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The impact of using graphic representations of signs in teaching signs to hearing mothers of deaf children

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ABSTRACT

Hearing parents of deaf children who are reliant on Sign Language need to learn to sign to ensure communication mode-match with their children. Signing is vital for parent-child interaction, and has implications for the socio-emotional well-being and educational outcomes of the child. However, poor signing skills of parents is repeatedly reported in the literature, with the majority of children in signing educational programmes reported not to be exposed to signing in the home. Teaching parents to sign therefore appears a priority, with sign teaching strategies being debated in the literature. The learning of Sign Language as a second language by hearing parents of deaf children within the bilingual educational approach, which regards Sign Language as the first language of deaf children, raises the challenges of cross-modality language learning for hearing parents. Reports on teaching methods are mainly anecdotal with only a few studies addressing sign learning by hearing individuals.

While the use of graphic representations of signs is a common practice in teaching signs, there is no empirical data on their influence on the learning of signs. This study explored the contribution of graphic representations of signs in sign teaching. The main aim of the study was to describe the impact of sign illustrations on the teaching of signs to hearing mothers. Two sub-aims were formulated to compare the conditions of sign learning with and without the use of sign illustrations in graphic displays in terms of (a) sign reception and sign production, and (b) the amount and nature of assistance required in learning signs. An Adapted Alternating Treatments Design (AATD), with four theme-based sign sets, and probes balanced for equivalence, was developed and used. Four biological mothers of three boys and a girl in a Grade Three class at a day school for the deaf in an urban area of KwaZulu-Natal, South Africa took part in the study.

The results revealed no significant differences between the two training strategies for sign acquisition, in terms of sign reception and sign production post-training. There were however, significant differences between the two training strategies with regard to assistance required while learning signs. The graphics strategy required significantly less trainer assistance ($p<0.05$). In addition, there were significant differences in the nature of assistance provided with the use of graphic representations. Significantly fewer repeated demonstrations of signs were required by the participants during self practice ($p<0.01$).

There was a significantly higher number of corrections with the graphics strategy ($p<0.01$) initially, and this decreased over time, unlike with the signing-only strategy. It would appear that the sign illustrations were redundant during the initial stages of sign learning using a multimodal approach, but that they were relied on to trigger recall of signs during the self practice phase. Thus, the study confirmed the supportive role of sign illustrations in sign learning. The use of theme-based graphic displays of sign illustrations emerged as a viable method in teaching signs. The implications of these results and recommendations for future research are discussed.

Key terms

AATD, communication displays, deaf children, deaf education, graphic representation of signs, graphic symbols, hearing parents, multimodality, sign illustrations, Sign Language, sign teaching strategies, signing, South Africa, South African Sign Language, theme-based.

OPSOMMING

Horende ouers van dowe kinders wat deur middel van Gebaretaal kommunikeer, moet Gebaretaal aanleer ten einde dieselfde kommunikasie metodes as hulle kinders te hê. Gebaretaal is noodsaaklik vir ouer-kind interaksie en het implikasies vir die sosio-emosionele welstand en opvoedkundige uitkomste van die kind. Die literatuur verwys egter herhaaldelik na ouers se beperkte Gebaretaal vaardighede. Daar word genoem dat die meerderheid kinders in "Gebaretaal" opvoedkundige programme nie tuis aan Gebaretaal blootgestel word nie. Gebaretaal-onderrig vir horende ouers is dus 'n prioriteit, maar die strategieë wat in hierdie programme gebruik word, word in die literatuur gedebatteer. Die uitdaging is egter die kruis-modaliteit aanleer van Gebaretaal deur horende ouers binne 'n tweetalige opvoedkundige benadering, waar die Gebaretaal die tweede taal is. Verslae oor onderrigmetodes is meestal anekdoties, met slegs enkele studies wat uitgevoer is rakende die aanleer van gebare deur horende individue.

Alhoewel die gebruik van grafiese voorstellings van gebare (illustrasies van gebare) algemeen gebruik word om gebare aan te leer, is daar geen empiriese data oor die invloed daarvan op die aanleer van gebare beskikbaar nie. Hierdie studie het gevolglik die bydrae van grafiese voorstellings van gebare op die aanleer van gebare geëksploreer. Die hoofdoel van die studie was om die impak van illustrasies van gebare op die aanleer van gebare aan horende moeders te beskryf. Twee sub-doelstellings is geformuleer om twee metodes, naamlik met grafiese voorstellings en daarsonder, vir die aanleer van gebare, te vergelyk, in terme van (a) begrip en produksie van gebare, sowel as (b) die aantal en aard van ondersteuning benodig tydens die aanleer van gebare. 'n Aangepaste Alternatiewe Behandelings-ontwerp is gebruik, en vier tema-gebaseerde stelle en ekwivalent gebalanseerde stimuli is ontwikkel en gebruik. Die biologiese moeders van drie seuns en een dogter in 'n Graad 3 klas in 'n dagskool vir dowe kinders in 'n stedelike gebied van KwaZulu-Natal, Suid-Afrika, , het aan die studie deelgeneem.

Die resultate dui daarop dat daar geen beduidende verskille tussen die twee onderrigmetodes vir die aanleer van gebare in terme van begrip en produksie was na die opleiding nie. Daar was wel beduidende verskille tussen die metodes, met verwysing na die ondersteuning benodig tydens die aanleer van gebare. Die grafiese metode het beduidend minder ondersteuning ($p<0.05$) deur die navorser vereis. Daar was ook beduidende verskille in die

aard van ondersteuning wat met die gebruik van grafiese simbole vereis is. Die proefpersone het beduidend minