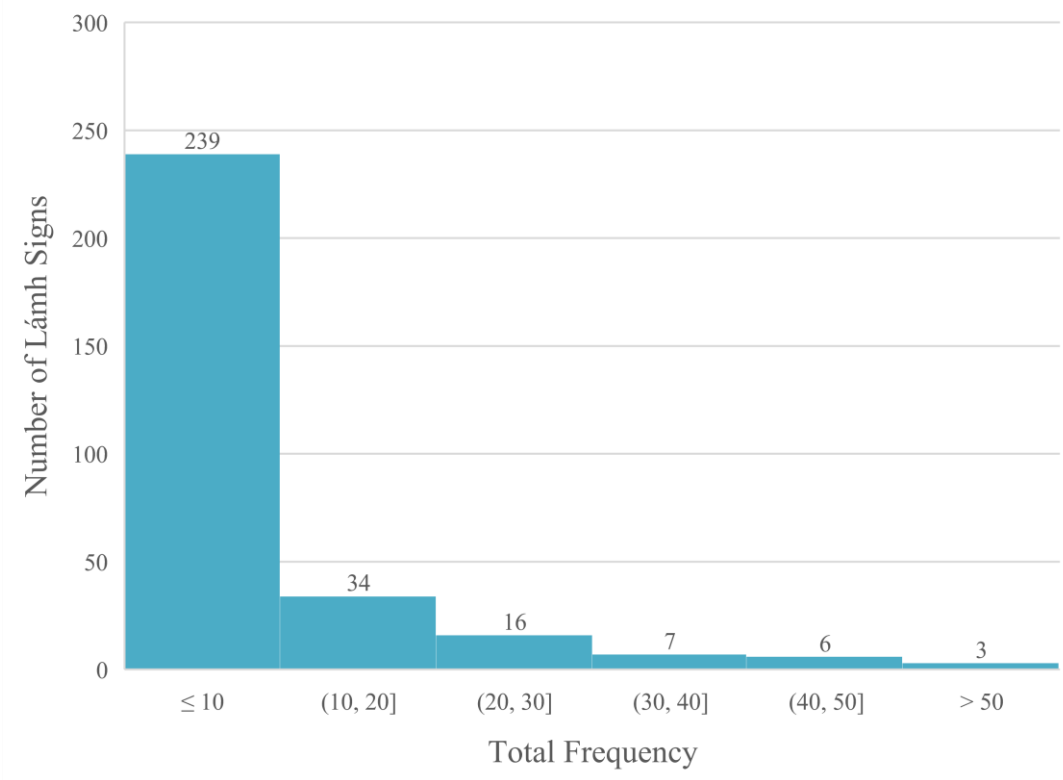


Table 7
Lámh signs most frequently contributed to the school-based vocabulary

Lámh Sign	Total Frequency	Lámh Sign	Total Frequency
Play, to	82	Catch, to	29
Look, to	81	Hello/ How are you?	27
Sit, to	71	More	27
Go, to	50	Want, to	26
Lunch	49	Box	25
You	46	Girl	25
Finish, to	42	I/ Me	25
Good	41	Coat	24
No	41	Red	24
Wait, to	39	Run, to	24
Listen, to	37	Blue	23
What?	36	Toilet	23
Time	35	Colour	22
Work, to	35	Show, to	21
Thank you	32	Home	21
Book	31	Jump, to	20
Stop, to	30	Bag	20

4.3.2 Most commonly contributed Lámh signs. To establish the Lámh signs that were most commonly contributed to the school-based vocabulary, each sign was given a commonality score. In the current study, commonality scores ranged from 1 to 5. A commonality score of 5 indicated that the sign was recommended by each of

the five groups of contributors (the SLT- researcher, the participants with DS, and the teachers, SNAs and peers). Conversely, a commonality score of 1 indicated that the sign had only been contributed by one of the groups. The breakdown of the school vocabulary by commonality is presented in Figure 8. Of the 305 different Lámh signs, 36 had a commonality score of 5. Fifty-five had a commonality score of 4, 58 had a commonality score of 3, and 74 had a commonality score of 2. Eighty-two of the 305 signs recommended had a commonality score of 1, indicating that they were only contributed by one of the five groups. A list of the most commonly contributed Lámh signs, i.e., those with a commonality score of 5, is presented in Table 8.

Figure 9

Distribution of Lámh signs in the overall school-based vocabulary by commonality score

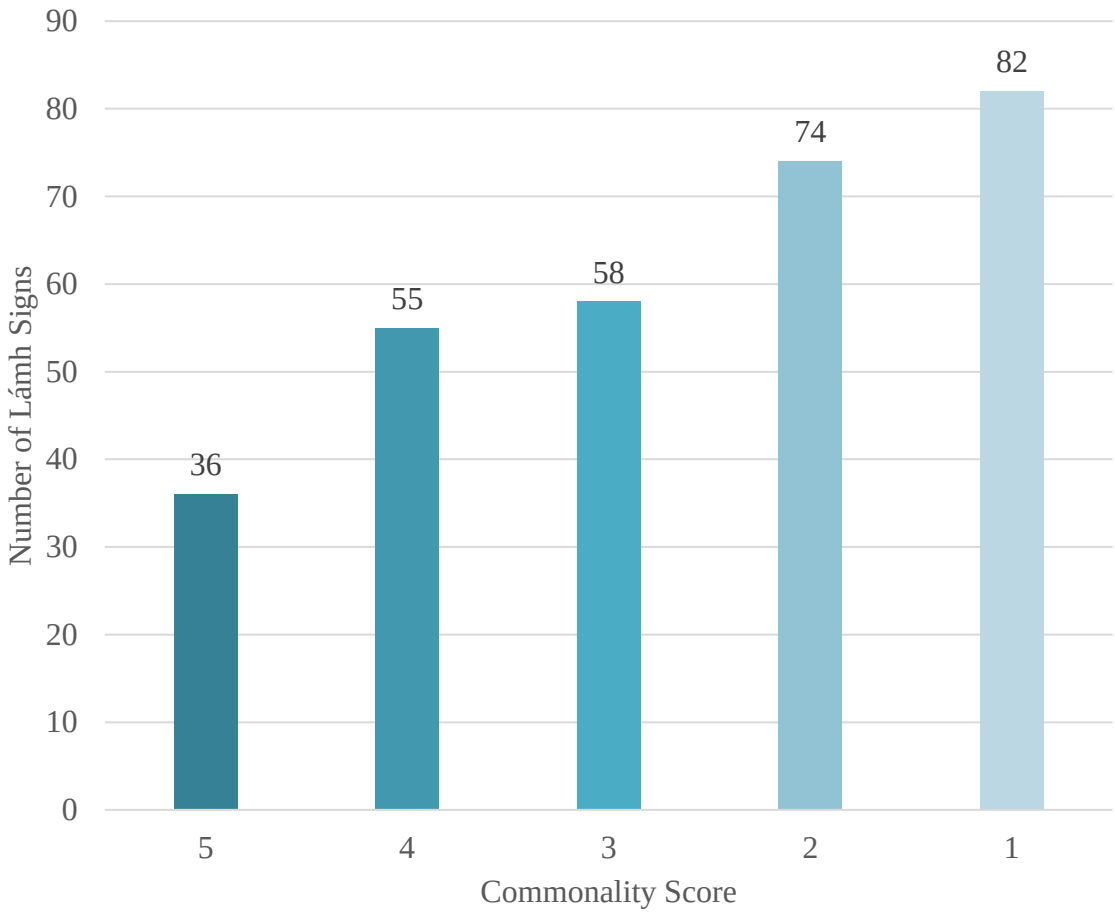


Table 8

Lámh signs most commonly contributed to the school-based vocabulary

Lámh Sign	Commonality Score	Lámh Sign	Commonality Score
Play, to	5	Jigsaw	5
Look, to	5	Game	5
Sit, to	5	Please	5
Go, to	5	School	5
You	5	Toy	5
Good	5	Mother	5
What?	5	Music	5
Time	5	Name	5
Thank you	5	Ball	5
Book	5	Big	5
Hello/ How are you?	5	Find, to	5
Want, to	5	Like, to	5
Box	5	Brick	5
Girl	5	Food	5
I/ Me	5	Today	5
Blue	5	On	5
Show, to	5	Tree	5
Table	5	Sheep	5

4.4 Words contributed to the school-based vocabulary that do not currently have a Lámh sign

The fourth research question in the current study asked if the contributors recommended any words that do not currently have a Lámh sign to the school-based vocabulary. In total, 140 different words for which there are no Lámh signs were contributed by the five groups. Similar to the rest of the vocabulary, the number of times each word was contributed was summed to calculate the total frequency, and each word was given a commonality score. The total frequency of the words with no signs ranged from 1-20, and the commonality scores ranged from 1-4. Seventy-nine of the 140 words with no Lámh sign (57%), had a total frequency of one, meaning they were only contributed once. With regards to commonality, 92 of the words (66%), had a score of 1, meaning they were only recommended by one group of contributors. Table 9 contains the full list of the 140 words with no Lámh sign that were contributed to the school-based vocabulary. The words are presented by commonality and frequency in descending order.

Table 9

Words with no Lámh sign contributed to the school-based vocabulary

Word with no Lámh Sign	Commonality Score	Total Frequency	Word with no Lámh Sign	Commonality Score	Total Frequency
Line up, to	4	20	Be Able, to (Can)	3	6
Outside	4	13	Favourite	3	5
Duck Duck Goose	4	12	Well Done	3	5
Watch, to	4	7	News	3	4
Yard	4	5	Stay, to	3	4

Table 9

Words with no Lámh sign contributed to the school-based vocabulary (continued)

Word with no Lámh Sign	Commonality Score	Total Frequency	Word with no Lámh Sign	Commonality Score	Total Frequency
Tell, to	3	4	Dress up, to	2	2
Question	3	3	Fly, to	2	2
Weather	3	3	Follow, to	2	2
Tall	2	6	Gymnastics	2	2
Little	2	5	Hi-5	2	2
Art	2	4	Hopscotch	2	2
Need, to	2	4	Match, to	2	2
Sort, to	2	4	Partner	2	2
Star	2	4	Picnic	2	2
Talk, to	2	4	Prayer	2	2
Centre	2	3	Skip, to	2	2
First	2	3	Timer	2	2
Hop, to	2	3	Trace, to	2	2
Nature	2	3	Try, to	2	2
Outdoor	2	3	Which?	2	2
Tour	2	3	Wolf	2	2
Balance, to	2	2	Worried	2	2
Camera	2	2	Wrong	2	2
Cross	2	2	Bell	1	4
Do not	2	2	Activity	1	3

Table 9

Words with no Lámh sign contributed to the school-based vocabulary (continued)

Word with no Lámh Sign	Commonality Score	Total Frequency
Tent	1	3
Wall	1	3
Bear	1	2
Fast	1	2
Fun	1	2
Noise	1	2
Playground	1	2
Sensory Room	1	2
Sign, to	1	2
Us	1	2
Delicious/ Tasty	1	2
Add	1	1
After	1	1
Age	1	1
Away	1	1
Babysitter	1	1
Basket	1	1
Beach	1	1
Bee	1	1
Bin	1	1
Bring, to	1	1
Bully	1	1
Busy	1	1
Camp	1	1
Candle	1	1
Carrot	1	1
Cartoon	1	1
Click, to	1	1
Cloud	1	1
Copy	1	1
Cream	1	1
Discipline	1	1
End	1	1
Everyone	1	1
Exercise, to	1	1
Fix, to	1	1
Fortnite	1	1
Ghost	1	1

Table 9

Words with no Lámh sign contributed to the school-based vocabulary (continued)

Word with no Lámh Sign	Commonality Score	Total Frequency	Word with no Lámh Sign	Commonality Score	Total Frequency
Giant	1	1	Other	1	1
Goblin	1	1	Owl	1	1
Hit, to	1	1	Parachute	1	1
Hold, to	1	1	Pattern	1	1
Hoola hoop	1	1	Praise, to	1	1
Inside	1	1	Princess	1	1
Irish	1	1	River	1	1
Kind	1	1	Robber	1	1
Know, to	1	1	Rocket	1	1
Leaf	1	1	Rough	1	1
Let's	1	1	Rude	1	1
Long	1	1	Scary	1	1
Loud	1	1	Schedule	1	1
Maths	1	1	Season	1	1
Message	1	1	Seatbelt	1	1
Minecraft	1	1	Shape	1	1
Move, to	1	1	Short	1	1
Neat	1	1	Start, to	1	1
Nervous	1	1	Step	1	1
Not allowed	1	1	Take, to	1	1

Table 9

Words with no Lámh sign contributed to the school-based vocabulary (continued)

Word with no Lámh Sign	Commonality Score	Total Frequency	Word with no Lámh Sign	Commonality Score	Total Frequency
Teapot	1	1	Use, to	1	1
Think, to	1	1	Weekend	1	1
Till	1	1	Witch	1	1
Together	1	1	Wizard	1	1
Tool	1	1	You're welcome	1	1
Travel, to	1	1	Zumba	1	1

4.5 Recommendations for a core school-based Lámh vocabulary

The fifth research question in the current study asked what recommendations can be made for a core school-based Lámh vocabulary. As discussed in Chapter 3, the criteria to separate the total data set into core and fringe vocabularies were based on frequency and commonality. Lámh signs were considered to be part of the core vocabulary if they had a total frequency greater than or equal to 5 (≥5), and a commonality score greater than or equal to 3 (≥3). The Lámh signs that did not fulfil these criteria were classified as fringe vocabulary. When the frequency and commonality criteria outlined above were applied to the data, the recommended core school-based Lámh vocabulary was made up of 132 Lámh signs. The full list of Lámh signs in the core school-based vocabulary is presented in Table 10, along with a record of Lámh category, total frequency, and commonality score. The remaining 173 signs, classified as fringe vocabulary, are presented in Appendix H.

Table 10

Recommendations for a core school-based Lámh vocabulary

Lámh Sign	Lámh Classification	Commonality Score	Total Frequency
Play, to	Action	5	82
Look, to	Action	5	81
Sit, to	Action	5	71
Go, to	Action	5	50
You	People	5	46
Good	Modifier	5	41
What?	Social	5	36
Time	Object	5	35
Thank you	Social	5	32
Book	Object	5	31
Hello/ How are you?	Social	5	27
Want, to	Action	5	26
Box	Object	5	25
Girl	People	5	25
I/ Me	People	5	25
Blue	Modifier	5	23
Show, to	Action	5	21
Table	Object	5	19
Jigsaw	Object	5	18
Game	Object	5	17

Table 10

Recommendations for a core school-based Lámh vocabulary (continued)

Lámh Sign	Lámh Classification	Commonality Score	Total Frequency
Please	Social	5	15
School	Object	5	13
Toy	Object	5	12
Mother	People	5	11
Music	Object	5	11
Name	Object	5	11
Ball	Object	5	10
Big	Modifier	5	10
Find, to	Action	5	10
Like, to	Action	5	10
Brick	Object	5	9
Food	Object	5	9
Today	Object	5	9
On	Modifier	5	8
Tree	Object	5	8
Sheep	Object	5	7
Lunch	Object	4	49
Finish, to	Action	4	42
No	Social	4	41
Wait, to	Action	4	39
Listen, to	Action	4	37

Table 10

Recommendations for a core school-based Lámh vocabulary (continued)

Lámh Sign	Lámh Classification	Commonality Score	Total Frequency
Work, to	Action	4	35
Stop, to	Action	4	30
Catch, to	Action	4	29
Coat	Object	4	24
Red	Modifier	4	24
Run, to	Action	4	24
Toilet	Object	4	23
Home	Object	4	21
Jump, to	Action	4	20
Eat, to	Action	4	19
Story	Object	4	19
Out	Modifier	4	18
Tidy up, to	Action	4	18
Chair	Object	4	17
Morning	Object	4	17
Open, to	Action	4	16
Same	Modifier	4	16
Stand Up, to/ Up	Action	4	16
Yes	Social	4	16
Help, to	Action	4	15
Turn	Object	4	15

Table 10

Recommendations for a core school-based Lámh vocabulary (continued)

Lámh Sign	Lámh Classification	Commonality Score	Total Frequency
Fall, to	Action	4	13
Small	Modifier	4	13
Be careful	Social	4	12
Next	Modifier	4	12
Sorry	Social	4	12
Boy	People	4	10
Different	Modifier	4	10
Friend	People	4	10
Ready	Social	4	10
Where?	Social	4	10
House	Object	4	9
With	Modifier	4	9
Father	People	4	8
Ok	Social	4	8
Quick	Modifier	4	8
Teacher	People	4	8
Come, to	Action	4	7
Doll	Object	4	7
Silly	Modifier	4	7
Down	Modifier	4	6
Happy	Modifier	4	6

Table 10

Recommendations for a core school-based Lámh vocabulary (continued)

Lámh Sign	Lámh Classification	Commonality Score	Total Frequency
Thirsty	Modifier	4	6
Birthday	Object	4	5
Break, to	Action	4	5
Build, to	Action	4	5
Goodbye	Social	4	5
In	Modifier	4	5
Sun	Object	4	5
More	Modifier	3	27
Colour	Object	3	22
Bag	Object	3	20
Again	Modifier	3	17
Yellow	Modifier	3	15
Green	Modifier	3	14
Dog	Object	3	12
Sad	Modifier	3	11
Drink, to	Action	3	10
Hand (Body Part)	Object	3	10
Song	Object	3	10
Wash, to	Action	3	10
Cat	Object	3	9
Day	Object	3	9

Table 10

Recommendations for a core school-based Lámh vocabulary (continued)

Lámh Sign	Lámh Classification	Commonality Score	Total Frequency
Sleep, to	Action	3	9
Slow	Modifier	3	9
Walk, to	Action	3	9
Sand	Object	3	8
Teddy	Object	3	8
Who?	Social	3	8
Draw, to	Action	3	7
Hide, to	Action	3	7
PE	Object	3	7
Read, to	Action	3	7
Baby	People	3	6
Farm	Object	3	6
Give, to	Action	3	6
Say, to	Action	3	6
We	People	3	6
Apple	Object	3	5
Clothes	Object	3	5
Cow	Object	3	5
Dance	Object	3	5
Door	Object	3	5
Hat	Object	3	5

Table 10

Recommendations for a core school-based Lámh vocabulary (continued)

Lámh Sign	Lámh Classification	Commonality Score	Total Frequency
Hungry	Modifier	3	5
Make, to/ Do, to	Action	3	5
Orange	Modifier	3	5
Pink	Modifier	3	5
Play dough	Object	3	5
Purple	Modifier	3	5
Put, to	Action	3	5
Angry	Modifier	3	4
Doctor	People	3	4
Have, to	Action	3	4
Holiday	Object	3	4
Hot	Modifier	3	4
Shop	Object	3	4
Sick	Modifier	3	4
Clock	Object	3	3
Cry, to	Action	3	3
Egg	Object	3	3
Excuse me	Social	3	3
Hair (Body Part)	Object	3	3
Horse	Object	3	3
Pig	Object	3	3

Table 10

Recommendations for a core school-based Lámh vocabulary (continued)

Lámh Sign	Lámh Classification	Commonality Score	Total Frequency
Sister	People	3	3
Write, to	Action	3	3

4.5.1 Words with no Lámh sign contributed to the core school-based vocabulary. The second part of this research question asked how many of the words with no Lámh sign meet the criteria for core vocabulary? In order to answer this, the same criteria that were applied to the overall data set were applied to the set of words with no Lámh sign (i.e. words with a total frequency ≥5, and a commonality score ≥3). In total, eight of the words with no Lámh sign had a total frequency ≥5, and a commonality score ≥3. These eight words are presented below in Table 6, in order of frequency and commonality. Each word has also been given a provisional Lámh category, to allow for comparison with the Module 1 vocabulary.

Table 11

Recommendations for a core school-based Lámh vocabulary- words with no Lámh sign

Word with no Lámh Sign	Provisional Lámh Classification	Commonality Score	Total Frequency
Line up, to	Action	4	20
Outside	Object	4	13
Duck Duck Goose	Object	4	12
Watch, to	Action	4	7
Yard	Object	4	5
Be Able, to (Can)	Action	3	6

Table 11

Recommendations for a core school-based Lámh vocabulary- words with no Lámh sign (continued)

Word with no Lámh Sign	Provisional Lámh Classification	Commonality Score	Total Frequency
Favourite	Modifier	3	5
Well Done	Social	3	5

4.6 The recommended core school-based vocabulary compared to the Lámh Module 1 vocabulary

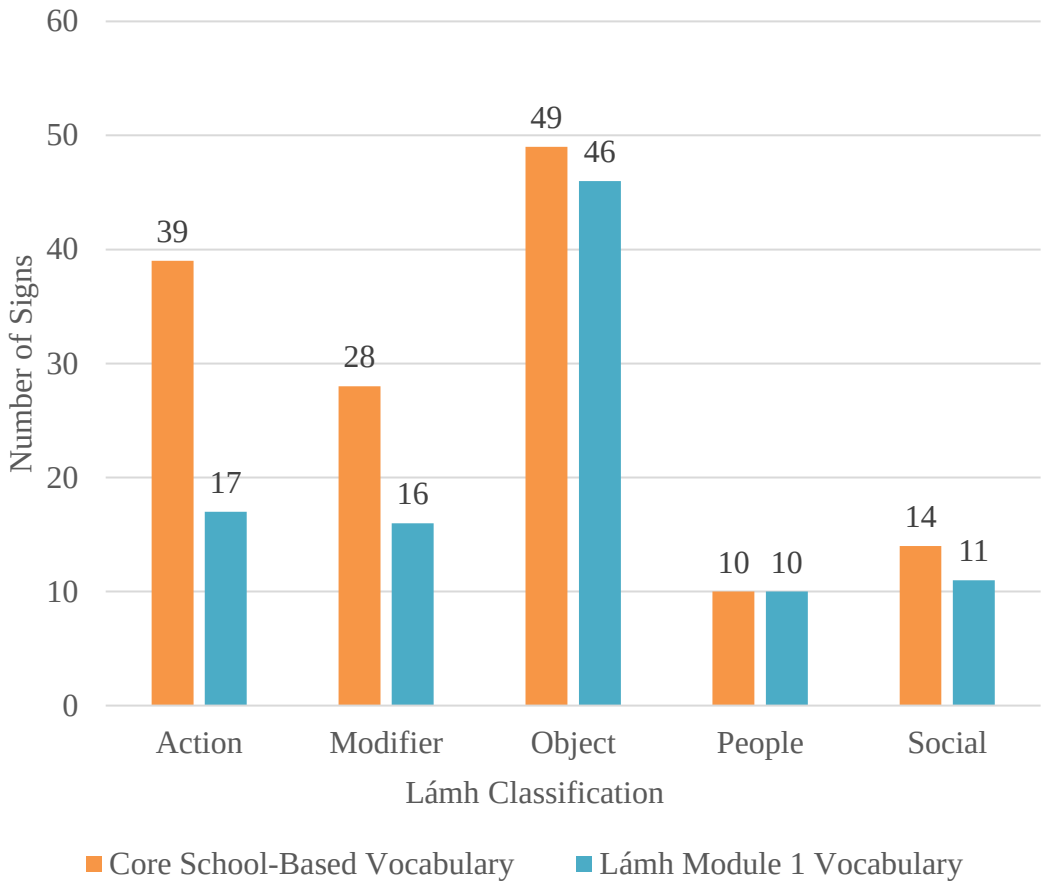
This section addresses the final research question in the current study, how does the recommended core school-based Lámh vocabulary compare to the vocabulary currently taught in Lámh Module 1 training? For the purpose of the study the recommended core school-based vocabulary includes the 8 words that do not currently have a Lámh sign. The similarities and differences between the two vocabularies are presented below.

4.6.1 Number of signs. The Module 1 vocabulary contains 100 different signs. As outlined earlier in this chapter, the recommended core school-based Lámh vocabulary contained 132 different signs and 8 words with no Lámh sign, resulting in a vocabulary of 140 words. Therefore, in terms of number of signs, the recommended school-based vocabulary contains 40 more Lámh signs than the current Module 1 Lámh vocabulary.

4.6.2 Lámh classification. Both the recommended core school-based vocabulary and Module 1 vocabulary contain signs from the five Lámh classifications: Action, Modifier, Object, People and Social. Given that the two vocabularies contain a different number of signs, the breakdown of each vocabulary by Lámh classification is presented in terms of actual number of signs as well as by percentage of the total vocabulary. Including the provisional classifications of the words with no Lámh sign, the recommended core school-based vocabulary contains 39 Action signs (28%), 28 Modifiers (20%), 49 Objects (35%), 10 People signs (7%) and 14 Social signs (10%). The Lámh Module 1 vocabulary contains 17 Action signs (17%), 16 Modifiers (16%),

46 Objects (46%), 10 People signs (10%) and 11 Social Signs (11%). Figure 4 depicts the classification breakdown of the Module 1 vocabulary compared to the recommended core school-based vocabulary, by number of signs.

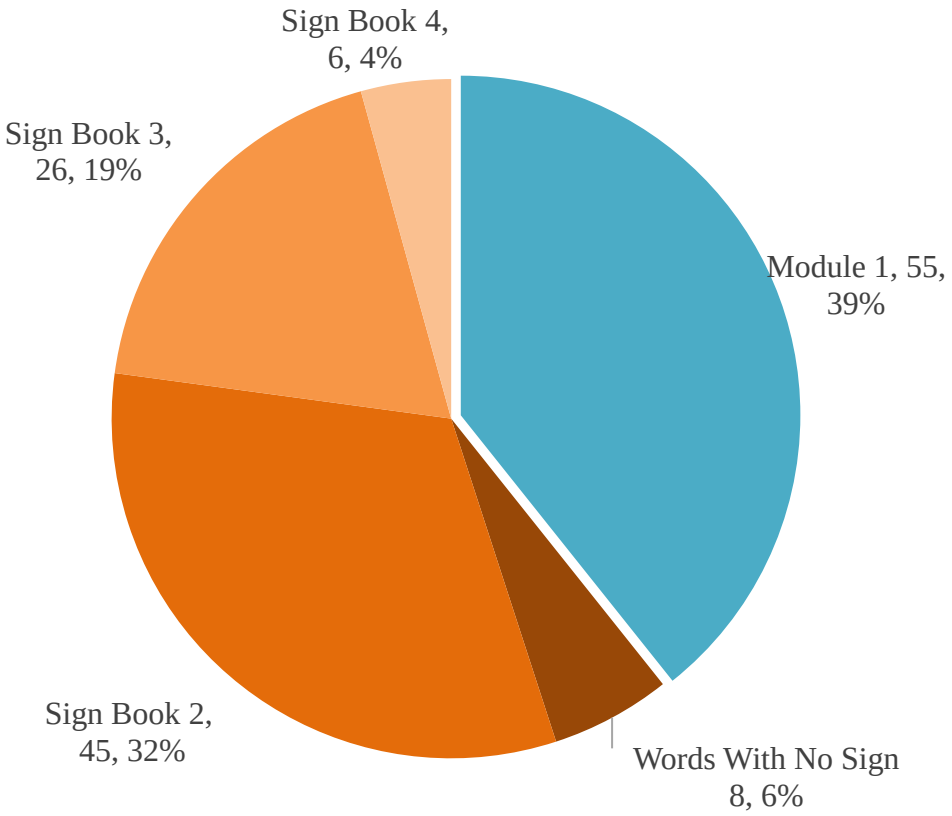
Figure 10
Breakdown by Lámh classification: Recommended core school-based vocabulary and Module 1 vocabulary



4.6.3 Overlap. As previously stated, the 100 signs in the Module 1 vocabulary are presented at entry level Lámh training, in a manual referred to as Sign Book 1. The other 480 signs of the Lámh KWS vocabulary are taught at more advanced training, with signs split between three further manuals, Sign Books 2, 3, and 4. When compared, the recommended core school-based vocabulary and the Module 1 vocabulary had 55 signs in common. This means that 39% of the signs recommended for the core school-based vocabulary are taught in the Lámh Module 1 course. The remaining 85 words and signs in the recommended core school-based vocabulary (61%) are not currently taught in Lámh Module 1 training. Seventy-seven (55%) are

part of more advanced training, with 45 (32%) coming from Sign Book 2, 26 (19%) from Sign Book 3, and six (4%) from Sign Book 4. The remaining 6% is comprised of the eight words with no Lámh sign. The breakdown of the 140 words in the core school-based vocabulary by level of training is presented in Figure 10. Lámh signs in the recommended core school-based vocabulary that are also part of the Module 1 vocabulary are in blue, and signs that are part of the more advanced training (in Sign Books 2, 3 and 4), as well as the words with no Lámh sign, are presented in shades of orange.

Figure 11
Breakdown of signs in the core school based Lámh vocabulary by Sign Book (levels of training)



Chapter 5
Discussion

The current study provides new insights into the complex process of vocabulary selection for AAC users, specifically children with DS who use Lámh, the KWS system in Ireland. The aim was to recommend a core vocabulary of Lámh signs that would facilitate communication in the first year of mainstream primary school, given the developmental significance of the transition from preschool to formal education (Margetts & Kienig, 2013). Core vocabulary lists for a number of different groups have been previously published (Banajee et al., 2003; Boenisch & Soto, 2015; Fallon et al., 2001), and while these lists are a useful tool, they largely reflect the spoken language of typically developing children. In addition, they were designed to aid vocabulary selection for high-tech AAC users. This study differs, in that the aim was to develop a core vocabulary of Lámh signs, for children with DS and their communication partners. As well as this, data collection was carried over a longer period, taking place at four points over the course of the academic year to reflect the changing nature of vocabulary requirements. It is this triangulation of participants, methods, and time (Noble & Heale, 2019), that distinguishes the current study, and provides the basis for discussion of the findings. This chapter provides a discussion of these key findings, including the core-school based vocabulary, the signs contributed by each group, the most frequently and commonly contributed signs, and words contributed to the vocabulary for which there is currently no Lámh sign. The similarities and differences between the recommended core school-based vocabulary and the Lámh Module 1 vocabulary will also be discussed. The final sections of this chapter will outline the clinical implications of the study, methodological strengths and limitations, and opportunities for future research.

5.1 Lámh signs contributed by the five key groups

The first research question in the current study addressed how many different Lámh signs were contributed to the school-based Lámh vocabulary by each of the five groups (the SLT-researcher, the participants with DS, and the teachers, SNAs and peers of children with DS). The total number of signs, and number of different signs contributed by each group varied considerably. The SLT-researcher contributed 1130 signs to the vocabulary, comprised of 209 different signs. Of the five groups of contributors, this was the highest number of total signs, and the highest number of

different signs. In fact, the total number of signs recommended by the SLT-researcher was more than double that of any of the other groups. This is likely to be as a result of a number of factors. Firstly, in relation to the number of different signs, the SLT-researcher was the only contributor that had advanced Lámh training and knowledge of the full 580-word vocabulary. Consequently, it is possible that the researcher recommended signs that other groups may not have been aware of. This advanced Lámh training also meant that the researcher had an understanding of both the expressive and receptive benefits of KWS as a method of AAC, and as such was viewing each communication attempt from the perspective of both communication partners.

The total number of signs contributed by the SLT-researcher (1130), can most likely be accounted for by the method of data collection employed. The SLT-researcher observations carried out in the current study were similar to the concept of 'just-in-time' supports, which are typically associated with high-tech AAC (Schlosser et al., 2015). Typically, the vocabulary in high-tech AAC devices is pre-programmed outside of the context interaction, either by manufacturers or support teams (Caron, Light & Dragger, 2016). Given the complexity of vocabulary selection, this can result in children who use these devices not having access to appropriate vocabulary as it's required in day-to-day communication. Just-in-time supports aim to provide children who use AAC with vocabulary as the need arises, creating a more dynamic process for vocabulary acquisition (Smith, 2015). The SLT-researcher observations (n=15), carried out at three of the four data collection points followed this model by observing communication across a range of contexts, documenting interactions as they happened, and hypothesising Lámh signs to enhance each interaction. The researcher, as an SLT, had the skills to observe beyond successful communication attempts and recommend signs that had the potential to prevent communication breakdowns. The specific contexts observed included communication during the morning, lunch-time, and home-time routines; communication involved in academic work; and social communication which took place between children in the school-yard. Furthermore, the time allocated to the SLT-researcher observations at each of the data collection points was a minimum of two hours. In terms of duration, this was longer than the time allocated for interviews, or the participant-led tours. This longer duration was central to the contributions made by the researcher, as it provided scope to observe

interaction in each of the specific communication contexts outlined above. Over the course of each observation period the researcher recorded as many communication attempts as possible, meaning that within one school visit, any number of signs could be contributed multiple times. The combination of these factors contributed to the discrepancy between the number of signs contributed by the SLT-researcher and the other four groups.

The other adult participants who contributed signs to the school-based vocabulary were the teachers and SNAs. Both contributed signs by means of interviews, carried out at each of the four data collection points. This resulted in relatively similar numbers of signs contributed to the vocabulary. The SNAs contributed a total of 424 signs, and 162 different signs, to the school-based Lámh vocabulary. The teachers as a group contributed a total of 384 Lámh signs, consisting of 154 different signs. This similarity suggests that the method of data collection was an influencing factor on the total number of signs, and number of different signs recommended by each group. The SLT-researcher observations facilitated multiple recommendations of the same sign over the course of each observation, resulting in a significant difference between the total number of Lámh signs and number of different signs. In the signs recommended by the teachers and SNAs there is a smaller difference between these two figures, because in the context of an interview it was more likely that each Lámh sign would be recommended only once. Only in the subsequent interview, at the next data collection point, was it expected that a teacher or SNA may recommend a sign to the vocabulary again, or highlight a Lámh sign as having been particularly helpful in facilitating effective communication at school.

Both the teachers and SNAs contributed signs from all five Lámh sign categories (Action, Object, Modifier, People, Social). Although many had not used Lámh before, this demonstrates an understanding of the need for signs to support a range of communicative functions. Throughout the literature, it is reported that there is a tendency to over-represent nouns and objects in AAC vocabulary. According to Bean, Cargill and Lyle (2019), this is because nouns are more concrete, typically have less referents, and as such are easier to represent in symbolic form. This can be limiting, as children with AAC need access to vocabulary that can serve a range of communication functions, including commenting, requesting, questioning, and protesting (Banajee et al., 2003). In fact, of the ten most frequently contributed teacher

signs, five were Actions signs, and only two were Objects. Similarly, the ten most frequently contributed signs by the SNAs encompassed four Action and three Object signs, as well as People and Social signs. As such, in the context of KWS it does not appear that communication partners favour nouns when selecting vocabulary. In each of the five schools, the teachers and SNAs worked together to support the participants with DS. This close partnership translated to use of similar signs, and five of the ten most frequently contributed groups were common to both groups (*Play, You, I/Me, Lunch*, and *Time*). However, role differentiation did exist between the two groups, and this becomes clearer in the remaining top five signs. As a group, the SNAs frequently contributed the signs *Sit, Go* and *Toilet*, indicative of their role as one-to-one support for the children with DS, with a particular focus on care needs (Dolva et al., 2011). The teachers, on the other hand, frequently contributed Lámh signs associated with giving instructions in the broader classroom environment, including signs such as *Colour*, *Finish*, and *Stop*.

The difference in the number of signs contributed by the two groups of children involved in the project, the participants with DS and their peers, also warrants discussion. Given that nine peers contributed to the vocabulary, compared to six participants with DS, one might expect that the peers would contribute more signs. However, as a group the peers recommended the lowest number of total signs, 199, and the lowest number of different signs, 104. In contrast, the participants with DS contributed a total of 424 signs, and 175 different signs to the school-based vocabulary. This was the second highest number of different signs of the five groups. Again, a variety of factors may have influenced these differences. Unlike the teachers and SNAs, who both contributed signs through interviews, the data collection methods employed to generate vocabulary from the two groups of children were very different. The participants with DS contributed signs to the Lámh vocabulary by means of guided tours of the school environment. Twelve of these tours took place, two for each of the six children, between data collection points two and three. The participant-led guided tours were chosen to ensure that the children with DS, who were the central Lámh users, could actively participate in the study, regardless of their individual needs or levels of ability. The tours were based on the participant's interests, encompassing a range of environments throughout the school. This made each tour a vocabulary rich experience. On the other hand, the peers contributed signs to the vocabulary via

interviews. There were nine peers, all of whom were interviewed at data collection points one two and three, resulting in a total of 27 interviews. While steps were taken to ensure that the interviews were age-appropriate and engaging for the peers, they still required an ability to talk about language and signing removed from the context of day-to-day school communication. Some children had difficulty with this, and instead relayed information about when they used signs, for example, when watching the Lámh-a-song DVD. This lack of insight into the role of Lámh as a method of communication for their classmate with DS may have hindered the peers' ability to recommend signs that would enable them to communicate more effectively. Furthermore, it is possible that the role the researcher played in extracting signs from the participant led tours influenced the gap in the number of signs contributed by the two groups. While the tours were led by the participants, the SLT-researcher played a significant role in recommending Lámh vocabulary that was relevant to the photographs taken on the tour. For the peers, data extraction from interviews meant that only explicit references to signs were added to the vocabulary, similar to the procedure followed for the teachers and SNAs.

Recent appraisals of core vocabulary lists for young children have questioned how developmentally appropriate they may be for the children they are intended to support (Soto & Cooper, 2021). Laubscher and Light (2020) compared five vocabulary lists for young children who use AAC to a validated list of vocabulary used by early communicators, The MacArthur-Bates Communicative Development Inventories (CDI) (Fenson et al., 2007). This included the core vocabulary developed by Banajee et al. (2003) and Trembath et al. (2007), discussed in Chapter 2. It was found that almost 80% of the words included in the CDI were not captured in the core vocabulary lists compared (Laubscher & Light, 2020). This highlights the importance of including the participants with DS and their peers in the study, and facilitating the selection of vocabulary that was relevant and timely, in the context of the first year of primary school.

The sign most frequently contributed by the participants with DS was *Look*, which had a frequency of 12. This sign served an important pragmatic purpose in the guided tours, eliciting social interactions (Bean, Cargill & Lyle, 2019). The sign *Look* also served to draw communication partners attention to items of interest, and provided a platform to expand on communication, through further commentary. *Look* was

contributed by the participants with DS 20 times over the course of the study, almost twice as many times as the second most frequent sign *Go*, contributed 12 times. This gap highlights the significance of the communication function of initiating and maintaining social interaction. The sign most frequently contributed by the peers who participated in the study was *Play*, which had a total frequency of 15. This represents an age-appropriate sign, given the importance of play in the life of young children. Following this, the remaining ten most frequent signs contained five People and Social signs, more than any other group. These five signs, *Hello, I/Me, You, Boy*, and *Thank you*, are interesting given the age of the peers. The Lámh signs *Hello, I/Me*, and *You*, follow widely accepted gestures; a point for the signs *You* and *I*, and a hand extending from the signer's forehead for *Hello*. In a study investigating peer attitudes towards Lámh, eight-year-old peers reported difficulties with learning and remembering signs (Bowles & Frizelle, 2016). The peers who participated in this study were younger, ranging from 4;09- 5;05 at the beginning of the study. As such, it is likely that their contributions to the school-based Lámh vocabulary were influenced by their ability to learn and remember signs. This may have led to a preference for signs that do not involve difficult hand shapes, or more closely resemble widely accepted natural gestures.

In terms of number of signs and number of different signs, it is difficult to compare the current study to the existing body of literature aimed at determining core vocabularies for school-aged AAC users. This is due to the differences in data collection, as well as the differences between spoken language and KWS systems. Fallon et al. (2001) determined core vocabulary items by recording language samples from typically developing preschool children. In their study, data collection was terminated when a sample of 1000 words was collected from each participant. This resulted in a composite sample of 5000 words, made up of 671 different words. Trembath et al. (2007) also investigated the core vocabulary of typically developing preschool children, with a view to informing vocabulary selection for high-tech AAC devices. Similar to Fallon et al. (2001), data collection involved recording language samples, but in this instance was concluded when a sample of 3000 words was obtained from each participant. There were six participants in total, and the number of different words in each sample ranged between 486 and 568. In contrast, the number of signs contributed by the participants in this study were much lower, with the six

participants with DS recommending a combined total of 424, and 175 different signs over the course of the 12 guided tours. The two studies referred to above involved only one group of informants: typically developing children. A second study detailed within Fallon et al. (2001) involved the development of a vocabulary selection questionnaire, where SLTs, parents and teachers had the opportunity to recommend vocabulary. Similar to the results of the current study, the SLTs who completed the checklist contributed more words than either the teachers or the parents. The SLTs contributed a mean of 217 words (range: 93-329), followed closely by the parents, who contributed a mean 211 (range: 108-324). The teachers contributed the fewest items to the vocabulary, with a mean of 145 words (range: 27-262).

The second part of our first research question asked what the breakdown of the signs recommended by each group was with respect to Lámh classification. All five sign categories (Action, Modifier, Object, People and Social) were represented in the signs recommended by each of the five groups. In terms of percentage, the breakdown of the signs recommended by each group was relatively consistent. In general, this breakdown consisted of approximately 25% Action signs, 20% Modifier signs, 40% Action signs, and the remaining 15% a combination of People and Social signs. While there were no significant outliers, the deviations from this average breakdown are worth noting. The teachers, for example, recommended a slightly higher proportion of Action signs (30%) and lower proportion of Object signs (33%). One potential explanation for this is the role of the teacher in the classroom, which requires giving instructions throughout the day. Verbs, or Action signs, are important to ensure that the children with DS can understand and follow these instructions. The peers as a group recommended a slightly lower proportion of Modifier signs (15%), alongside a higher proportion of Objects (46%). In interviews, the peers were encouraged to talk about their favourite games to play at school, both in the classroom and in the yard, and the signs that they saw other people in the environment using. Given that Object signs (nouns) are more referential than Modifier signs (adjectives, adverbs), this may have made them easier for the peers to learn. While peers may have understood Modifier signs when used in context, they may not have been as likely to demonstrate them to the SLT-researcher as expressive signs. With regard to the participants with DS, Bello, Onofrio, and Caselli (2014) report that children with DS use nouns significantly more frequently than verbs and adjectives. While this was reflected in

the signs that emerged from the participant tours, the same was also true for the other four groups. Overall, the breakdown of the signs recommended by the participants with DS was relatively similar to the other groups of contributors, with 44% Object signs, 24% Action signs and 19% Modifier signs.

5.2 Unique Lámh signs

The second research question addressed the Lámh signs that were uniquely contributed to the vocabulary by each of the five groups. Signs contributed by one group only would not be considered core vocabulary, but still warrant discussion in terms of being part of the fringe vocabulary. In contrast with core items, fringe vocabularies tend to be highly individualised, large in number and can change frequently (Yorkston, Honsinger, Dowden, & Marriner, 1989). Nevertheless, fringe vocabulary plays an important role in effective communication, allowing people to express more personal interests, activities, and communication styles (Stuart, Beukelman, & King, 1997). The current study isolated the unique signs recommended by each group with the goal of gaining a deeper understanding of their specific communication needs. Unique signs also had the potential to further demonstrate how data collection methods influenced the signs recommended to the vocabulary. As presented in Section 4.2, all five groups contributed unique signs to the school-based Lámh vocabulary. While the unique signs contributed by the groups were distributed across all five Lámh classifications, Object signs were by far the most represented. According to Stuart et al. (1997), this is typical of fringe vocabulary items, which tend to be content words. Object signs accounted for 17 of the unique signs contributed by the participants with DS (65%), 14 of the unique signs contributed by the SLT-researcher (60%), 10 of the peer's unique signs (77%) and 4 and 7 of the unique signs contributed by the teachers and SNAs (50% and 58%, respectively).

The highest number of unique signs came from the participants with DS, who recommended 26 signs that were not recommended by the other four groups. This accounted for 15% of the 175 different signs contributed to the school-based vocabulary by the participants with DS. The data collection method for the participants with DS, the guided tours, focused exclusively on the children's interests, and were therefore likely to generate more personalised, individual signs. As well as this, the role the SLT-researcher played in relation to interpreting their interests and suggesting possible vocabulary facilitated a broad range of signs to emerge from this group,

regardless of their expressive language abilities or proficiency with Lámh. Many of the unique Object signs recommended by the participants with DS referred to specific toys (*Airplane*, *Train*, *Hospital*, *Trampoline*), and pretend play items (*Pizza*, *Plate*, *Spoon*, *Monkey*, *Mouse*). Two of the signs, *App* and *iPad*, came from a particular guided tour where a participant showed the SLT-researcher their favourite school activity, a matching task on a tablet device. Unique Action signs, including *Cook*, *Pour*, and *Dig* were also related to play activities, with one guided tour involving a toy kitchen, and another sand-box play. As well as being developmentally appropriate, these signs reflect the interest-focused nature of the guided tours. These unique signs demonstrate the methodological importance of the Mosaic approach, which aims to listen to the voice of the young children, acknowledge their competence within their environment, follow their lead to the spaces and objects that are important to them, and listen to all communication attempts (Clark & Moss, 2005).

With respect to the number of unique signs, the participants with DS were followed by the SLT-researcher, who recommended 23 unique signs (11% of their overall 209 different signs) to the school-based vocabulary. The SLT-researcher contributed signs by observing and making note of communication attempts as they happened in real time, contributing signs that had the potential to enhance communication. As such, the unique signs recommended by the SLT-researcher may have been intended for receptive or expressive use by any number of communication partners within the environment. Many can be attributed to the observation of specific communication attempts within the classroom context, for example a report of lost glasses (*Room*, *Glasses*), instructions to be careful when cutting paper (*Scissors*), or a discussion around favourite foods at lunch time (*Sandwich*). Three of the unique signs contributed by the SLT-researcher were social signs. This is interesting, given that across the other four groups, there was only one additional social sign, *Danger*, which was recommended by the SNAs. Two of these signs *And*, and *Why*, which could be used to expand signed utterances, can be attributed to the researcher's knowledge that combining signs is an important milestone for early signers (Laubscher & Light, 2020). The other adults who contributed to the school-based vocabulary may not have been explicitly aware of this.

Three of the signs recommended by the SLT-researcher that were not recommended by other groups were numbers (*One*, *Two*, and *Three)*. It is common

practice to use fingers as a visual support when counting from one to ten, therefore the other groups of contributors may not have considered individual signs for numbers a priority. On the other hand, these numbers in particular are frequently used when counting down the start of a task or race, and the SLT-researcher considered this an opportunity to support inclusion within these games. *Wednesday* was also uniquely recommended by the SLT-researcher. Although the presence of 'Wednesday' alone appears arbitrary, it is linked to the researcher's observation of a common primary school practice, indicating the day of the week and the weather outside on a chart each morning. Signs that fell under these two categories, numbers and days of the week, may be slightly under-represented in the recommendations made by the other groups. This is because of the data extraction rules which were applied before analysis, whereby only when a specific sign was recommended was it included in the school-based vocabulary. In the context of an interview, participants were more likely to refer to a category of signs rather than listing individual numbers, or specific days of the week, in contrast with observation data that recorded specific communication attempts.

The peers as a group contributed 13 unique signs to the vocabulary, which accounted for 13% of their 104 different signs. Many of the signs recommended uniquely by the peers, similar to those recommended by the participants with DS, reflected play and leisure activities (*Superhero*, *Tractor*, *Bowling*, *Phone).* The peers also made reference to signs for specific foods in interviews (*Ice-cream*, *Juice*, *Potato).* These signs referred to both favourite foods and pretend play activities, such as making shapes with play-dough or playing with a toy kitchen. Food items also appeared in the core vocabulary reported by Boenisch and Soto (2015), who attributed the presence of the word 'Burrito' in the top 200 words to the fact that it was a lunch option in the school canteen on the day of data collection. The sign *Santa Clause* was recommended uniquely by the peers at data collection points two and three, which took place in the lead up to Christmas and then after the school holidays. The influence of context and timing is also evident in the study by Trembath et al. (2007), where the word 'Spiderman' emerged as core vocabulary, explained by the fact that a Spiderman film had been released at the time of the study.

The teachers and SNAs recommended the lowest numbers of unique signs. Twelve of the signs recommended by the SNAs were unique, accounting for 7% of

their 162 signs, and the teachers recommended 8 unique signs, which accounted for 5% of their 154 different signs. The fact that the lowest number of unique signs came from these two groups is most likely an indicator of their awareness of the communication needs of the other people within the school environment, in that they were asked to recommend signs that would be useful for themselves, the children with DS, and their peers. Despite this, the unique signs recommended by each of the groups can still offer an insight into their roles within the environment. *Understand* was one of the unique Action signs recommended by the teachers, reflective of the need for Lámh signs for academic language. SNAs were the only group to recommend the sign *Ask*, indicative of their role in promoting independence in the children they support, both inside the classroom and at break times (Dolva et al., 2011). *Now* and *Tomorrow* were also both uniquely recommended by the SNAs, indicating their close relationship with the participants with regards to schedules and planning.

In the literature, core vocabulary is reported to account for approximately 80% of the language used within a specific environment (Deckers et al., 2017). The advantage of this as a strategy for AAC vocabulary selection is that words will be high frequency, and generic enough to be used by multiple communication partners for a range of communicative functions (Snodgrass, Stoner, & Angell, 2013). In terms of teaching, research has demonstrated that children display better generalisation of core vocabulary items than fringe vocabulary which may not be relevant across a wide range of activities (Tan et al., 2014). While these findings reinforce the advantages of core vocabulary, researchers also note that no AAC users should be limited to core vocabulary alone, as the remaining 20% of language used in each context is critical for effective communication (Bean, Cargill & Lyle, 2019). The research on generalisation is also limited, with the above study involving only three participants with Autism Spectrum Disorder (ASD), aged 3-4 (Tan et al., 2014). Consequently, although fringe vocabularies may be seldom-used and context-bound, they must be considered on an individual basis to ensure AAC users are supported with an appropriate vocabulary. This highlights the importance of access to resources and supports as a facilitator of successful KWS (Dark et al., 2019), as important fringe vocabulary may not be provided in entry-level training courses.

5.3 Signs most frequently and commonly contributed to the school-based Lámh vocabulary

The third research question in the current study addressed the Lámh signs that were most frequently and commonly contributed to the school-based vocabulary. For the purpose of this study, the most frequent Lámh signs were considered to be those contributed to the vocabulary twenty times or more (i.e., had a total frequency ≥20). This differs from the criteria for 'most frequent' in other core vocabulary studies, largely due to differences in study design. These differences are highlighted clearly when the current study is compared to the core vocabulary study carried out by Boenisch and Soto (2015). Although the two studies had a relatively similar number of overall contributors, the total data set of their study (>100,000 words), was more than 40 times larger than that of current study (2557 signs). The most frequently recommended sign in the current study, *Play*, had a total frequency of 82. In contrast, the most frequent word in the Boenisch and Soto (2015) study, 'To Be', was recorded 9,775 times. This gap can be explained by the fact that Boenisch and Soto (2015) recorded and transcribed 1-3 hours of a language sample from 30 typically developing school-aged children, whereas in the current study data collection was more targeted, with participants contributing specific signs that could potentially facilitate effective communication within the school setting.

Thirty-four Lámh signs were contributed to the vocabulary 20 times or more. Although these 34 signs only accounted for 11% of the school-based vocabulary in terms of number of different signs, the sum of their total frequencies accounted for 46% of the overall vocabulary. This means that these 34 signs account for just under half of the total signs contributed by the five groups, emphasising their importance within the school environment. All five Lámh classifications were represented in the 34 most frequently contributed signs. There were 14 Action Signs, 4 Modifiers, 9 Object signs, 3 People signs, and 4 Social signs. As stated above, the Lámh sign that was most frequently contributed to the school-based vocabulary was *Play*. This is representative of the importance of play within primary school settings. For school-age children, not only does play provide important opportunities for learning social skills and building relationships, it is also a source of joy, both inside and outside the classroom. In terms of the curriculum for junior infants, in recent years there has been a more formal acknowledgement of the role of play in facilitating learning. Aistear

(meaning journey in Irish) is a play-based curriculum which was introduced in 2009 to address the educational needs of children aged 0-6, in an attempt to move away from the more historical formal learning curriculum (Gray & Ryan, 2016). While not yet compulsory in Irish primary schools, all of the junior infants teachers who took part in the current study reported integrating Aistear play 'stations' into their teaching.

The other most frequently contributed Action signs, which included words such as *Look, Sit, Go, Finish, Wait, Work,* and *Listen,* were also fitting in the context of the routines that form everyday school communication. While these verbs may appear teacher or adult focused, particularly in their root form, many covered a range of communication functions. *Go,* and *Finish,* for example, while often being used as part of classroom instructions, were also frequently used by children in play activities, for example 'Ready, steady, go!'. The sign *Look* was contributed to the school-based vocabulary 81 times, making it the second most frequently contributed sign. 'Look' is a common verb in classroom instructions, such as 'Look at the board', however its importance goes far beyond this in terms of creating a successful KWS environment. Joint-attention is an essential pre-requisite for successful signing (Clibbens et al., 2002). Prefacing communication with the sign for look, alongside spoken language, will ensure that communication partners establish this shared attention, increasing the likelihood of effective communication.

Action signs were followed by Objects, which accounted for nine of the 34 most frequently contributed signs. Similar to the most frequently contributed verbs, many of these nouns were items readily associated with a school environment. The signs *Coat, Bag, Box* and *Book* were part of the morning routine across each of the five schools, where coats were hung on hooks, bags were placed under the table, and books or pencils were placed in a box to create space on desks. The signs *Lunch*, *Toilet*, and *Home* also featured. It is unlikely that these Lámh signs would be considered particularly important for younger Lámh users, but by school age they become an important part of everyday communication. The presence of these signs as the most frequent nouns highlights the role of context in determining the most important core vocabulary (Dark & Balandin, 2007). The four Modifier signs with a frequency greater than 20, were *Good, More,* and two colours, *Red* and *Blue*. Colours, in particular, emerged as important vocabulary items within the junior infants classroom, where they are used to both describe and label books, pictures and toys. One school-specific

use of the colour signs was in establishing groups within the classroom, for example a blue table, green table, red table, and yellow table. Teachers also reported using Lámh colour signs as a visual support when teaching colours in Irish. Unlike the most frequently contributed Action and Object signs, which were dominated by vocabulary particularly relevant to the school setting, the Social and People signs were much more general. *Hello, Thank you, No*, and *What*, were the most frequently contributed Social signs, and the three People signs were *You, I/Me*, and *Girl*. These signs would be likely be frequently used by Lámh users of all ages, across a range of environments.

In the core vocabulary study by Deckers et al. (2017), which also involved young children with DS, the words 'Yes' and 'No' alone made up 19% of the total word sample. In the current study, only *No* reached the threshold outlined for the most frequent signs, contributed 41 times. It is possible that the contributors may not have considered *Yes*, which had a total frequency of 16, as a particularly important sign to facilitate successful communication, given that nodding is a well-established natural gesture for affirmation. If this was the case, the higher frequency of the sign *No* may be as a result of the need for Lámh signs that related to discipline, or classroom management. The SLT-researcher observations demonstrate that the signs *No* and *Stop* were used in situations where behaviour was inappropriate. In interviews, however, teachers and SNAs recommended words such as 'Rude', 'Not allowed', 'Noise', 'Bully', and 'Discipline' to the school-based vocabulary. The fact that these words do not currently have a Lámh sign may have created more of a reliance on the sign *No*. *No* may also have been recommended to enable the participants with DS to take a more active rather than passive role in play situations. In a study by Guralnick, Connor, and Johnson (2009), teachers rated their pupils with DS as being less prosocial than their peers, and highlighted the need for adult support in sustaining play, understanding social rules and knowing how to play with others. In the school-yard, the participants with DS frequently withdrew from play, or abandoned games if there was a misunderstanding. SNAs, who regularly supported the children with DS in these situations, reported that peers could be overbearing. If the participants with DS were equipped with signs that would allow them to be more assertive, such as *No*, this may eliminate some of these breakdowns. Similar to 'Yes' and 'No', *Girl* met the criteria for the most frequent signs, contributed 25 times, whereas *Boy*, which had a total frequency of 10, did not. This is most likely related to the fact that the study had only

two male participants. All of the teachers and SNAs who contributed to the school based Lámh vocabulary were women, five of the six participants with DS were girls, and eight of the nine peers who contributed to the vocabulary were also girls. The sign for *Boy*, however, did meet the criteria for core vocabulary.

The second part of this research question addressed the Lámh signs that were most commonly contributed to the school-based vocabulary. This was established by giving each sign a commonality score. In the current study, commonality was considered in terms of the groups that recommended the signs, i.e. the SLT-researcher, participants with DS, teachers, SNAs and peers. A score of 5 indicated that a sign was contributed by all of the groups and a score of 1 by a single group. Unlike frequency, commonality is not always used as a criterion in distinguishing core and fringe vocabulary. Boenisch and Soto (2015), for example, did not investigate word commonality at all, relying on frequency data alone to establish core vocabulary. Fallon et al (2001) did report commonality scores but did not use these scores as a factor in determining the core vocabulary, using them only to describe the most frequent words. In studies that do apply commonality scores to establish core vocabulary, the definition varies. Banajee et al. (2003), for example, who recorded language samples at snack time and free time on three separate days, applied a commonality score of six if a word was used by a participant during all six of the language samples collected. For Trembath et al. (2007), and Mngomezulu et al. (2019), commonality referred to the number of participants that used a particular word. This definition relates most closely to the current study but with groups of people, rather than individual participants.

Thirty-six Lámh signs in the school-based vocabulary were contributed to the vocabulary by all five groups. These 36 signs were recommended a total of 894 times, accounting for 34% the 2557 signs in the overall data set. The most commonly contributed signs included 16 Object signs, 8 Action signs, 4 Modifier, 4 Social signs, and 4 People signs. It is particularly noteworthy that 16 of the most commonly contributed signs (44%) were Object signs, considering the Object signs accounted for only nine of the 34 most frequently recommended signs (26%). Conversely, 8 of the most commonly recommended signs were Action signs, (22%), while these accounted for 14 of the most frequently recommended signs (41%). This implies that while verbs were the most frequently recommended category of signs, nouns were the most

common. The school environment provides the context for these commonly contributed signs, which included the word *School* itself, alongside other items that are central to the classroom environment (*Lunch, Table*, *Box*). The signs *Game, Toy, Ball,* and *Music* were also contributed by each of the five groups, which demonstrates the importance of having a vocabulary that is motivating, and caters to the interests of the Lámh user within their environment. Lámh-a-song, a DVD of nursery rhymes accompanied by Lámh signs, was a popular resource across all five schools. This popularity, to some extent, is a likely explanation for the signs *Tree* and *Sheep* being contributed by all five groups. Although these nouns are less closely associated with the school environment, both are demonstrated on the Lámh-a-song DVD. This demonstrates the importance of having access to engaging, age-appropriate resources, one of the key elements of a successful signing environment outlined by Dark et al. (2019).

Only one question word, *What*, had a commonality score of five. In terms of the language of instruction (Blank, Rose, & Berlin, 1978), 'What' is a level one, or 'least abstract' question, which is characteristic of the language used in a junior infants environment. The three other Social signs that were contributed by all five groups were *Hello/How are you*, *Please*, and *Thank you*. Similar to the most frequently contributed Social signs, these signs would be likely be recommended by Lámh users of all ages, in a range of environments. The most commonly contributed Action signs were *Play, Look, Sit*, *Go*, *Show*, *Want*, *Find,* and *Like*. With the exception of *Find* and *Like,* these signs also had a total frequency greater than 20, indicating their potential to facilitate communication between a range of communication partners, and in a range of situations. Overall, 17 of the signs with a commonality score of 5 also had a total frequency ≥20, indicating that they met the criteria for both most frequently and most commonly contributed signs. This included three of the four most common People signs (*You, I/Me*, and *Girl)*, and two of the four most common Modifier signs (*Blue* and *Good*). The other most commonly contributed Modifiers were *On*, and *Big*, and the final common People sign was *Mother*. It is these words that highlight the importance of including both metrics, as less frequent vocabulary items may be as important, if not more important than those that are more frequent, depending on the number of communication partners that would find them beneficial.

5.4 Words that do not currently have a Lámh sign

As a type of AAC, KWS involves using manual signs to augment the most salient words in a sentence (Rombouts et al., 2017a). In this way, the vocabularies of KWS systems are carefully chosen, using their respective country's sign language to develop key signs, rather than using the full breadth of the established sign language (Frizelle, 2019; Glacken et al., 2019). In the case of Lámh, this sign language is ISL. As a KWS system, Lámh currently contains a vocabulary of 580 signs. The fourth research question in this study asked if any words that do not currently have a Lámh sign were contributed to the school-based vocabulary. The aim of this research question was to explore if the vocabulary currently available within the Lámh lexicon could accommodate the expressive and receptive language needs of children in the first year of primary school, or if there is a need for the development of news signs.

In total, 140 different words with no Lámh sign were contributed to the school-based vocabulary. Seventy-nine, (57%), had a total frequency of one, meaning they were only contributed once throughout the four data collection points. Ninety-two, (66%), had a commonality score of 1, meaning they were contributed by only one of the five groups. The sum of the total frequencies of these words, i.e. the total number of words with no Lámh sign contributed, was 294. This is significantly less than the total number of existing signs contributed, which was 2557. The total frequency of the words with no signs ranged from 1-20, and commonality scores ranged from 1-4. The most frequently contributed word with no Lámh sign, with a total frequency of 20, was the instruction 'Line up'. It is reasonable to suggest that 'Line-up', and other words such as 'Bell' and 'Classroom' (both of which were recommended four times) would be considered niche, or fringe vocabulary outside of an educational setting. In terms of synonyms within the available Lámh vocabulary, the signs *Group/Class,* and *Room* could be used together to represent 'Classroom'. However, neither of these signs are part of the vocabulary taught in Lámh Module 1 training, so the teachers and SNAs who contributed to the vocabulary may not have been aware of these as an option. Many of the recommended words with no Lámh sign referred to the outdoor play space of the school, where children played in the morning and at lunchtime. 'Outside' was the second most frequently recommended word with no Lámh sign, contributed 13 times by four of the groups. 'Yard' was contributed 5 times, 'Outdoor' 3 times, and 'Playground' twice. Unlike 'Classroom', which has almost exact Lámh synonyms, the

two available Lámh signs which relate most closely to this setting are *Out*, and *Garden*. Considering the importance of the schoolyard in the everyday school routine, a more specific sign which would encompass these areas may be helpful. One difficulty with this is the lack of consensus in terminology. Even in the relatively small sample collected in this study, three different words (outside, yard and playground) were used interchangeably to refer to the same space. In the development of a new sign to address this gap, it is likely that one sign would be chosen to encompass these three referents.

Words that referred to specific games played in the school environment also featured heavily in the list of words with no Lámh sign. 'Duck Duck Goose', a game similar to tag, was observed by the SLT-researcher at all five schools. As a vocabulary item, 'Duck Duck Goose' was contributed 12 times, by four of the five contributing groups. 'Hopscotch', another common school-yard game, was recommended twice. One could argue that these games could be supported by using Lámh signs that already exist, such as *Duck*, *Catch*, *Run*, or *Jump*. On the other hand, for vocabulary to be used successfully it must accurately reflect a person's age and group membership (Trembath et al., 2007), and these signs may not be specific enough to be accepted. Vocabulary referring to computer games also featured, with the words 'Fortnite' and 'Minecraft' both contributed by peers. The diversity of children's interests mean that this type of vocabulary is particularly difficult for communication partners to predict prior to interaction (Caron, Light & Drager, 2016). While clearly important to the peers at the time the study took place, popular games change frequently, and it is unlikely that Lámh signs would be developed to allow for such specific descriptions. In recent years, the Lámh vocabulary has been updated to include signs relating to technology, with more general signs such as *App* and *iPad* being developed, reflecting the importance of these items in terms of modern communication (Lámh, n.d.). Other words that featured in the list of words with no Lámh sign that related to play, specifically pretend play, were 'Ghost', 'Giant', 'Goblin', 'Witch', 'Princess', and 'Robber'. Many of these signs were recommended by the various groups at data collection point 2, which took place around Halloween. Given that these are fringe words they may not be a priority in terms of developing new Lámh vocabulary items. On the other hand, Halloween and other celebrations throughout the year such as Christmas and Easter are clearly important to children with DS and their peers, and

are important from a learning perspective when integrated in the classroom through thematic learning. With this in mind, perhaps these words should be a priority for sign development, given their significance within the primary school calendar.

The question of vocabulary size is debated across AAC literature. Individuals with ID who use AAC may not acquire large vocabularies (Snodgrass, Stoner & Angell, 2013). While this may be caused by the interaction of a range of factors, it increases the significance of vocabulary selection in maximising the voice of the AAC user. For children with DS, one of the advantages of KWS is that it does not involve the same level of working memory and operational demands associated with high-tech AAC devices (Caron, Light, & Drager, 2016). On the other hand, the vocabulary available in KWS systems may be limiting, considering that signs will not be acquired spontaneously, and must be modelled to children extensively to promote use (Wright et al., 2013). In terms of overall size, the 580-word Lámh vocabulary is comparable to the KWS Australia vocabulary, which contains 600 signs (KWS Australia, n.d.). Both the Lámh and KWS Australia guidelines encourage the use of KWS within a wider, total communication approach, whereby a wide range of supports are used together to facilitate communication (Lámh, n.d.; KWS Australia, n.d.). One solution may be to provide children with DS with alternative visual supports, such as symbols or pictures. This framework has been built into the Makaton KWS system, which encompasses over 11,000 signs and symbols (Makaton, n.d.).

In terms of academic language, the concept of matching appeared to be an important part of the junior infants' mathematics curriculum. The verb 'Match' was contributed twice, and 'Sort' four times. At present, the Lámh signs that align most closely with these concepts are *Same* and *Different*. In terms of synonyms, it must be acknowledged that these are not exact, given that they are adjectives rather than verbs. Words relating to key curriculum areas were also recommended to the vocabulary, including 'Art', contributed four times, and 'Irish' and 'Maths', which were both contributed once. While these words were not very frequent, they highlight the importance of words relating to the curriculum as an area for future sign development. Subject names and other vocabulary items related to the curriculum take on increased importance as students progress through to second level education, where subject areas become more defined. Many of the words with no Lámh sign contributed related to common school activities ('Trace', 'Copy') and instructions ('Stay', 'Try', 'Start').

Again, while similar Lámh signs do exist, such as *Write*, or *Go*, communication partners may not agree that these synonyms are specific enough in the context of the school environment. As stated, the purpose of this research question was to investigate whether or not the available 580-word Lámh vocabulary could cater to the specific communication needs of children with DS and their communication partners in junior infants. Overall, the results demonstrate the importance of having scope for new sign development, particularly in relation to school-specific vocabulary and academic language.

5.5 Recommendations for a core school-based Lámh vocabulary

The fifth research question in the current study asked what Lámh signs can be recommended as a core vocabulary for mainstream primary schools. The definition of core vocabulary varies, however in terms of AAC it generally refers to a small set of words that can be used consistently across environments and communication partners (Deckers et al., 2017). While this definition largely applies to the work of the current study, the core vocabulary was intended to serve the communication needs of a range of communication partners, within the specific environment of the first year of mainstream primary school. Augmented communication can often be characterised by an imbalance of input and output, where AAC users receive messages predominantly through spoken language but are expected to reply using a different modality (Lynch, McCleary & Smith, 2018). The aim of facilitating vocabulary contributions from a range of communication partners was to work towards balancing this asymmetry, by developing a core vocabulary with relevant Lámh signs for all communication partners in the environment. In the current study, Lámh signs were recommended for inclusion in the core vocabulary if they had a total frequency greater than or equal to five, and a commonality score of greater than or equal to 3. Throughout the literature, these two criteria, frequency and commonality, are the most widely reported for determining vocabulary as either core or fringe, but the exact metrics vary from study to study. Trembath et al. (2007), for example, who aimed to establish a core vocabulary for Australian school-age children who use AAC, considered words to be core vocabulary if they were used by at least 50% of the participants, and had a frequency of at least 0.5 per 1000 words. In that particular study, a 3000-word sample was collected from each participant, and 50% of the participants translated to three of six school age children. Mngomezulu et al. (2019), who determined a core Zulu vocabulary for AAC

users applied the same criteria as Trembath and colleagues, citing the study in terms of both data collection and analysis. Frequency and commonality criteria were also used by Deckers et al. (2017), however the sample collected from each participant was smaller, and allowed for both spoken and signed language modalities. As a result, the frequency cut off for core vocabulary was tailored to the smaller sample size (the 50 most frequently recorded words).

It is suggested in the literature that core vocabulary can account for up to 80% of words used within a communicative context (Deckers et al., 2017). When the frequency and commonality criteria outlined above were applied to the data set in the current study, the recommended core school-based vocabulary contained 132 signs. Although over 300 different signs were recommended by the five groups, these 132 core signs accounted for 83% of the words contributed to the school-based Lámh vocabulary. The 263-word core vocabulary outlined by Trembath et al. (2007) accounted for 79.8% of the total sample. Similarly, Boenisch and Soto (2015), who used only frequency criteria, reported that approximately 200 words accounted for 80% of the total sample. For children in the same study who were English language learners, slightly fewer words, 141, represented 80% of the total sample. Therefore, despite the methodological differences between the current study and other studies in which core vocabulary was determined, the results are in keeping with expectations as outlined by Deckers and colleagues.

The recommended core school-based Lámh vocabulary contained 36 Action signs (27%), 27 Modifier signs (20%), 46 Action signs (35%), 10 People signs (8%), and 13 Social signs (10%). The percentage breakdown of the core vocabulary in terms of Lámh category was largely consistent with the breakdown of the signs recommended by the individual groups. While many of the signs recommended as core vocabulary expanded on patterns and communication functions discussed in previous sections, several new trends also emerged. The Action signs contained a number of verbs associated with giving instructions (*Tidy up*, *Stand up*, *Write*), but also verbs that could be used expressively, to make requests (*Open*, *Help*) as well as signs that could be used to facilitate communication between peers when playing together (*Build*, *Fall*, *Draw*, *Hide*). These Action signs, or verbs, are important for language development, particularly of syntax, and serve multiple communication functions (Bean, Cargill & Lyle, 2019). For example, the sign *Open* could be used to

with multiple Object signs in the classroom, such as *Box*, *Lunch*, or *Drink*, to clarify a message, or to promote combining of signs.

One notable pattern that emerged in the core Object signs was the presence of vocabulary relating to animals (*Horse*, *Pig*, *Cat*, *Dog*, *Cow*, *Farm*). Clearly, these signs play an important role in the stories and songs that reach across all aspects of the junior infants curriculum. As well as this, four of the five schools involved in the study were in rural areas, and farming was a frequent topic of discussion. The other core Object signs were more intrinsic to the school environment, including signs such as *PE*, *Story*, *Song*, *Door* and *Morning*. The Social signs included two further question words, *Where* and *Who*, as well as the sign *Excuse me*, which along with *Look* could serve the purpose of gaining a person's attention before signing, or initiating social interaction. While *Mother* was one of the only People signs recommended by all five groups, the signs *Father*, *Sister*, *Baby* and *Friend* met the criteria for core vocabulary. The core Modifier signs included words such as *Slow*, *Quick* and *Again*, as well as Lámh signs to express physical needs (*Hungry*, *Thirsty*, *Sick*) and emotions (*Happy*, *Angry*, *Sad*). While nouns were historically over-represented in AAC vocabularies, particularly AAC system designs (Adamson, Romski, Deffebach & Sevcik, 1992), the distribution of signs in the core school-based vocabulary across a range of word types is indicative of the shift towards providing rich, varied vocabularies. A more recent study carried out by Thistle and Wilkinson (2015), found that the majority of speech and language therapists surveyed included verbs, adjective, adverbs, and emotions when choosing AAC vocabulary for their clients.

When Object and People signs were combined, the recommended core vocabulary contained 54 nouns. This equates to 42% of the overall signs. The 263-word core vocabulary outlined by Trembath et al. (2007), contained only 30 (11%) nouns. The core vocabulary for toddlers outlined by Banajee et al. (2003) contained no nouns. This higher proportion of nouns relative to published vocabulary lists reflects the tendency to use KWS to support only the key words in a sentence, rather than grammatical markers, articles, or prepositions, one of the crucial differences between KWS and spoken language (Dark et al., 2019). In spoken language, the most frequently used words tend to be function words, including pronouns, conjunctions, auxiliary verbs, determiners, and modals (Witkowski & Baker, 2012). This is demonstrated clearly in core vocabulary studies for high-tech AAC users that employ

language samples as the primary tool for data collection. Boenisch and Soto (2015) report that 61% of the core vocabulary of school aged children is comprised of function words. Trembath et al. (2007, pp. 294) describe the core vocabulary of preschool aged children in Australia as consisting of mostly "structure" words, which are defined as "pronouns, conjunctions prepositions, articles, auxiliary verbs, modals, and indefinites". While function words may be the most frequently occurring words in spoken language, they are not particularly motivating to sign, and some, specifically articles and auxiliary verbs, do not play a role in Lámh. The same is true for Makaton, a KWS system used in the UK, however function words are represented by symbols, or line drawings (Makaton, n.d.). Instead, KWS emphasises vocabulary that conveys information about objects, people, places, and events in children's lives, and these words tend to be content words (Dark et al., 2019). Content words, such as nouns, verbs, adverbs, and adjectives, are highly referential, and can be used in isolation for labelling and describing. This is what separates them from function words, which often need to be combined with other words to create meaning (Boenisch & Soto, 2015). The study by Deckers et al. (2017) investigating the core vocabulary of children with DS provides further evidence for the differences between spoken and signed language modalities, in that the 50-word core vocabulary contained 11 nouns (22%). Deckers et al., (2017) attributed this higher percentage of nouns to the fact that both spoken and signed word modalities were recorded.

The second part of this research question addressed the words with no Lámh sign that were recommended for inclusion in the core school-based vocabulary. When the frequency and commonality criteria were applied to the 140 words with no Lámh sign, eight words emerged as core vocabulary. These eight words were given provisional Lámh classifications, and included three Action words, three Object words, one Modifier, and one Social word. The Action words were 'Line up', 'Watch', and 'Be able to (Can)'. The objects were 'Outside', 'Yard', and 'Duck Duck Goose'. The Modifier was 'Favourite', and the core Social word was 'Well Done'. Although 140 different words with no Lámh sign were recommended to the school-based vocabulary, these eight words accounted for 25% of the sum of their total frequencies, and typify some of the main categories discussed in Section 5.4. 'Duck Duck Goose' was a popular school-yard game, and two of the other Object words ('Outdoor' and 'Yard') referred to the outdoor space of the school. 'Well done' was one of the

recommended words that related to praise, and the verb 'Line-up', is inherent to school order and communication. While synonyms available within the current Lámh vocabulary have been suggested for some of these words (such as *Good* and *Make/Do* for 'Well done'), these eight words provide an insightful starting point for the development of new Lámh signs, specifically for Lámh users in mainstream primary schools.

5.6 The recommended core school-based vocabulary compared to the Lámh Module 1 vocabulary

The sixth and final research question in the current study asked how does the recommended core school-based Lámh vocabulary compare to the vocabulary currently taught in Lámh Module 1 Training. As stated in Chapter 1, the Department of Education, through the National Council for Special Education (NCSE), first provided funding for teachers to attend Lámh Module 1 training in 2008 (NCSE, n.d.). Over the last 12 years there, has been a steady increase in demand for this training. In 2008, 24 teachers were funded to attend Module 1 Lámh training, and within five years (by 2013) this had risen to 74 teachers. Last year, in 2019, 182 teachers received funding to attend Lámh training. This increase in demand for training reflects the increase in the number of children with ID that attend their local primary schools, which according to the National Institute of Intellectual Disability (NIID) (n.d.) more than tripled between 1996 and 2014. DS Ireland (n.d.) report that more than 90% of the members of their organisation attend their local school. While these are positive developments in terms of inclusive education, Module 1 continues to be the only Lámh training course for which funding is provided. In the current study, eight of the 13 teaching staff who participated had completed Module 1 training, and only one had gone on to complete further training. One of the key concerns regarding the provision of Module 1 as the only funded form of training is the application of the vocabulary to the school environment. Module 1 training is intended for a range of professionals, who may be supporting Lámh users of all ages, in a range of settings. These settings can include the home, residential settings, therapy settings, the community, or employment settings. Dark and Balandin (2007) emphasise the importance of providing AAC users with not only a core vocabulary, but a core vocabulary that is context specific. As such, the purpose of this research question was to determine if the training most commonly accessed by school staff can accommodate the Lámh

vocabulary needs of children with DS and their communication partners in mainstream schools.

The Module 1 Lámh vocabulary contains 100 signs. This is comparable to the entry level training of a number of other KWS systems. The Core Vocabulary Book which is the foundation of the Makaton programme, also contains 100 signs (Makaton, n.d.). Basic Training, the entry level training for KWS Australia, encompasses a slightly smaller vocabulary of 80 signs (KWS Australia, n.d.). The recommended core school-based Lámh vocabulary contains 140 words (132 signs and 8 words with no Lámh sign). Including the provisional classifications of the words with no Lámh sign, the recommended core school vocabulary contained 39 Action signs (28%), 28 Modifiers (20%), 49 Objects (35%), 10 People signs (7%) and 14 Social signs (10%). The Lámh Module 1 vocabulary contains 17 Action signs (17%), 16 Modifiers (16%), 46 Objects (46%), 10 People signs (10%) and 11 Social Signs (11%). In terms of sign categories, the most significant differences between the two vocabularies were the number of Action signs (39, and 17, respectively) and Modifier signs (28 and 16, respectively), with the number of Object, People and Social signs relatively similar. The differences between the two vocabularies become more apparent when the overlap is calculated. Only 55 (39%) of the 140 signs recommended as core vocabulary for schools are also in the Module 1 vocabulary. The remaining 85 words, 61%, are part of more advanced training, and are in the vocabularies outlined in sign books 2, 3, and 4.

The 85 signs recommended as core vocabulary for schools that are not in the Module 1 vocabulary consisted of 21 Action signs, 21 Modifiers, 32 Objects, 4 People and 6 Social signs. This is particularly interesting in terms of Object signs. As stated above, the two vocabularies had relatively similar overall numbers of Object signs, 49 and 46 respectively, however when we look at this figure in terms of overlap, 32 of the Object signs in the recommended vocabulary, 65%, came from more advanced Lámh courses. Of these Object signs, the most frequently recommended was *Lunch*, which had a commonality score of 4, and was recommended a total of 49 times. In fact, *Lunch*, was the most frequently recommended of all of the 85 signs not in the Module 1 vocabulary. This was followed by *Listen*, which also had a commonality score of 4, and was recommended 37 times. While *Lunch* and *Listen* could be considered relatively general vocabulary, more school specific items such as *PE* and

Teacher also featured. Many of the words related to specific play activities, with Object signs such as *Play-dough, Story, Jigsaw, Toy, Bricks, Teddy,* and *Doll*, and Action signs like *Catch, Run, Jump, Find, Hide,* and *Build*. While it is understandable that many of these signs would not feature in a generic training course that aims to cater for the needs of Lámh users of a broad age range, for children in mainstream primary school they play an important role in facilitating effective communication.

The discrepancy between the number of Modifier signs in the two vocabularies can be attributed, at least in part, to Lámh signs for colours. The Module 1 vocabulary does not contain any colour signs. In contrast, the recommended core school-based vocabulary contains seven; *Red, Blue, Yellow, Green, Orange, Pink,* and *Purple*. These signs alone account for 5% of the core vocabulary, a clear indicator of their importance to communication partners in the first year of primary school. According to the National Council for Curriculum and Assessment (NCCA) (1999), colour is part of the curriculum under the subject area of visual arts education. However, the use of colour words, particularly in the junior infants classroom goes beyond this. Throughout SLT-researcher observations, colour signs were documented during stories, songs, maths activities (such as sorting), and as part of instructions. Colours were also a common topic of conversation between the children in the class, used to describe toys, clothes and other items of interest. According to Bracken and Crawford (2010), colours, numbers, and shapes, described as 'basic concept vocabulary', serve as the foundation for much of early childhood knowledge. In turn, this basic concept vocabulary may influence academic success, reinforcing its importance in the context of early primary school education. In relation to social signs, many of those recommended as core vocabulary, including *Please, Sorry, Ok,* and *Ready*, are not part of Module 1 training. All of these words play an important role in the everyday communication between the children with DS and their communication partners. Supporting these words with Lámh signs would not only facilitate language learning and successful communication, but also promote inclusion within the context of the mainstream classroom.

5.7 Clinical implications

The findings of the current study have implications for both Lámh users and the network of people and professionals that support them in attending mainstream primary school. This network includes families, SLTs, principals, teachers, SNAs, and

disability services in general. In Ireland, all children have the right to 'appropriate support' that enables access to the curriculum in their local mainstream primary school (Oireachtas, 2004). For children with DS, the importance of having access to communication supports cannot be understated. These supports are required not only to facilitate access to the curriculum, but also to support overall inclusion within the school environment. According to Engevik et al. (2018), expressive language skills are the strongest predictor of teacher's ratings of overall classroom inclusion for children with DS. Even within inclusive education settings, pupils with DS are reported to be less prosocial than their peers, often requiring adult support to understand social rules and sustain play (Guralnick, Connor, & Johnson, 2009). For children with DS who use Lámh, effective communication, and therefore inclusive practice, is contingent on communication partners' acceptance and knowledge of Lámh as a type of AAC. One of the pillars of this knowledge is access to a vocabulary that is meaningful, relevant, and appropriate for the context of the communication (Dark et al., 2019). The recommended core school-based Lámh vocabulary was developed to address the specific receptive and expressive language needs of these Lámh users in the first year of mainstream primary school. The core vocabulary list is the result of contributions from five groups of stakeholders, including the participants with DS themselves. This triangulation of participants ensures that the resulting vocabulary is a balance of adult and child-centred vocabulary, supporting a wide range of communicative functions (Caron, Light & Drager, 2016). This encompasses signs to support access to the curriculum, signs to support social interaction, and in a move away from wants and needs driven vocabulary, signs to support conversation and personal narratives (Waller, 2018).

For SLTs, the results of the study are a valuable resource to guide vocabulary selection for school-aged Lámh users. Vocabulary selection for children who use AAC is widely regarded as a difficult task (Trembath et al., 2007). Despite this, it is important that the process is carried out with care, given the impact it may have on an individual's ability to communicate successfully (Snodgrass, Stoner & Angell, 2013). Guidelines suggest that vocabulary selection should be a collaborative process, including multiple communication partners (Bean, Cargill & Lyle). For KWS users, vocabulary selection presents an added layer of complexity, given the dual role of KWS in supporting both expressive and receptive language (Dark et al., 2019). Dark

and colleagues (2019) propose a number of strategies for identifying meaningful, motivating, and relevant vocabulary for children who use KWS. Similar to those outlined above, these include asking multiple informants to identify important words, and conducting assessments of the environment, also referred to as a communication inventory. This is a time-consuming process (Fallon et al., 2001; Trembath et al., 2007), and may not be feasible for SLTs working with large caseloads of AAC users. It is understandable that SLTs may turn to published core vocabulary lists to aid vocabulary selection, or focus on the vocabulary included in entry level training. While published vocabulary lists are available for young children (Boenisch & Soto, 2015; Deckers et al., 2017; Trembath et al., 2007), these lists are not tailored to the specific context of communication in the first year of primary school. As such, they may have limited application to the needs of children who use Lámh in mainstream primary schools in Ireland. The findings of the current study also demonstrate that while the Lámh Module One vocabulary offers a valid starting point, the majority of signs identified as core vocabulary for schools (61%) are part of more advanced Lámh training. The recommendations for a core Lámh vocabulary in this study are the result of an in-depth, longitudinal, multi-method investigation. Although no method of vocabulary selection is likely to produce a complete list of all the words that are relevant for an individual, the recommended core school-based Lámh vocabulary is generic enough to be used frequently by multiple communication partners (Soto & Cooper, 2021), but specific enough to be appropriate to the context of the first year of mainstream primary school (Bean, Cargill & Lyle, 2016).

The core school-based Lámh vocabulary is also a valuable resource for education staff, particularly at the time of transition from preschool to primary school. This transition to formal schooling is a significant milestone for all children (Margetts & Kienig, 2013). According to Rous, Myers & Stricklin (2007), educational transitions are disproportionately difficult for children with disabilities, as they adapt to increasing academic demands, complex social environments, changes in routine, and reduced levels of one-to-one support. Fontil, Gittens, Beaudoin, and Sladeczec (2019) carried out a systematic review of the barriers and facilitators of successful school transitions for children with disabilities. While parents, teachers, and professionals were identified as having unique concerns and perspectives, almost all of the literature reviewed identified collaborative practice as an invaluable form of support. These

collaborative practices were reported in various forms, including multidisciplinary meetings, sharing of information between stakeholders, and regular parent contact. We know that limited knowledge and use of KWS in early education settings creates considerable barriers to inclusion for children who use sign to communicate (Cologon & Mevawalla, 2018). The core school-based Lámh vocabulary offers a shared resource to overcome these barriers, and facilitate successful transitions from preschool to primary school for children with DS. SLTs working with families could begin targeting school-based vocabulary in the months leading up to the transition, and these goals could be shared with educators in preschool settings. The vocabulary could also be provided to class teachers in advance of the transition, to ensure communication supports are in place from the outset. If used collaboratively in preparation for the transition from preschool to primary school, the school-based Lámh vocabulary could help to foster high quality inclusive practice within the school environment.

A further implication of the current study relates to the development of new Lámh signs. As a KWS system, Lámh is undergoing development all the time, with 80 new signs added to in 2019 (Lámh n.d.) Six of these signs featured in the recommended core school-based vocabulary, including *Tidy up*, *Ready*, *Pink*, and *Purple*. While the availability of these new Lámh signs is a positive development, the current study highlights the need for ongoing sign development, specifically for school-aged Lámh users. In total, 140 different words for which there are currently no Lámh sign were recommended to the school-based vocabulary by the five groups of contributors. Although many of the words with no Lámh sign were classified as fringe vocabulary, it is imperative that the Lámh signs available to children with DS and their communication partners are functional, meaningful, and flexible. As outlined by Beukelman et al. (1991), the vocabulary needs of children who use AAC are the same as any other child. Eight of the words with no Lámh sign did meet the frequency and commonality criteria for core vocabulary. These eight words were ‘Outside’, ‘Yard’, ‘Line up’, ‘Watch’, ‘Be able to (Can)’, ‘Duck Duck Goose’, ‘Favourite’, and ‘Well Done’. These eight words offer a launchpad for new sign development, especially in relation to the early years of mainstream primary school.

The final implication of the current study relates to the provision of Lámh training for schools. As the number of Lámh users attending mainstream school continues to

grow, it is essential that school communication partners have access to Lámh training that will facilitate effective communication and support access to the curriculum (Dark et al., 2019). Despite the need for specific, school-based vocabulary items, Module 1 continues to be the only Lámh training that receives funding, and funding is provided only for teachers, not SNAs. In primary school alone, children who use Lámh may have as many as eight different class teachers, as well as numerous SNAs and special educational needs (SEN) teachers. Friends and classmates are also essential communication partners. If signing is to move from the margins to becoming commonplace within inclusive school settings, all of these communication partners need access to appropriate Lámh training and resources. This study found that only 55 (39%) of the 140 signs recommended as core vocabulary for mainstream primary schools are taught in Module 1 training. The remaining 85 words (61%) are part of more advanced training courses. Without access to a core vocabulary of relevant, motivating, context-specific signs, it is likely that Lámh will be used in a restricted way, with emphasis on correcting breakdowns, maintaining focus, or labelling (Parkhouse & Smith, 2019). The recommended core school-based vocabulary developed as part of this study could provide the basis for school-specific Lámh training and resources. These resources could be funded by the Department of Education, or the NCSE, in the knowledge that the vocabulary will meet the needs of children and teachers during this important transitionary period.

5.8 Methodological strengths and limitations

The current study is an important initial exploration into the vocabulary needs of Lámh users in the first year of mainstream primary school. Findings, however, must be considered in the context of the methodological strengths and limitations of the study design. The use of multiple participants and multiple methods to address the research questions is a key methodological strength of this study. This triangulation of participants and data ensured that all relevant stakeholders made equal contributions to the Lámh vocabulary. Regarding triangulation of participants, this is the first study to the best of our knowledge to develop a core Lámh vocabulary based on contributions made by five key groups: 1) an SLT-researcher, 2) children with DS in junior infants, 3) their peers, 4) their class teachers, and 5) their SNAs. Best practice guidelines suggest involving AAC users in the vocabulary selection process where possible, as well as input from parents, teachers and SLTs (Bean, Cargill & Lyle,

2019). However, current core vocabulary lists intended to support vocabulary selection for AAC users largely reflect the language of typically developing children (Banajee et al., 2003; Boenisch & Soto, 2015; Mngomezulu et al., 2019; Trembath et al., 2007). Soto and Cooper (2021) emphasise the importance of vocabulary that is specifically tailored to the context of communication in ensuring the success of AAC interventions. As such, it is unlikely that these published core vocabulary lists are specific enough to apply to children with DS and their communication partners in the first year of mainstream primary school in Ireland. The inclusion of five groups of vocabulary contributors in the current study enhances the completeness of the data (Casey & Murphy, 2009), ensuring that the findings reflect multiple perspectives and creating a holistic picture of the vocabulary required to support effective communication.

A further strength of the study is the triangulation of methods. In order to support meaningful vocabulary contributions from all participants, the means by which each group recommended vocabulary was adapted to their age, needs, and abilities. A recent appraisal of core vocabulary lists questioned if they are developmentally appropriate for the children they are intended to support (Laubscher & Light, 2020). The core vocabulary developed as part of this study was intended to serve a broader range of communication functions, including adult and child-led interactions, and academic and social language. However, it was essential that the voice of the participants with DS was to the fore. By leading the SLT-researcher on tours of their school, the participants with DS could indicate what was most important to them within the environment (Clark & Moss, 2005). This ensured that regardless of language ability, all of the participants with DS made equal contributions to the Lámh vocabulary. The methods by which the other groups participated in vocabulary selection were based on recommendations made in the literature; asking a range of communication partners to identify important words, and conducting observations within the communication environment (Bean, Cargill & Lyle, 2019; Dark et al., 2019). Peers were invited to take on the role of ‘Lámh teacher’ to ‘Patch’, a puppet character, to investigate their knowledge of Lámh and the signs that were most important to them. The teachers and SNAs were asked to reflect on their use of Lámh and their vocabulary needs in structured interviews. The SLT-researcher contributed signs by observing communication attempts as they happened in real time,

recommending signs that had the potential to enhance communication. The longitudinal study design allowed for these recommendations to be made at four different time points, reflecting changing vocabulary needs over the course of the academic year. If triangulation of participants ensured completeness of data, the triangulation of methods ensured the confirmability of the data, that is the confidence that the vocabulary that emerged as core is in fact vocabulary that can facilitate effective communication (Casey & Murphy, 2009). The combination of participant and methodological triangulation facilitated the input of each group, and ensured that the core school-based Lámh vocabulary was developed both by and with the population it aims to support.

The limitations of the study also warrant discussion, in order to inform future research. With the exception of Deckers et al. (2017), who allowed for both spoken and signed language modalities, the core vocabulary literature referenced throughout this study (Banajee et al., 2003; Boenisch & Soto, 2015; Fallon et al., 2001; Mngomezulu et al., 2019; Trembath et al., 2007) relied on analyses of audio recorded language samples. This methodology, although well established, was not applicable to the current study, given the differences between spoken and KWS vocabularies (Dark et al., 2019). In the current study, data collection varied for each of the five groups, involving a combination of observations, interviews, and participant-led guided tours. While it was this flexibility in terms of data collection that facilitated the participation of such a diverse range of contributors, it must also be acknowledged that this resulted in a less established methodology for core vocabulary data analysis. Although following the child's lead was a priority at every stage of the participant-led tours (Clark, 2001), the resulting vocabulary recommendations involved a significant level of interpretation on behalf of the researcher, leading to potential bias. For the peers, who were aged between 4:09-5:07 at the beginning of the study, questions relating to Lámh and language use involved a level of meta-linguistic skill, in that they required talking about and analysing language use removed from a specific context (Chaney, 1992). For teachers and SNAs, only recommendations of specific signs were extracted from interviews, which potentially resulted in more abstract communication challenges being overlooked. For example, if a teacher spoke about a breakdown in understanding, but did not recommend a sign which if used could have prevented this breakdown, this challenge was likely to persist. As well as this, due to COVID-19

restrictions only three of the four intended school data collection visits were possible. At Time 4, during the final school term, data collection was carried out through remote interviews with the teachers and SNAs. This meant that there were no contributions (for the final data collection point) to the school-based vocabulary from peer interviews, participant-led guided tours, or SLT-researcher observations, which were part of the original design. While it would have been preferable to have this data, the teacher and SNA interview schedules were expanded to include a discussion of signs that would be useful for all communication partners.

A third limitation relates to the potential influence of the Lámh teaching visits on the signs recommended to the vocabulary. As outlined in Chapter 3, signing visits took place after the first three data collection points, and at each visit the researcher demonstrated 25 signs for the whole class that were involved in the study. The 25 signs were chosen based on initial analysis of the signs recommended at the previous data collection point. The signing visits did not constitute formal Lámh training, but at the end of each visit the class were provided with a booklet showing how to make the signs that had been demonstrated. Over the course of the year, it is likely that these signs were the most widely used within the classroom, and therefore would be more frequently and commonly recommended by the participants at subsequent data collection points. Potentially, this could have been mediated by carrying out the study in schools that had an established, strong signing culture, or by not including the visits in the study design. However, at the time of participant recruitment, it was not known whether school staff had completed Lámh training, and there was no guarantee that peers of the child with DS would be familiar with Lámh as a method of communication. Therefore, from an ethical standpoint, the signing visits were important, increasing awareness of KWS as a method of communication and enabling contributors to make more holistic recommendations to the school-based vocabulary through a cascading effect. While the potential impact of the signing visits on the vocabulary must be acknowledged, only 75 signs were demonstrated over the course of the study, and the final school-based vocabulary contained 305 signs.

5.9 Future research

The current study sets the groundwork for future investigations into the use of Lámh as a method of communication in mainstream primary schools. There are three primary research areas that warrant exploration. First, while this study is an important

step towards predicting and selecting core vocabulary for Lámh users in mainstream primary school, it focused on one particular group: children in junior infants. The first year of school is a significant time of transition for all children, especially those with complex communication needs (Van Herwegen, Ashworth, & Palikara, 2018; Villeneuve et al., 2013). However, because this study took place specifically within the context of junior infants, the vocabulary may not be applicable to more senior classes, where the demands of academic and social language increase. One area of future research would be to investigate the vocabulary needs of older Lámh users, as they progress through primary school and on to second level education. This is a particularly important area for future research, considering that many children with ID who initially attend mainstream schools turn to special schools in later years (Lightfoot & Bond, 2013). Although research is limited, it is reported in the literature that for children with DS there are social and academic advantages in attending mainstream school (Turner, Alborz, & Gayle, 2008). The transition from primary to secondary school is complex, however, and as the pace of learning increases and differences in social interaction skills become more apparent, many parents feel that a special school is a more appropriate setting for their child with DS (Cambra & Silvestre, 2003). Many factors can influence decision making in terms of educational provision, including having a positive relationship with the school, and the types of support provided by teachers and other members of staff (Lightfoot & Bond, 2013). Vocabulary investigations in these older classes would support the use of Lámh becoming more widespread throughout primary and secondary schools, and furthermore, could enable children with DS to continue in mainstream education for longer.

Second, while having access to a functional core vocabulary is important, it does not guarantee a successful signing environment. Access to communication partner training and other supports are also essential (Dark et al., 2019). Following on from the current study, research is required to develop the signs recommended as core vocabulary into a resource for Lámh users and their communication partners in mainstream primary schools. This could take the form of a Lámh training course specifically for school staff integrating the core vocabulary described here. The course could be developed in partnership with the NCSE in lieu of the model that is currently in place, whereby teachers can apply for funding to attend Lámh Module 1 training only. A more holistic choice would involve developing the core vocabulary as a

resource for classroom-based or whole-school Lámh training. This would increase awareness of KWS as a method of communication throughout the school community, as well as empowering communication partners with a bank of relevant, context-specific vocabulary. While this study focused on children with DS, children who use Lámh are a diverse population, including children with a broad range of Intellectual and Developmental Disabilities (IDD), and Autism Spectrum Disorder (ASD) (Byrne et al., 2019). The development of a school-based Lámh training course would have both social and academic benefits for all Lámh users in mainstream primary schools.

Finally, as with any intervention, the efficacy of school-specific Lámh resources would depend on their ability to change the behaviour of school communication partners. According to Michie, van Stralen, and West (2011), the three conditions essential for behaviour change are capability, opportunity, and motivation. Research investigating the application of these conditions to the creation of a successful Lámh environment in mainstream primary schools would inform the development of effective Lámh resources for school communication partners. Furthermore, it is widely acknowledged that the attitudes of school staff towards AAC can serve as either a barrier or facilitator to its success within the school environment (Moorcroft et al., 2019). While research has been carried out in relation to parents' experiences with Lámh (Glacken et al., 2019), and the attitudes of peers towards Lámh in schools (Bowles & Frizelle, 2016), the attitudes and experiences of teachers, SNAs, and other school staff have not been explored in more recent years. When Sheehy and Duffy (2009) investigated the attitudes of teachers in the UK towards Makaton, results demonstrated that many positive changes had occurred over the course of a 25-year period. In Ireland, the provision of Lámh training for teachers is a more recent development, with funding first provided in 2008 (NCSE, n.d.). Given the increase in the number of Lámh users attending mainstream primary school, and the fact that more school staff have had the opportunity to use Lámh, attitudes are likely to have changed significantly in the last decade. Research investigating the motivations and opportunities for signing, and the attitudes of school staff towards Lámh would help to ensure that any training materials that are developed are congruent with the needs of the environment.

5.10 Conclusion

An increasing number of children with DS who use Lámh attend their local mainstream primary school. This study sought to investigate the Lámh vocabulary needs of these children and their teachers, SNAs, and peers in the first year of school, with the aim of developing a core, school-based Lámh vocabulary. Vocabulary was contributed by each of these core communication partners in the school environment, reflecting the role of KWS as a support for both expressive and receptive language (Launonen, 2019). Finally, given the nature of Lámh training for schools and teaching staff in Ireland, the core vocabulary that emerged from the study was compared to the vocabulary currently taught in Lámh Module 1 training.

The main findings of the presented research were:

1) The overall school based Lámh vocabulary contained a total of 2557 Lámh signs, and 305 different signs. These signs were contributed by five key groups (an SLT-researcher, children with DS in junior infants and their teachers, SNAs, and peers), through varying methods of data collection including observations and interviews.
2) Each of the five groups contributed unique signs to the school-based vocabulary. The children with DS contributed the most unique signs, driven by the fact that they recommended signs based on their interests and favourite places within the school environment.
3) One hundred and forty words with no Lámh sign were contributed to the school-based vocabulary by the five groups. This included words specifically associated with the school environment, such as ‘Line-up’, and ‘Bell’.
4) Based on the criteria of frequency and commonality, the recommended core school-based Lámh vocabulary contained 140 words, including 132 signs and eight words that do not currently have a Lámh sign. The 132 signs accounted for 83% of the total data set, which is in line with figures stated throughout core vocabulary literature (Boenisch & Soto, 2015; Deckers et al., 2017; Trembath et al., 2007).
5) The recommended core school-based vocabulary contains 40 more signs than the Lámh Module 1 vocabulary, including almost double the number of Action and Modifier signs but comparable numbers of Object, People and Social signs. The two vocabularies have 55 common signs, which equates to 39% of

the recommended core school-based vocabulary. Without access to a Lámh vocabulary that is tailored to the school environment, it is likely that many signing opportunities throughout the school day are missed.

Overall, this study highlights the importance of access to a functional sign vocabulary in ensuring the widespread use of Lámh in the context of mainstream primary schools. We hope that the findings of this study will inform the development of further, more specific, resources and supports for Lámh users and their school communication partners, and therefore contribute to high-quality inclusive education practices for children with DS in Ireland.

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Appendices

Appendix A. Letter of Ethical Approval

UCC
Coláiste na hOllscoile Corcaigh
University College Cork, Ireland

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Caoimhe Lyons,
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Brookfield School of Medicine and Health,
College Road, Cork.

3rd September 2019

Dear Caoimhe

Thank you for submitting your research project, Log 2019-111 (entitled "The development of a core school-based Lamh vocabulary to facilitate effective communication between children with intellectual disability, their peers and staff in mainstream schools.") to SREC for ethical perusal. I am pleased to say that we see no ethical impediment to your research as proposed and we are happy to grant approval. Approval date was 22nd August 2019.

We wish you every success in your research.

Yours sincerely,

Mike Murphy,
Chair of Social Research Ethics Committee

Professor Anita R. Maguire BSc PhD CChem MRSC
Vice President for Research and Innovation

Ollscoil na hÉireann, Corcaigh
National University of Ireland, Cork

Appendix B. Study Information Sheet

Research Project:
Promoting the use of Lámh as a method of communication in mainstream primary schools

UCC
University College Cork, Ireland
Coláiste na hOllscoile Corcaigh

Lámh

Purpose of the study:

My name is Caoimhe Lyons and I am a Speech and Language Therapist completing my masters in University College Cork. As part of my masters I am completing a research project at UCC in partnership with the Development office. The focus of this study is to develop a core Lámh vocabulary for mainstream primary schools.

At the time that the majority of Lámh signs were developed most children with intellectual disability attended special schools, so a core bank of vocabulary for mainstream school was never developed. With the significant positive developments that have taken place in recent years, regarding inclusive education for those with special education needs, this needs to be addressed!

A core school based Lámh vocabulary would provide the necessary support for children with ID who are Lámh users, and would facilitate better communication between your child, their teachers and their peers in this first important year in primary school.

What will the study involve?

The study will involve four visits to your child's school over the course of the year, to reflect the changing vocabulary needs of all communication partners as the school year progresses.

Each visit will involve me asking your child a set of simple questions about signs that would be helpful to them and observing your child in a number of different settings. e.g. the classroom, the yard.
Interviews will be carried out with 1) your child 2) three peers/ friends of your child in the classroom 3) the class teacher and 4) the special needs assistant.

Interviews will focus on what the 25 most effective Lámh signs would be with respect to successful communication from the perspective of all communication partners.

After each school visit, I will collate all of the information and the 25 most valuable signs will be identified. I will then teach the signs to your child and to the children and staff in daily contact with your child. This will result in a core key word school signing vocabulary of 100 signs at the end of the school year.

At that point the participating children and staff will be interviewed to obtain feedback regarding the impact of using Lámh in the school.

Why is this information relevant to you?

We sent you this information sheet through Down Syndrome Ireland, who are supporting us in this project. We asked DSI to circulate this information to any parent(s)/ caregiver(s) of a child with intellectual disability who is due to commence Junior Infants, in a mainstream primary school in September 2019.

Down Syndrome Ireland

Is there an expectation that you or your child should take part?
Participation is completely voluntary.

If you are interested in participating in the study and you do decide to take part we would be very grateful if you could fill in the consent form attached and get back to us as soon as possible via email so that we can answer any questions you might have and you can begin to make arrangements with your child's school.

What will happen to the information that your child gives?

All interviews will be audio recorded so that they can be written out accurately for analysis. All audio data will be stored on a password protected, encrypted laptop within UCC and only the researchers will have access to the data. The anonymised audio recordings will only be used for educational purposes if explicit consent is given.

Who has reviewed this study?

This study has obtained ethical approval from the UCC Social Research Ethics Committee.

Will your participation in the study be kept confidential?

All data collected and used in the study will be entirely anonymous, therefore no clues to your child's identity, or the school's identity will appear in the study.

Are there any disadvantages to taking part?

We don't envisage any negative consequences for you in taking part, however the researchers can be contacted at any stage if you or your child do need any support. This project has no bearing on any other service that you currently receive. As a parent of a child with special education needs transitioning to mainstream primary school we appreciate that this is a very busy time for you and your child, however we would be very grateful if you would consider taking part in this valuable project.

One of the most important aspects of this project that we would like to highlight is that although there would be input from a speech and language therapy 'expert' the vocabulary set would primarily emerge from those who use Lámh in their everyday communication with teachers and peers in the school setting.

In developing a core Lámh vocabulary for schools, the aim of this project is to support children with intellectual disability in the transition to mainstream primary school and promote successful communication with all partners.

For further information please contact:

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Appendix C. SLT-Researcher Observations and Vocabulary Recommendations (sample)

Development of a Core Lámh Vocabulary for Mainstream Primary Schools: Observation Form
School: School 3 Visit Number: 1 Date:-------- Setting: Classroom, Yard

Communication Partner	Initiated by	Description	Outcome	Lámh Sign To enhance communication/ Prevent breakdown
Teacher	Teacher (whole class)	Introduction to the day. Visual schedule used to support communication.	Lámh sign used: Hello	Hello Look (to) Listen (to)
Teacher	Teacher (whole class)	Activity: Days of the week Song used, Lámh signs modelled by teacher	Lámh signs used by teacher throughout the song	All days of the week signed. To enhance: Today
Teacher	Teacher (whole class)	Colouring activity. Question: "what colour will we do?" Signs used for colours: Blue, red, yellow, green	PPT3 and peers imitated signs	Blue Red Yellow Green What?
Teacher	PPT3	PPT3 brought folder to teacher and gave it to her.	Teacher signed "thank you"	Thank you
Peer	Peer	Colouring activity. Peer turned to PPT3 and said "you're	No signs used by peers. SNA gave PPT3 the	Show (to) Colour (to)

		doing the wrong colour” Another peer replied “it’s ok, she’s only learning”	correct colour and signed “red”.	
SNA	SNA	Colouring activity. SNA gave PPT3 colours, PPT3 repeated words “red, green, yellow”.	Successful interaction.	Red Yellow Green
Teacher	Teacher	Correcting homework: “that’s very good work, well done”. Signs used: good, look	Successfully got PPT3’s attention before signing.	Look (to) Good Work (to)
Teacher	Teacher (whole class)	Transition from one activity to the next: “Look at me ___, we’re finished” Signs used: Look, finish	Lámh signs used Children in the group imitated the sign “finish”	Finish (to) Look (to)
Teacher	PPT3	PPT3 brought crayon up to teacher Teacher pointed at another classmate and said “will you give that to ___?”	Verbal instruction supported by visual cue (point). PPT3 gave the crayon to the correct child	To enhance: Give (to)
Teacher	Teacher (to whole class)	Song with counting actions (1,2,3,4,5 once I caught a fish alive) Numbers counted on a number line Teacher modelled Lámh signs for numbers one to five	The whole class used Lámh to sign the numbers during the song. Song was quite fast.	One Two Three Four Five Fish

				Go (to)
SNA	PPT3	PPT3 made eye contact with SNA, SNA asked “do you need to go to the toilet?” PPT3 nodded	No sign used by PPT3, SNA anticipated need	Toilet
Teacher	Teacher (to whole class)	Lunch time: “Tá sé in am don lón”	No sign used	Lunch
Teacher	Teacher (to whole class)	Introducing story Signs used: chicken, farm, look	Signs used by teacher throughout the story	Chicken Farm Look (to) Story
SNA2	SNA2	PPT3 stood up from chair Verbal instruction given, no Lámh sign used	PPT3 was brought by the hand back to her chair.	Sit (to) Please
SNA	SNA	Classroom topic: The farm Sign used by SNA: Cow	PPT3 imitated sign	Cow Farm
Peer	Peer	PPT3 returned to the classroom from resource room with certificate. Peer asked, “what did you get?”	PPT3 help up sign and sat down	What? You
SLT-researcher	PPT3	Activity: Hopscotch PPT3 finished hopscotch, looked at the researcher and said “your turn”	The researcher took a turn in the game	Turn

SNA	PPT3	Activity: obstacle course in the yard PPT3 ran along the line and said "I can run"	SNA responded "Great running, be careful"	Run (to) Be careful
SNA	PPt3	Bell rang to signal the end of lunch. PPT3 looked at SNA and said "bell"	SNA responded "ya the bell, lunch time is over"	To enhance: Bell Finish (to)
Teacher	Teacher	Instruction: Line up	Verbal instruction given	Line up (to)
SNA2	SNA2	Routine: Whole school run two laps of the yard before going back to class. PPT3 sat on the ground instead of running SNA gave verbal instructions to PPT3, not supported with any visuals.	PPT3 did not continue in the running	Look (to) Stand up (to) Run (to) Go (to)
Peer	Peer	PPT3 gave crayon to peer, peer signed "thank you"	Sign used spontaneously by peer	Thank you You're welcome
SNA	SNA	Tidying up toys SNA gave instruction "tidy up, we need to put them back into the box"	PPT3 imitated words "tidy up" and "box", and followed instructions	Tidy up (to) Box
Teacher	Teacher (whole class)	Teacher asked a question "Do you live on a farm? Yes or no" And modelled Lámh signs for farm, yes and no.	Teacher prompted class to answer using Lámh signs	Farm Yes No

SEN Teacher	SEN Teacher	Going between classrooms: Instruction: “PPT3, open the door”	Sign used: Door PPT3 opened the door	Door Open (to)
SEN Teacher	SEN Teacher	Game: Hide and seek SEN Teacher counted to 10, PPT3 repeated numbers up to five after him	Lámh sign could be used to support comprehension.	One Two Three Four Five
SEN Teacher	PPT3	Activity: Hide and Seek. When the SEN Teacher found PPT3, she said “your turn”	The SEN Teacher signed “my” as part of my turn and hid	My Your Turn
SEN Teacher	SEN Teacher	Activity: Building a house with blocks. SEN Teacher gave PPT3 blocks one by one, asked “do you want more?” and modelled sign. PPT3 imitated sign and said “more”. Other signs used: House	Signs used PPT3 communicated to SEN Teacher using a combination of signing and speaking	More House Blocks Build
SEN Teacher	SEN Teacher	Going back to smaller classroom “ok, it’s home time, we need to go back to your class” No signs used	PPT3 followed verbal directions, turned off the light in the room and walked with the SEN Teacher	Home Time Class
Teacher	Teacher	Home time: Teacher gave instruction: “put on your	Signs used: Home	Home School

		coat, it's home time"		Coat

Development of a Core Lámh Vocabulary for Mainstream Primary Schools: Observation Form

School: School 1 **Visit Number:** 2 **Date:**---------- **Setting:** Classroom, School Support Room, Yard

Communication Partner	**Initiated by**	**Activity Description**	**Outcome** **Lámh sign used?**	**Lámh Sign** **To enhance communication/** **Prevent breakdown**
Teacher/ SNA	Teacher (whole class)	Morning Routine: Hang up coats, take out lunches, put bags in a box	No signs used PPT1 facilitated by SNA	Coat Bag Box Lunch
SEN Teacher	SEN Teacher	Instruction: "Will you put your books up on the desk?"	No signs used PPT1 nodded "no"	Morning Put (to) Books Table
SEN Teacher	SEN Teacher	Visual Schedule: First/ Then	No signs used, PPT1 supported with the visuals	First Next
SEN Teacher	SEN Teacher	Lacing activity: Going through pictures of animals Question words, colours, giving praise.	Animal noises used as a semantic cue No signs used	Colours: pink, purple, yellow. What Picture Pull (to) Good Girl Help (to)

SEN Teacher	SEN Teacher	Doing a jigsaw (reward for lacing work). Looking for corners "where are those pieces, I need more"	Signs used: Sand Yellow Blue PPT1's words used: Yeah No	Jigsaw Where More Sand Yellow Blue
Teacher	Teacher (whole class)	Lámh a song: Old Macdonald	Whole class made signs throughout song	Music Sing (to) Sign (to)
Teacher	Teacher (whole class)	Giving instructions to the class "*Suígi síos*"	Sign used: Sit	Sit (to)
SNA	PPT1	PPT1 tapped SNA and started jumping up and down. SNA replied "no, later"	Sign used: No	Later No
Teacher/ SNA	PPT1	PPT1 stood up from table with visual schedule to give to teacher Teacher replied "Sit down it's time for work"	Sign used: Work	Work (to)
Teacher	Teacher (whole class)	Giving out books "leaders up here, this is for ___"	No signs used	Book Here
Teacher	Teacher	Writing activity: "Good girl, go slowly"	No signs used	Good Girl Slow
Teacher	Teacher (whole class)	Instruction:	No signs used	Finish (to) Pencil Colour

		"When you're finished will you pick your favourite colour and trace it with you favourite colour"		Favourite
Teacher	Peer	Peer asked teacher for a drink	Sign used: Thirsty	Thirsty
Teacher	Teacher (whole class)	Introducing phonics activity: "X + X weren't at school yesterday they were at home, they missed a new song"	Signs used: School Home	School Home Song
SNA2	SNA2	PPT1 crawled under the table "oh I'll be sad if you don't sit down"	Signs used: Sad Listen Sit	Chair Sad Listen (to) Sit (to)
SNA2	PPT1	PPT1 got up and pointed to picture of music on board. SNA replied "yes, later".	No signs used	Yes Later
Teacher	PPT1	PPT1 pulled table out from the group x3. Teacher put table back and replied no.	No signs used	Table No
Teacher	Teacher (whole class)	During phonics: "We'll have to colour in, I don't think everyone is waiting"	Signs used: Wait	Colour Wait (to)
SNA	SNA	During colouring activity: made signs for colours	Signs used: Red Green Blue	What Red Green Blue
Teacher/SNA	PPT1	PPT1 finished activity, stood up from chair.	Signs used: You Finished	You Finish (to) Sit

		Question: “Are you finished? If you aren’t finished then you have to sit back down”	Sit PPT1 signed finished	
Teacher	PPT1	PPT1 stood up, took teacher by the hand and showed her the visual schedule for lunch. Teacher replied “ya we’re doing that next”	No sign used	Yes Next
SNA	SNA	Instruction: writing “Hold your pencil, around and down, careful”	No signs used	Pencil Down Careful
SNA	SNA	Putting away book “Don’t throw it, gentle, good girl”	No signs used	Gentle Throw (to) Good Girl
Teacher	Teacher (whole class)	Instruction: “Time for lunch”	Sign used: Lunch	Time Lunch
SNA	PPT1	PPT1 tapped SNA and ran away, playing catch	No signs used	Run (to) Catch (to)
SNA	SNA	SNA asked PPT1 to say sorry to peer	PPT1 signed sorry with no model	Sorry
Peer	Peer	While PPT1 was playing catch with SNA, a peer tapped her, then PPT1 started running after peer	PPT1 followed rules of game, both took turns catching and running	Catch (to)
Peer	Peer	Peer stopped PPT1 in the yard and asked “do you want to play a game?”	Peer used signs for play and game spontaneously	Yes Play (to) Game

		PPT1 replied “ya” and they proceeded to play catch		
Peer	Peer	Game of leapfrog in the yard PPT1 followed peers lead and they played leap frog for three turns	No signs used	Jump (to) Frog
Peer	Peer	PPT1 played game of duck duck goose with 4 other peers in the yard. Took turns in game successfully	No signs used	Run (to) Sit (to)
SNA2	SNA2	Colouring activity: hard and soft Showing contrast with pillow and book Explaining colours Corrected mistake	No signs used	Crayon Red Green No
SNA2	SNA2	Instruction: “Do one more”	No sign used	More
SNA2	PPT1	When finished, PPT1 put her head down on the table and “went to sleep”	No sign used SNA requested sign for tired	Tired

Development of a Core Lámh Vocabulary for Mainstream Primary Schools: Observation Form

School: 5 **Visit Number:** 3 **Date:** -------- **Setting:** Classroom, School-yard

Communication Partner	Initiated by	Activity Description	Outcome Lámh sign used?	Lámh Sign To enhance communication/ Prevent breakdown
Teacher	Teacher (whole class)	Describing daffodils that a child had brought in: "Look girls, the flowers are open"	No signs used	Look (to) Open (to)
Peer	PPT6	PPT6 tapped peer's shoulder, then pointed at her copy.	No signs used	Look (to)
SNA	SNA	PPT6 stood up and "fell" on the floor. SNA asked, "Did you fall?"	Fall	You Fall (to)
Peer	PPT6	PPT6 tapped peer's shoulder and said their name.	Peer made eye-contact with PPT6, then pointed to the work that they were doing.	Look (to) Work (to)
SNA	SNA	Giving praise: "Good job, well done"	No signs used	Good Work (to)
Peer	PPT6	PPT6 tapped peer on the shoulder and said her name. Peer pointed to the board where the teaching was working.	No sign used	Look (to)
SNA	SNA/ PPT6	PPT6 sat down in SNA's chair. SNA pointed to the correct chair for PPT6 to sit	No sign used	Sit (to) Chair

		in and corrected her, saying "No, this is ____'s chair".		
SNA	SNA	Timer on the board finished. SNA made comment: "Writing is finished"	Finish	Listen (to) Finish (to)
Teacher	Teacher	PPT6 stood up from chair and sat on the floor. Teacher commented: "Ok ___, will you show me good sitting?"	Good	Sit (to) Show (to) Me Good
Teacher	Teacher (Whole class)	Morning prayer: Quiet time instruction: "If there's something you want to say to God"	No signs used	Say (to) Want (to)
Teacher	Teacher	Correction: PPT6 was facing the wrong way in their chair. Teacher commented: "PPT6, are we looking?"	Look	Look
Teacher	Teacher (whole class)	Reader: School uniform book. Current page: "I have a long tie, I put it on" Whole class read the page, then did activities on the whiteboard.	No signs used	Clothes Colour
SNA	SNA	PPT6 stood up from table. SNA gave instruction: "No, time to work". PPT6 returned to table and SNA signed "Good job".	Good	No Time Work (to) Sit (to) Good

SNA	SNA	PPT6's nose was running. SNA brought PPT6 to a roll of tissues at the back of the class to blow their nose.	No sign used	Tissue
Teacher	Teacher (whole class)	Question: "How many words are in the sentence?"	No sign used	How much/ many
Teacher	Teacher (whole class)	Comment after an activity: "Will we give our five friends a bualadh bos?"	No sign used	Friend
SEN Teacher	SEN Teacher	Brushed past PPT6 and commented "oh I'm sorry"	No sign used	Sorry
Teacher	PPT6	PPT6 got teacher's attention and showed her the words she had been given. Teacher commented "Thank you"	Thank you	Thank you
Peer	Peer	PPT6 was playing with a peer's work. Peer reprimanded PPT6, saying "no" with a point.	Peer used gesture rather than Lámh sign.	No Stop (to)
Teacher	Teacher	Comment: "This is work time PPT6, sit down please"	No signs used	Sit (to) Please Work (to) Time
SNA	SNA	Giving instructions with the first/then board. "First play, then work."	Play Work	First Play (to) Work (to)
Teacher	Teacher (whole class)	Activity: Go fish with new words. Instruction: "Who can find the word ___?"	No signs used	Who Find (to)

				Quick
Teacher	Teacher (whole class)	Instruction: “Put the words back in the bag and tidy up”	Tidy up	Bag Tidy up (to)
SNA	SNA	Question: “___ will you help me?”	Help PPT6 attended to the task	Help (to)
SNA	SNA	Instruction: PPT6 was distracted from work playing with a doll that was on her desk. SNA gave instruction “___, let the baby wait”	Wait PPT6 put the baby down on the table and continued with the task.	Wait (to)
Teacher	Teacher	Instruction: PPT6 stood up from chair and went to get a toy. Teacher commented: “This is work time, are you ready to sit down?”	Work Sit PPT6 sat back down	Work (to) Time Sit (to) Ready
Teacher	Teacher (whole class)	Toy “critters” were placed on children’s desks to watch them doing good work. Counting was brought in to count the left-over critters for the children who were absent. Question: “How many critters are left in the box?”	No signs used	Count How many Box
SNA	PPT6	Activity: Writing on a blackboard.	No signs used.	Tissue

		PPT6 asked SNA for a tissue to wipe the board.	PPT6 said "tissue", SNA understood.	
Teacher	Teacher (whole class)	Question/ instruction "Have we all got our bags tucked under the table?"	Bag	Table Under Bag
Teacher	Teacher (whole class)	Activity: Counting. Repeated instruction throughout activity: "Can everyone show me…?"	No sign used PPT6 imitated peers.	Show (to) Everyone
SNA	SNA	Counting activity: grouping small toys in correct amounts. Questions: "what's this?" "Where's number one?"	No sign used	What Where How many
SNA	SNA	Matching activity: Number 3 Connect the pictures in the book with the correct number. SNA giving instructions.	No signs used	Same Different
SNA	SNA	Instruction: "Colour!" Pencils were out on the table. Sign was in context.	Colour	Picture Colour
Teacher	Teacher	PPT6 stood up to go over to her toys. Teacher commented: "No, you had a turn a minute ago"	No sign used	Turn
Teacher	Teacher	Giving praise: "Thank you! Good girl"	Thank you	Good Girl Thank you

Teacher	Teacher	Movement break: Song on the board. "Shake your sillies out"	No signs used in introduction During song: imitating actions from the board	Sing (to) Dance (to) Break
Teacher	Teacher (whole class)	Instruction: "It is lunch time!"	Lunch	Lunch Time
Whole class	Whole class	Lunch time: Discussion What foods to eat at small lunch and big lunch.	No signs used. PPT6 not part of the conversation.	Big Small
Teacher	Teacher (Whole class)	Instruction: "Time to line up!"	Line up (to)	Line up (to)

Appendix D. Participant-led Guided Tours and Vocabulary Recommendations (sample)

School 1, Participant 1

1. "VIP" Table

Description:

PPT1 brought the researcher to a table at the back of the classroom called the "VIP table", a table with a few small toys and two chairs. PPT1 rolled the green car in and out to the wall, opened the box, spilled out all the felt balls and put them back in. SNA reported that PPT1 can go to this table during the day if they are tired or need a break.



Lámh Signs:

Table, Toy, Green, Car, Ball, Out, Go (to), Tidy up (to), Break (as in take a break) Box Play (to), Sit (to), Open (to), Close (to).

2. Yard Marking

Description:

In the yard, PPT1 tended to play more with their peers, but on one occasion brought the researcher to stand at the top of a yard marking of hopscotch, while they jumped and ran along the flower from one end to the other. Peers in the class lined up behind them and took turns.



Lámh Signs:

Outside, Friend, Play (to), Jump (to), Flower, Leaf, Run (to), You, Line up (to), Turn, Go (to), Again, Stay (to), Stand up (to), Wait (to).

3. Sandpit

Description:

On the way in from the yard, PPT1 stopped at a sandpit in the hallway outside the classroom. They picked up the small toys in the sandpit, filled a teapot with sand and then poured it into cups. SNA reported that at the beginning of the school year PPT1 took frequent breaks for them classroom at the sandpit, but now goes every few days.



Lámh Signs:

Sand, Bucket, Teapot, Full, Empty, Pour (to), Cup, Again, Toy, Look (to).

4. Wall Schedule.

Description**:**

Inside the classroom PPT1 brought the researcher to the top of the class, to a wall schedule. PPT1 took down the 'Music' picture, followed by the 'Bua na Cainte' (Irish curriculum) picture, and gave them to the researcher. Teacher and SNA both report that Bua na Cainte (Irish) is the participants favourite part of the day, as it involves songs and activities on the interactive whiteboard.



Lámh Signs:

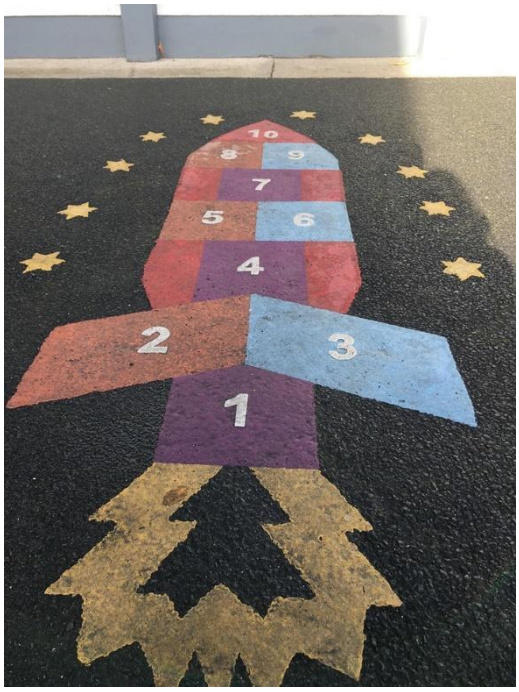
Music, Sing (to), Picture, Look (to), Irish, Schedule, Next, Favourite.

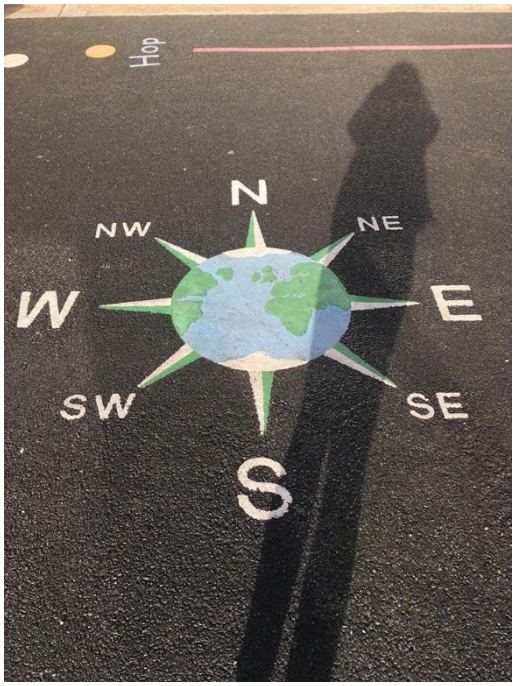
School 3, Participant 3.

1. **Yard Markings**

Transcript of Audio Commentary:

SLT-researcher: Participant showed the researcher around the yard, bringing me first to a rocket. The participant then ran, jumped, and skipped all along it. Some other children joined in to take turns. The participant then brought the researcher to a yard marking of a globe, and helped to take the picture, saying "I press", but did not play with that marking any further.





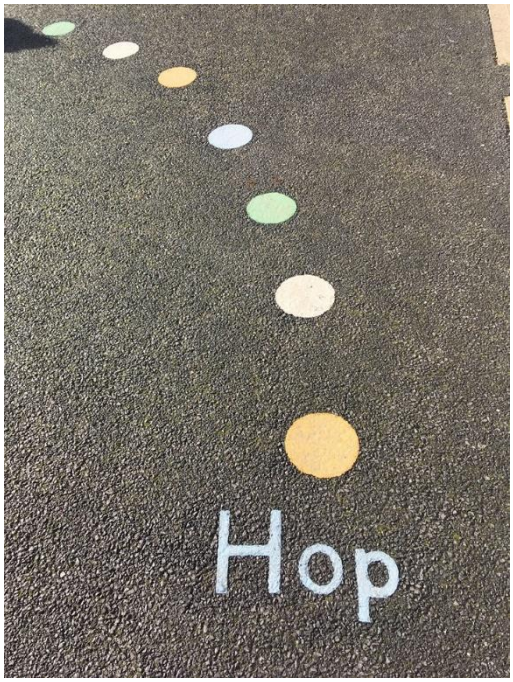
Lámh Signs:

Yard, Outside, Look (to), Rocket, Jump (to), Skip (to), Go (to), Camera, Me.

2. Yard Marking Obstacle Course

Transcript of Audio Commentary

SLT-researcher: Participant played most frequently with an obstacle course marked out on the yard and assisted the researcher in taking pictures of the various parts. Participant went around the course several times, following the instructions given on the ground.





Lámh Signs:

Jump (to), Run (to), Go (to), Walk (to),

Balance (to), Quick, Slow, Again

Start (to).



3. Weather Chart

Audio Commentary:

I: Participant tour continued in the classroom. Asked participant to show me what she liked, she brought me to the weather and day chart and showed me the sun, took off the pieces and handed them to me. Language sample: 'Sun' and 'Monday'



Lámh Signs:

Weather, Sun, Clouds, Look (to), Monday, On, Off.

4. iPad

Transcript of Audio Commentary:

SLT-Researcher: Participant tour continued in the hall with the SEN Teacher. The participant showed the researcher her red cushion and the iPad, then completed activities from the "See and Learn" program.



Lámh Signs:

iPad, Same, Different. Red, App. On. Off.

School 4, Participant 5

1. Car Game

Description:

When given time for free play in the in the morning, the researcher asked PPT5 what toy he would like to play with. PPT5 went straight to a car game, where he took the cars out and put them back in one by one. PPT5 imitated the Lámh sign for the colours 'blue', 'red' and 'green'. The SEN teacher reported that this is one of PPT5's favourite toys.



Lámh Sign:

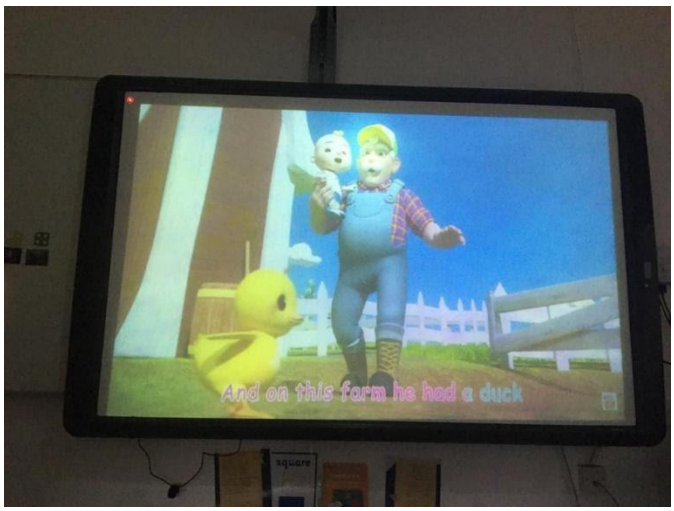
Car, Yellow, Out, Again, Blue, Red, Green, In, Tall.

2. **Bean Bag and Nursery Rhymes.**

Description:

It was raining outside so the children stayed inside at lunch time. PPT5 was given a choice between free play or watching music on the whiteboard. PPT5 brought a bean bag from the library area of the classroom and watched the nursery rhymes for the duration of the break. Throughout the songs he tapped the researcher, pointed at the board, and imitated the actions on screen. PPT5 spontaneously signed for animals ('duck', 'chicken', 'monkey', 'cow', 'sheep') during old MacDonald and other songs.





Lámh Signs

YouTube, Song, Music, Listen (to), Farm, Watch (to), Sit (to), Duck, Chicken, Monkey, Cow, Sheep, Dance (to).

3. Doll House

Description:

Later in the day PPT5 brought the researcher the doll's house and held up the wooden figures one by one to show them. PPT5 signed granny, then played with the people, putting them into the house, lying them on the bed and sitting them on the chair.



Lámh Signs:

Doll, Play (to), Game, Granny, House, Chair, Sit (to), Girl, Boy, Look (to), Clothes.

4. Cash Register

Description:

After playing with the doll's house PPT5 brought the researcher to one of the toy cash registers in the classroom. PPT5 opened and closed the drawer, pressed the buttons on the machine and took out the money.



Lámh Signs:

Money, Shop, Please, Open, Close, More, Thank You, Push.

5. **Costumes.**

Description:

The final toy that PPT5 showed the researcher was a box of hats and other costumes. PPT5 opened the drawer, took out two hats, put them on first and then gave them to the researcher to wear.



Lámh Signs

Hat, Dress up, Clothes, Box, You, Blue, Red, Silly, Look (to).

6. **Artwork**

Description:

On a walk down the hall, PPT5 stopped the researcher and pointed to little red riding hood artwork on the wall, which the class had done the previous week. The participant made a sign for wolf, and the Lámh sign for "little", which the SNA reported meant "little red riding hood". The SNA reported that throughout the story, PPT5 had been fascinated by the wolf.



Lámh Signs:

Look (to), Story, Red, Book, Little, Wall, Watch (to), Picture, Wolf, Scary.

Appendix E Teacher Interviews and Vocabulary Recommendations (sample)

Data Collection Point 3

Questions as per interview guide:

1. What Lámh signs have been the most useful for you so far in the school year?
2. What signs do you find yourself using most often?
3. Are there any differences between the signs that you find yourself using the most compared to the other people using Lámh in the environment?
    a. Teaching staff, peers, child themselves.
4. What new Lámh signs do you think would be the most helpful for you at this stage in the school year?
5. Are there any other signs that you think it would be useful for _____'s peers to learn?

School	Quote	Lámh Sign
School 1	I: Then, what signs are the most helpful for you at the moment? Which ones would you find you're using the most? T1: at the moment we're kind of using wait, stop, yes, no. am, and I suppose at the moment, it's kind of, we do use Lámh signs but it's just pushing (CHILD), and we have kind of gone now if she wants something, yknow "do you want this?" that I'm waiting for the sign kind of yknow that its, as in "yes you want it" because she does know the meaning it's just getting her to use them I: ok, yeah, its, if everything is anticipated for her she'll never need to T1: exactly ya. Amm, and we still use all the ones like lunchtime, hungry, eating, drink all of those ones I: yeah. and do you find any change in, say (CHILD)'s use of signs? Or anything along those lines between the start of the year compared to now, or do you think it's pretty much the same? T1: yknow what she actually, even there just the last kind of week or two since she's going home she'll walk out the door, then she's coming back into us telling us she's going on the slide I: ok yeah T1: or a game, or at home time she'll be saying, yknow I'm going home a bit more, yknow what I mean? I suppose when she's excited about something like she's excited about going home so if anyone pops in she's telling them it's home time, or then she'll come back in telling us she's going to the slide so yknow, she is I: if she has something to tell you she's using them T1: exactly I: yeah. ok, then, has there, so the ones you'd find yourself using the most often would be all those ones around the routine, colouring T1: the colouring, finished. And I suppose, on yard then as well we're using out in the yard, I don't know do we have one for slow down? Kind of, now we do have be careful and all those, and yknow wait on the yard, but yknow things like if they're being too rough? I: yeah T1: I don't know, maybe at the moment we might say that's silly? Y'know or words kind of like that that you're playing too rough kind of?	Wait, to Stop, to Yes No Want, to Lunch Time Hungry Eat, to Drink, to Slide Home Colour Finish, to Slow Down Be careful Silly

	I; those sort of discipline ones T1: that it's not actually, she mightn't be being silly I: ya T1: it might just be a case of that somebody's being rough? Y'know that kind of thing I: yeah T1: but I suppose then we can use the, we just use the "be gentle" instead yknow I: yeah it's kind of finding the, maybe what one word to describe those situations is hard when it comes down to it, yknow you don't want to say just wait when you don't feel that's specific enough T1: yes, ya those kind of things I: and would there be any difference then between the signs you would find yourself using the most compared to say maybe SNA or SEN room? do you think you're all going off the same ones or is there any in particular T1: I think we're kind of all going off, like the same ones to be fair. Like obviously, when she's in the classroom and SNA is there it is a lot of the same signs that we're using, yknow are you finished I: ya T1: we are using the same ones together. Then when she goes to resource, they're doing different things yknow they are doing different signs I: yeah T1: when they're going to different rooms I: sure T1: and she is, she's even with names I suppose we're kind of, we're trying to push names we'd always be using the sign for whoever she's going to or wherever she's going but she hasn't really used, she doesn't use them. But she does understand them I: ok, kind of at that stage of learning where she's taking it all in and picking it up and matching things to meanings and things like that before she ever comes along and starts doing them herself T1: ya, exactly ya I: and then for this stage of the year, for the next times when I come back you'd be thinking? Or even since the last time I was here the words you'd be using more would be around, silly, the ones out in the yard, what other ones were you saying, for the next 25 signs? T1: just I suppose yard ones kind of I: yeah T1: those, yknow we do have a lot of feeling words, so I think we have enough of those, I: mhmm T1: as in I: I know as in you're able to use them T1: yeah we can get by like with what we have but I suppose just kind of the yard ones really I: ya, and I know those ones with feelings, we didn't do those as a class or whatever, but do you feel that they're helpful when you're one to one with her? Cos that was something you were talking about the last time yknow like are you cross are you sad T1: yeah and I suppose, at the moment with them ones, she's going through, this is only this week last week she's going through this phase where she's being, I suppose defiant? And it's trying to get the words, and we're saying oh	Rough Gentle Finish, to Name Yard Outside Cross Sad Angry

	that's really silly, but other things, like I wouldn't say all of the things that she's doing are silly? I: yeah T1: but that the only, we're calling it silly I: so trying to pinpoint, and match the word to the meaning T1: yknow those kind of things that we have. But I dunno, look, I suppose she's cute enough anyway she knows, I think she knows when we say silly we don't mean y'know funny I: so I guess even to have one where it's a consistent pattern? Even if it's not necessarily silly if she just knows that this was "I know I shouldn't be doing this now" T1: yes, yeah, something like that ya I: yeah T1: that you know that I: mhmm, that would definitely be something that T1: I suppose would you call them behaviour words? And I suppose like, positive behaviour words like the ones we have phrases like good girl, or even like well done or that's gorgeous or that's really neat, yknow kind of to expand on those sort of words I: yeah T1: yknow or that's very tidy, well I suppose, I dunno would you "tidy up" is that the same as tidy? Yknow those kind of things I: yeah, we could definitely look into those kind of things to have T1: phrases I: you don't want to be saying good girl maybe every time yknow T1: exactly I: I understand. Then what about for all of (CHILD)'s peers? Like any new games that have just come up at this stage of the year or anything they're talking about inside in the class? T1: see, with things like, I don't know now with cartoons and stuff, there's not really signs for them? Y'know what I mean? I; yeah T1: yknow, if there was something around, yknow a word for cartoon or something around I: maybe television? T1: I know there's that one, but yknow if they're talking about, I don't know what they might be on about but that she could engage. But to be fair, she does engage with them I: yeah T1: but I find she can be very silly with them? Because she, I suppose she might find I can't really express myself properly here with words I: but that might get the reaction then T1: exactly she's just looking for the reaction. Am, things like that. I suppose there's no specific words that I would think I: ya, that straight off a Lámh sign. And out in the yard do you find now that she's sort of well able with them or that the SNA would lead her into the game sort of thing? T1: she actually will go herself like she will join in I: mm T1: but it all depends on the day. So some days, there's a girl that she plays with every single day, and then today then I was out there and she's saying "(CHILD) do you want to play?" and It's "no" I: no	Good Girl Neat Praise Tidy Cartoon Want, to Play, to

	T1: now, yknow what I mean I: she is, it's not something where you're thinking around "how can we encourage this?" T1: no no she will if she wants to play with them she will play. Now sometimes, she can get really tired, so I don't think it's an angry thing, just a tiredness that she just will say no, I'm done I just don't want to go in I: ya of course T1: I don't really think it's a language thing because she does play with them outside I: mhm, but with regards to being social she, you find that it's not a thing where she's really reliant on Lámh or she's stuck or T1: yeah no she's not and I suppose. Well I suppose on the yard its catch so there's not a lot of talking? I: very true T1: and she's comfortable doing that because there's no pressure on her she's able to play that I: mhmm	Tired Catch, to
School 2	I: sure, and then what signs would you say are the most useful for you at this stage? What would you find yourself using the most? T2: the social signs. The hello, the goodbye, thank you, I'm sorry, coat on, get your bag, lunch time, play time, yknow kind of I: those ones that happen, that come up a T2: the most often I: more general ones T2: in a more general sense, ya I: absolutely, and then is there any differences between the signs that you as the teacher would use, compared to the ones that maybe SNA2.1 or SNA2.2 would use? T2: well I suppose, sometimes they would be working with them in the more one to one. So I suppose they would use, maybe more colours, we'll say for the activities they're doing with them, say jigsaw I: ok, getting into the specifics a bit more T2: ya I: sure. And then between yourself and the children themselves, do you ever find that they would use Lámh signs independently or is it that you'll make one and they'll copy? T2: no, they won't am they'll do them independently as well I: ok, and would they be using more kind of play T2: play, play ones, yeah. I: sure, and with regards to the signs that will be coming back with the next day, are there any signs that you think would be particularly helpful for you around this time of the year T2: I suppose yknow like PE today, a few of the kids came up to me they wanted to know the PE sign so maybe subject signs I: yeah T2: I don't know I suppose writing is writing, or you know something like those kind of signs I: We can get in to more those type of signs T2: and I suppose something I need to work on more is my questioning I: right T2: questioning ya I definitely need to work on that I haven't really worked on that	Hello Goodbye Thank you I Sorry Coat On Get Your Bag Lunch Time Play, to Jigsaw Play, to PE Write, to Questions

	I: and the questions now that ye would, would it be like the who what where when why? The main ones T2: yes, yknow like those ones. Or what happened, mm, ya I: ok so questioning around things that have happened T2: yes ya, it could be around an event, for example am the psychologist was saying maybe in the yard yknow if she did well, playing well, not pulling hair or pulling jumpers or whatever giving her something, a token to bring around a lollipop stick say, and she'll give it to the teacher and they'll say "oh you were very good today, what happened" or what have you I: right T2: do you know what I mean, down the line I: ya T2: that's more down the line I'd say I: and in around those rewards things, maybe signs around those for giving praise. I can see using good girl, you're definitely using that one T2: we are yeah, coat on, yknow lunch time, play time, we do a lot of those, then book, as they come up yknow lunch box, I: as they come up during the day T2: as they appear yeah I: as they appear T2: and as I say, they'd appear in stories then as well, animal signs and that I: and I guess those are the ones that are hard to plan for T2: they are I: when there's a different, when they come every week or there's a different story every T2: they do, they kind of just come up I: every once in a while T2: yes I: yeah, and then are there any signs that you think would be more useful for all of (CHILD)'s peers to know or any signs for (CHILD) herself (pause) any games that they play or any questions they'd often ask each other? What have you for lunch or that or is there any things that come up that you would think, maybe not too important for a teacher but for the kids themselves? T2: yes, I hear you. Am, I suppose yknow, I suppose like "come on" or one of them ones the play ones, will you play with me, will you play with us, shop I: bringing people in T2: bringing people in, inclusive kind of ones. I'm trying to think now, maybe around some of the foods, lunch box, yknow that kind of thing I: and I suppose they would have been something at the start of the year that wasn't very urgent, yknow when you're trying to get something like bag and book, but now that we're here T2: we can move I: we can move forward with those	What? Book Lunch Box Story Animals Come, to With Me Us Shop Foods
School 3	I: it's not there yet, sure. Ok and then what, with regards to the signs specifically, what ones are you finding the most useful for you at the moment? T3: it's still the, it's the instructions, it's like eat, sit, stand, tidy up. It's those I would find, for myself I: ya T3: so ya, the children themselves it's things like that would be, like catch and that I: the playing ones T3: they're not telling each other to sit and stand I: very true, and they'd be the ones you use the most often?	Eat, to Sit, to Stand up, to Tidy up, to Catch, to

	T3: am, I suppose they are. Because my teaching ones I suppose, sometimes I find I'm caught for one or I'm, I can't, it doesn't come to mind even for close the door now I'll kind of. I feel I should I: you know it's there T3: and then I can't remember what the Lámh sign is for it I: yeah, and you want to be using it at the same time you say it rather than following it up T3: yes I: ya T3: so that probably will take a while again just, to get there I: there's probably just a bank at this stage now that you're very familiar with that are almost second nature T3: yes I: and then any new ones you have to go through the whole lot again of getting familiar T3: that's it. And you know that ones that I'd prepare for then, you know the concept ones coming up you know the tall and that. It's good that you were even there today because I had mentioned it am, that that would be coming up this month. Like last week it was long, the longer, long and short, and wide, narrow was another one and yknow there's a lot of them I: and they're all fairly similar T3: yeah, ya. So today tall and short again, now like I'm sure, yknow, it's a lot y'know even big and small and heavy and light will come up this year as well I: ya, and you were saying the signs that you would use and the children might be using the more play ones, are there any that you would find that might be more specific to the SNA? Or maybe kind of a mix? T3: am, well I suppose, more the care needs as well for the SNA. I think once, cos the SNAs would be enthusiastic to use the Lámh signs too but their signs might be different to mine you know they're not teaching her as such. So even just for the ones we do in the mornings you know putting up your coat, put up your bag I: mhmm T3: at this stage, I suppose she knows the routine I: she's not as reliant on T3: ya, whereas I'd say for an SNAs point of view, even going to the toilet y'know wash your hands, y'know I suppose I wouldn't be using those ones with her so I suppose those ones would be good or even anything out in the yard, even she needed their help even I: like a tissue or T3: ya I: any of those things ok T3: ya, you know the hurt or sore or pain in my tummy or something like that y'know those ones she might need that I: ok, and then at this time of the year, are there any new Lámh signs that you think would be helpful for you? T3: am, I suppose, so let's see at the moment, it's the concepts. That's quite heavy at this time of the year now and, am, time would be coming up, I said weight there as well, they're coming up in the maths, coming up in sese, and I suppose those are the ones id be using this time of year I: sure, at this time you can think more about using Lámh for academic language T3: yes	Tall Long Short Big Small Put, to Coat Your Bag Toilet Wash, to Your Hands Hurt, to Sore Pain

School 4	I: yeah sure, and then what signs would you say you're finding yourself use most often in the classroom at the moment? T4: am I suppose again it's the instructional ones. We started trying to bring the Lámh sign into the prayer in the morning I: yeah, I guess that's a great place to start because you can sort of bring in new signs and try to use two together T4: ya absolutely because y'know you can even see night and day was, they still find that hard but it's kind of nice for them to see it in kind of more than just isolation of one sentence I: what it can be T4: what it can be ya or that y'know the word and comes in a few times and they could use the same sign again, but y'know they have the play and time but like they use them in isolation rather than having it as a full sentence or a full little story I: definitely and then, are there any differences between the signs that you would use the most often compared to the ones that SNA would use when she comes down, or do you find that they're kind of the same across the board? T4: am I: is there any that you feel, this is really a teacher sign T4: yeah, signs for a teacher. I suppose the teacher ones would be kind of, the instruction, the looking the listening, the colouring, the waiting. Then I suppose if you were more one on one, like an SNA you might be checking if they were ok, checking their care needs more so than giving an instruction I; ok, and then what, I know ye have loads of signs already, what new signs, if I'm coming back the next time where you think that new vocab would be helpful? Or any situations at this time of the year where a Lámh sign would be helpful? T4: am, I suppose, hmm I: it's kind of hard the more signs you have to to pick out more T4: am, need, maybe even some of the ones, I know we have dance and different ones, I'm trying to think like, in PE I: yeah T4: I know, y'know I presume it's the same to get the ball? Or go, those kind of ones or hop, skip, jump I: ok so different ones, T4: different actions for I: for pe or maybe other games T4: or even on the yard so the children have. The children have maybe would you like to play, but y'know or game, but then I: play what T4: they don't have to run or you must jump or you must catch I: ok so kind of maybe more specific verbs T4: verbs, ya I: and then you were saying earlier that ye have drama, with other teachers coming in, would there be anything with that that you think whoever comes in could learn to help with that? or I don't know, even, describing words around that or T4: ya, like even the last day now at drama, they would've been doing a game, and it was wizards, goblins and giants I: ok T4: and like as in, there was none of the three, and those things	Prayer Night Day Play, to Time Look, to Listen, to Colour Wait, to Ok Dance, to PE Ball Hop, to Skip, to Jump, to You Like, to Play, to Game Run, to Jump, to Catch Drama Wizard Goblin

	I: they're real kind of, top level complex words, there might not necessarily be a sign for T4: ya, yes exactly so some of them were, or concepts or like, am, I know we'd some of the farm animals but even y'know they do different animal walks I: ok, yeah so like walk like an elephant or something like that T4: ya, exactly I: ok so that might be something, maybe some more exotic animals T4: yeah, not just the farm animals I: we'll have to expand on dog and cat! Am, then for the peers, you were saying as well maybe more verbs for out in the yard? Like hopping or giving instructions for how to play ya T4: or if something isn't, if they wanted to say slow down or to be gentle or that hurt	Giant Animals Elephant Slow Gentle Hurt
School 5	I: yeah sure and then so what would, kind of at this stage of the year what would be the signs that you find yourself using the most? T5: am I use I use the signs that you have taught us more than more than the signs I: more than the module one T5: yeah definitely and I don't use all of the signs I: ya there's a lot , 50 would be an awful lot T5: we go through we've done we would use bag and book and coat, home a little bit but she goes to after school so I don't, I think I confuse her I: it doesn't translate T5: a little bit by using home, we would use lunch every day am, we would use finish, go, help a little bit ah, listen look play times sit, the toilet, wait, am sorry a little bit a little bit but we just you know while you're speaking about feelings and that to kind of remind her a little bit just so she doesn't I: yeah yeah T5: so she doesn't forget Christmas we'd obviously used a good bit earlier on I: at the time of the year T5: color we kind of she doesn't like colouring so we don't dwell on it very much I: T5: so that's probably one I need to use a little bit more I: hmm T5: line up, stop tidy up kind of mainly the action words I: OK the verbs T5: yeah I: mhmm, definitely and then so between the signs maybe that you would use the most versus signs that SNA would use do you think that there is a difference there or do you think there's ones that like specifically as a teacher are more important kind of for you or more necessary T5: no, well SNA would use the toilet sign more than more than I would just sometimes she can be a little bit reluctant to sort of go to the toilet so then I would kind of row in as well and say yknow it's time for the toilet I: yeah T5: but generally we would use the same signs yeah maybe it's more because it's this age group I: yeah yeah T5: maybe if she was an older child there may be more of a variation but we do tend to use the same	Bag Book Coat Home Lunch Finish, to Go, to Help, to Listen, to Look, to Play, to Time Sit, to Sorry Colour Line up, to Stop, to Tidy up, to Toilet

	I: yeah, the same ones kind of across the board and then for new signs has anything come up where you thought a sign might be helpful or would there be any kind of new areas are kind of new things happening at this time of year where a Lámh sign might be useful? T5: am, well just as you mentioned feelings because we're starting the stay safe program because I did worry about how how I could make it accessible for (CHILD) I: yeah T5: there's a lot of feelings work but there's a large around bullying and strangers and that kind of I: right T5: all very abstract topics that involve a lot of talking I: right yeah T5: and language and so we would try to use pictures in as much as we can I: carrying over between between sort of two things. And are there any signs like they might not necessarily even be new signs but just for her peers that you think it would be helpful for them to be even using more, or is there anything T5: maybe play I know that's one we already know but that's probably one that I need to do a little bit more with them I: yeah T5: so that they're using them I: so play would be kind of one and are there any kind of games that they like in your kind of stations or whatever is there anything that comes up kind of every day or is there just Lego and T5: yeah I: jigsaws T5: and blocks, jigsaws	Stay, to Safe Bully Play, to Jigsaw Blocks

Appendix F. SNA Interviews and Vocabulary Recommendations (sample)

Data Collection Point 2

Questions as per interview guide:

Vocab:

1. What vocabulary has been the most useful for you since the last visit?
2. What signs do you find yourself using the most?
3. Are there any differences between the signs that you find yourself using the most compared to the other people using Lámh in the environment?
    a. Teaching staff, peers, child themselves.
4. Has anything come up where you'd find a Lámh sign helpful?

School	Quote	Lámh Signs
School 1	I: …So what signs would you say have been the most useful for you since the last visit? Which ones would you find yourself using the most? SNA1: oh well I suppose it's been a lunchtime, later, am I suppose no, finished am, eh, what else would we use, the toilet sign is used a good bit SNA1: it's happened yeah. So we're, we're using the same signs like to go, quickly, yeah ones like that. and actually we've learned some, yknow the songs that Teacher has up on the whiteboard? I: yeah SNA1: a few of those, am one or two of those I can't remember off hand, quick was the one that came I: from a song SNA1: ya from a song I: sure, brilliant. So they'd be the ones you'd find yourself using I: yeah, and then would you say there's any differences between the signs that you would need? Versus maybe the signs that Teacher would use or that the children would use SNA1: well yknow we'd all I: or would you all kind of be using the same ones SNA1: we'd all kind of use the same, I suppose there's certain things like, anything around toilet, and toilet and washing hands and all I'd use that am, things like to be careful yknow I: yeah SNA1: I'd have to use that. now some of them are getting into it, some of them are getting it like some of them will learn, pick that up very fast yknow I: yeah SNA1: ya. And, am the usual thing, because she's inclined to push people, or shout or whatever, the usual thing you have to say sorry, yknow	Lunch Time Later No Toilet Finish, to Go, to Quick Toilet Wash, to Hands Be careful Sorry

	I: and then has anything come up where you'd find a Lámh sign helpful? I know you were saying, in the class you were coming up you were saying about the small and big lunch SNA1: yes the big lunch. It's just because, I do know that she would eat everything in the lunch box in one go. But trying to explain to her, yknow in the beginning it was just a case of having to close the lunch box or put it away I: pacing kind of SNA1: or there would be a meltdown. Am, but I think she's beginning to learn herself yknow at big lunch that it's there. But just the initial eh, stage of explaining	Big Lunch
	I: Absolutely ya. And then with regards to the next set of signs coming back, would there be anything else you'd like to see in that or to have included? SNA1: am, well off hand, am, well whatever Teacher, we were going through it this morning, and I think between the two of us, did she give you signs? I: ya she was saying kind of am questions and maybe words around giving praise SNA1: yes, yes, she needs that ya. And like for her to understand that ok, we have the sign sad. But, sometimes she'll do something and I suppose it's just, she's being defiant I: ya SNA1: and I suppose "sad" I think is too general sometimes I: not necessarily appropriate for "this is something you shouldn't do again kind of" SNA1: exactly, yeah ya. So if we had something for that, even to say, yknow rude is one too. She can stick out her tongue, and blow raspberries as we say and, sticking her bum into people's faces when she's going around the classroom- and I know it's only fun and yknow like at the same time it's not, appropriate. And I'm trying to get across from her and I use the word rude and I put a cross face on but I don't know whether she's understanding	Sad Rude
School 2	I: yeah, absolutely. And so with regards to the vocab and the actual signing words, what words have been the most useful for you since I came last? Or is it still kind of the same ones? SNA2: we're using a lot of the animals, well now I had the animals I: ok SNA2: only since your last visit I've had the animals, I didn't have them in my first book I: ok, yeah SNA2: I don't think anyway, I didn't look I didn't root them out it would have been more thank you and bye bye and hello the basics	Animals Thank you Hello Goodbye

	before your last visit so since then I'm using more of the farm animals, a lot more of the colours SNA2: ya and anything I seem to be stuck with I try and google, or look up if I can get them at all. But I try to, I haven't, you've given us a good vocabulary with the last twenty and I wrote down two or three more that I tend to use like boy and girl and them things that I'd like to know I: ok so those ones, and so I guess ya, so the ones you find yourself using the most are thank you, lunchtime SNA2: thank you lunch time home time school, am home, mammy and daddy, baby. Amm what else, the farm animals, colours I: mhmm SNA2: tidy up, open, amm, ya the the everyday I: sure and then, any more signs, has anything come up where you'd need more signs SNA2: I suppose a couple of them, the stories where words might come up that we don't really have the sign for and then we're trying to improvise and kind of think of words I: more specific SNA2: I can't think off the top of my head now I: ya sure SNA2: but other than the one I mentioned to you there where boy, girl, yknow, fairytale, princess,	Boy Girl Lunch Time Home Mam Dad Baby Tidy up, to Open, to Boy Girl Story Princess
School 3	I: no, yeah no problem and then, so you would say kind of, would you have any signs that you would use in the classroom or? SNA3.2: the days of the week, am, toilet, yes and no that would be, and lunch was a new one from last week ya I: ok, perfect and so, those signs that you would use, they'd be pretty much only in the classroom? SNA3.2: that's it ya I: or would you ever see anyone using Lámh out in the yard? SNA3.2: No I: and would you ever see any of the children using it? SNA3.2: oh you would, you'd see they're very good inside actually they all go "thank you" and yknow they do. I: ok I: ok brilliant, so am, I guess what vocab would be most useful for you if you were to use more signs? Is there anything that you think would be helpful? SNA3.2: Mmm, for me personally I need to learn more like colours am, that's it really yeah. Colours, I suppose I do know a few, the days of the week, I don't know them all, I would need to learn more to know the Lámh	Toilet Yes No Lunch Thank you

	I: ok ya, colours, so they'd be kind of like the school kind of topic signs SNA3.2: oh ya y a, school orientated I: and then for just like general communication ones? SNA3.2: it would be nice to have am, like family ones, like sister brother mother I: ok, ya just to kind of talk more about SNA3.2: about what's going on at home I: absolutely ya, and I saw there the news SNA3.2: what they did the weekend I: yeah, there could be maybe some signs around that SNA3.2: yeah I: absolutely. am, and then, so I guess has anything come up where you'd find a Lámh sign helpful? I know you've kind of answered already, the family words and colours, they'd be kind of the main ones? SNA3.2: ya, and for playing games I don't know, some way to just, because she wouldn't be great to interact on the yard. But she loves little games I: ok SNA3.2: like am, duck duck goose and that I: ok	Family Sister Brother Mother Home What? You Do, to Weekend Play, to Game Duck Duck Goose
School 4	I: …what signs would you say you're using the most? SNA4: oh ok, so I would say the question words again? So yknow maybe the what and things like that are the ones that I'm probably using a bit more now, rather than, cos I'm trying to expand it rather than just say yknow box I: right, ya SNA4: like I'm adding maybe "what's in the box" yknow I: ya ok, trying to combine ya	What? Box In
School 5	SNA5: ya, every single day. There's signs that we're using constantly like lunch, home, toilet, all those. They're kind of like the big events I: the routine, the parts of the day that happen all the time yeah SNA5: ya ya. Am, playtime but we have other signs like the "what's your name, my name is", we're going around some of the teacher and we're showing them I: brilliant, ok you're showing them in school? SNA5: the receptionist is really really good actually she's doing a lot of signs she's picking them up from just me and PPT6 using them. Thank you, am do you need help? We're doing the help sign to (receptionist) like "I'd love some help?" I: perfect, and then out on the yard, is there many signs used out there? Either by yourself or by PPT6 or any of the other kids or do you find it's mostly in the structure of the classroom?	Lunch Home Toilet Play, to Time What? Your Name Thank you Help

	SNA5: it's mostly in the structure of the classroom. Out in the yard she's kind of off playing, she doesn't come near me as much I: sure, mhmm SNA5: if she needs help like that it's, she'll go to the corner and I'll go over, but she's stuck in the corner that its hard, I need her to look at me, to sign? So I'm often kind of tipping her saying "it's SNA, turn around!" I: right, ok, that kind of, to get that kind of attention before making signs SNA5: ya and I suppose I would say like "are you ok?" "do you wanna go play" I: and that would be out in the yard SNA5: and that would be all through sign, ya she doesn't come near me much which is great really I: brilliant, and then what vocabulary or what signs would you say have been the most useful for you since the last visit? SNA5: amm, finished, help, am lunchtime I was signing wrong, all along I: ok, so SNA5: and then you, you taught us. Am, eat, home time, that can be a bit confusing but I think she understands? I: oh with the afterschool you were saying SNA5: ya cos she doesn't go home she goes to afterschool but I do say its home I: yeah, yeah, I remember. I: and then would you find, are there any differences between the signs that you would use the most versus maybe Ms (Teacher) or the other children in the class? Are there any that you feel are kind of particular to you in the work you do? SNA5: amm, the toilet sign, am let's get your coat on or off? That would be kind of me encouraging her at that time when it's chaotic, Teacher is asking the entire class and (child) sometimes doesn't pick up that it's her? So I'll sometimes sign directly to (child), let's get your coat, or (child), take off your coat. Am, bag, like get your bag or tidy up your bag? Again, teacher would be talking to the whole class? Yknow get your bag get your lunch. Whereas I would sign that to (child), calling her by name I: right yeah so it's more kind of direct, one to one kind of rather than the whole class SNA5: yeah, yeah, Teacher would sign, kind of to the whole class it's lunchtime, but if (child) hasn't got the attention I: there's kind of that extra support SNA5: who's she speaking to? And I'm, "ok I need everyone to sit down", and like that the girls would even, to (child), like they all think they're her mammies and they're like "(child), sit down, sit down" do you know "find your table" and they'll sign table. Some of them, it's the same ones all the time?	You Ok Want, to Go, to Play, to Finish, to Lunch Time Eat, to Home Time Coat On Off Bag Tidy up Get, to Lunch Table Sit, to Find, to

	I:…. have any new situations kind of come up where there's been a Lámh sign helpful, with regards to say the next 25 where I come back, would there be any that would be helpful for you in that? SNA5: am, I'm saying stand up, like that if we're walking down the corridor she might be throwing herself and I'll say "stand up", I'm trying to kind of knock out, we were saying "whoopsie daisy" but she's laughing and she's in the habit of falling I: yeah kind of making a show SNA5: and she'll have so many bumps and bruises yeah, ya, ya. So I'm more just trying to direct "yeah, you stand up (child)", but I'm not sure am I signing it right? I: kind of more matter of fact about it sort of SNA5: yeah, stand up. Am, jobs, she's now kind of doing her jobs? I have a picture image and she's now associating it, she'll point at it if she wants to go out of the class, and she knows that means going on a job, but it would be lovely to have a sign for it? I: yeah sure	Stand up, to Fall, to Job

Appendix G. Peer Interviews and Vocabulary Recommendations (sample)

Data Collection Point 2

Questions (as per interview guide)

1. Tell Patch what you know about Lámh?
2. Patch really want to learn some Lámh, can you show him some Lámh signs that you know?
3. What Lámh signs do you use in the classroom?
4. What Lámh signs do you use in the yard?
5. Are there any new signs you'd like to know?

School	Quote	Lámh Signs
School 1		
Peer 1.1	I: ya, show off now cos he really wants to learn P1.1: house I: house! Oh great signing, do you think he could make that one with his little hands? House. Oh he's trying his best, he really wants to learn. So that's one that you know, house. (child made sign for show). Show P1.1: show I: show, that one's kind of tricky for him. Patch did you know that one before? Nope, no one else showed him that one. So house, and show, any other ones? P1.1: jigsaw I: jigsaw! Show him that one! P1.1: jigsaw I: aw great signing, jigsaw. Patch loves playing with jigsaws. Jigsaw. And what about any other ones? P1.1: music I: music! Ah, I love music and Patch loves music, can you show him the sign for music? Two hands, well done! Oh my goodness, so jigsaw, music, house, that's great signing. Do you know a sign for book I bet you do! P1.1: toilet I: toilet, that's another one, toilet P1.1: quesin I: what's that one? P1.1: question! I: cress? P1.1: question	House Show Jigsaw Music Toilet Question

	I: and was there songs in the class today where everyone was doing signs? P1.1: am clock I: clock P1.1: I don't know how to do that one I: you don't know how to do that P1.1: paper! I: no, and then if you knew some new signs you were saying like paper P1.1: clock I: clock P1.1: chair I: that would be a good one too definitely P1.1: shoe I: shoe, for your school shoes? P1.1: table I: I showed you table the last time! P1.1: how?	Clock Paper Chair Shoe Table
Peer 1.2	I: Like, maybe show him some of the signs that you know, Patch would you like that? P1.2: cow I: cow, great signing P1.2: hello I: hello, oh do you think Patch could make that one with his hand? Oh his hand is kind of small, hello! What other signs do you know? P1.2: pig I: paint? P1.2: pig I: oh pig, silly goose I'm not even listening. Patch will get cross with me P1.2: am, sheep I: sheep, oh that's a really tricky one, Patch do you think you could make that one? Oh I don't know he'd have to try really hard, can his arms reach across? P1.2: no I: oh aw poor Patch can't make the sign for sheep P1.2: am, am the horse is pretty hard it's like this except I don't know which finger we have to go like that I: horse is a tricky one, and where did you see all those signs? P1.2: am there's a song with signs	Cow Hello Pig Sheep Horse

	I: ya, and then do you ever use any, so Patch might come out with me to the yard later, do you ever use any signs in the yard that you could show him? P1.2: ya I: ya? Like what ones? He's so excited to learn P1.2: (made sign for play)	Play, to
Peer 1.3	I: oh ok, P1.3, will you tell Patch what you know about Lámh? P1.3: hello I: hello, great sign, do you think he could do that one? Hello! I: wow, that sounds like a great holiday. So, remember Patch was here because he wanted you to be his teacher for Lámh? And I said that P1.3 knew loads of signs when I was here the last time, can you show him some of those ones? P1.3: ya I: ya P1.3: house P1.3: goodbye I: bye! That's a good one, that's a good one to know. No one else has actually showed him that one before P1.3: mom I: mom, ya like that, well done P1.3: dad I: dad, and that's kind of like the one for bag isn't it? Bag, bag, bag, is he doing it? I: go back? Or if you could learn some Lámh signs for games you play in the yard, what kind of games do you play in the yard? P1.3: tag I: tag P1.3: robbers I: robbers? P1.3: no actually the game of that is cops and robbers	Hello House Goodbye Mam Dad Catch, to Cops and Robbers
School 2		
Peer 2.1	I: Ok, let's start off, will you tell Patch, tell Patch what you know about Lámh? P2: I know play game, I: play game P2: I know home time	Play, to Game Home

	I: home, great signing P2: time I: two signs together! P2: I know am, jigsaw. This one's kind of hard I: Look Patch! Look! Wow P2: and I know ahh, circle time I: wow P2: and I know sleep I: sleep, oh Patch loves going to sleep, he's a sleepy dog! P2: and I know morning I: morning P2: and I know, that's all I: that's all. (child) knows loads of signs doesn't she! P2: and I know juice and I know tree and I know apple I: do you know, are you supposed to talk and do the sign? P2: and thank you I: thank you, another one! I think Patch could do that one, thank you! P2: and lunch I: lunch P2: and, eat, and I know sleep I: which new ones? P2: am man I: man, so maybe signs for people, or would you like to know maybe like girl P2: yeah like to know maybe girl and boy and house I: an any more kind of games? Cos it can be fun using Lámh signs for games P2: am catch I: catch P2 hide and seek I mhmm P2: and fortnight I: fortnight P2: ya and Minecraft	Time Jigsaw Time Sleep, to Morning Juice Tree Apple Thank you Lunch Eat, to Man Girl Boy House Catch, to Hide Find Fortnite Minecraft
School 3		
Peer 3.1	I:.... what do you know about Lámh? P3.1: hello	Hello

	I: hello, and what else do you know about it? So that was a really good sign for hello, hmmm what other signs do you know? P3.1:mm I: can you remember any of them? P3.1: apple I: apple, oh Patch she knows the sign for apple, do you like apples? Oh will you show him P3.1: I forgot the sign of it I: oh it's like this isn't it! Apple, apple. And I bet you know more signs than that P3.1: waiting P3.1: ahh, asking can I play I: oh, great sign for play I: can you think of any that you could do in the yard? What are your favourite games in the yard? Patch might come out at lunch time. P3.1: duck duck goose I: duck duck goose that's still your favourite game.	Apple Wait, to Can I Play Duck Duck Goose
Peer 3.2	I:… Lámh lámh eile, that's a sign, or that's a song isn't it. And what about Lámh where you do your signs with your talking? P3.2: thank you I: thank you! Look there's a sign, do you think Patch could do that sign? Thank you, thank you! P3.2: laughs I: Could you show him some other signs that you know? P3.2: amm, please I: please, can I see that one? P3.2: please, ohh I: or can you remember so please is like this isn't it? Please P3.2: please P3.2: thank you I: can you think of any more signs? Thank you oh great signing, Patch you're learning loads! Oh he loves Lámh. So, are they all the signs that you know do you think? I: like what? Wow Patch, wouldn't that be great if you could see some signs in the yard? P3.2: can you play with me?	Thank you Please Can You Play, to With Me
School 4		

Peer 4.1	I: first but will you tell him the answers? Ok, are you ready P4.1: puzzle I: jigsaw, great sign! Ok Patch, what's your first question? Ok, ya, Patch or P4.1, will you tell Patch what you know about Lámh? P4.1: cross I: cross, is that cross the sign for cross. And do you know any other signs? P4.1: am ya I: there's a big fish up there ya. Can you think of any more signs P4.1: laugh I: any ones you could use in the yard? P4.1: do you want to play with me? I: oh that's a great sign that you could use in the yard! I: de-spooky them, mm that sounds good. Did you learn any spooky Lámh signs for Halloween? P4.1: puca, Cailleach	Jigsaw Angry Do You Want, to Play, to With Me Ghost Witch
School 5		
Peer 5.1	P5.1 I: he'll ask me the question first. So (child), will you tell Patch everything you know about Lámh? P5.2: look I: wow P5.2: I like you I: yeah, what new words would you like to know if I came back again P5.2: ice-cream I: ice-cream, is that your favourite food P5.2: ya, can you show me?	Look I Like, to You Ice-cream
Peer 5.2	I: ya, ok thank you, right are you ready? Ok so (child), tell Patch what you know about Lámh. P5.1: book I: book, do you know a sign for book? I: well done, thank you, that's another one you can show Patch will you show him that one? P5.1: I had another one	Book Sorry

	I: another one? P5.1: sorry I: sorry, oh well done, great signing, I: you don't know, that's ok. Maybe it would be fun if you could talk about your birthday with some Lámh signs? Ya. Or would there be anything else, what games do you play in the yard? P5.1: tag	Catch, to

Appendix H. Recommendations for a school-based Lámh vocabulary: Fringe vocabulary items.

Lámh Sign	Commonality Score	Total Frequency	Lámh Sign	Commonality Score	Total Frequency
Love, to	4	4	Summer	2	5
Angry	3	4	Throw, to	2	5
Doctor	3	4	Tired	2	5
Have, to	3	4	Bucket	2	4
Holiday	3	4	Car	2	4
Hot	3	4	Crayon	2	4
Shop	3	4	Cup	2	4
Sick	3	4	Dirty	2	4
Clock	3	3	Full	2	4
Cry, to	3	3	Gentle	2	4
Egg	3	3	Here	2	4
Excuse me	3	3	Money	2	4
Hair	3	3	Nice	2	4
Horse	3	3	Pain/ Sore	2	4
Pig	3	3	Share, to	2	4
Sister	3	3	Shoe	2	4
Write, to	3	3	Banana	2	3
Picture	2	16	Bus	2	3
Yours	2	9	Chicken	2	3
Upset	2	7	Close, to	2	3
Get, to	2	6	Dry	2	3
Off	2	6	Garda	2	3
Cold	2	5	Garden	2	3
How many?	2	5	Kitchen	2	3
Hurt, to	2	5	Light	2	3
Later	2	5	Man	2	3
Quiet	2	5	Monday	2	3
See, to	2	5	Photograph	2	3
Sport	2	5	Pull, to	2	3

Lámh Sign	Commonality Score	Total Frequency
Tissue	2	3
Biscuit	2	2
Brother	2	2
Christmas	2	2
Clean	2	2
Count, to	2	2
Duck	2	2
Easter	2	2
Elephant	2	2
Family	2	2
Fish	2	2
Flower	2	2
Football	2	2
Frog	2	2
Hug, to	2	2
Hurling	2	2
Jumper	2	2
Lego	2	2
Night	2	2
Paint, to	2	2
Paper	2	2
Push, to	2	2
Scared	2	2
Slide	2	2
Snow	2	2
Sweet	2	2
Swim, to	2	2
Under	2	2
Water	2	2
Wet	2	2
Yoghurt	2	2

Lámh Sign	Commonality Score	Total Frequency
YouTube	2	2
Group/ Class	2	2
Pencil	1	5
Library	1	4
Ask, to	1	3
Brown	1	3
Empty	1	3
Two	1	3
Animal	1	2
Black	1	2
Film	1	2
Now	1	2
Rabbit	1	2
Rain	1	2
Room	1	2
Safe	1	2
Sandwich	1	2
Sky	1	2
Spoon	1	2
Three	1	2
Video	1	2
Welcome	1	2
Aeroplane	1	1
And	1	1
App	1	1
Bad	1	1
Bird	1	1
Bowling	1	1
Bread	1	1
Brush your teeth, to	1	1

Lámh Sign	Commonality Score	Total Frequency	Lámh Sign	Commonality Score	Total Frequency
Cake	1	1	Potato	1	1
Children	1	1	Pour, to	1	1
Chocolate	1	1	Rice	1	1
Cook, to	1	1	Road	1	1
Danger	1	1	Roll, to	1	1
Dig, to	1	1	Santa Claus	1	1
Dress	1	1	Scissors	1	1
Finger	1	1	She	1	1
Glasses	1	1	Sink	1	1
Grandmother	1	1	Snake	1	1
Grow, to	1	1	Superhero	1	1
He	1	1	Swimming	1	1
Hospital	1	1	pool		
Ice-cream	1	1	Tiger	1	1
iPad	1	1	Tomorrow	1	1
Juice	1	1	Town	1	1
Kick, to	1	1	Tractor	1	1
Lady	1	1	Train	1	1
Late	1	1	Trampoline	1	1
Lose, to	1	1	Tuesday	1	1
Monkey	1	1	Understand,	1	1
Mouse	1	1	to		
My/ Mine	1	1	Vegetable	1	1
New	1	1	Wednesday	1	1
One	1	1	Week	1	1
Phone	1	1	White	1	1
Pizza	1	1	Why?	1	1
Plate	1	1	Zoo	1	1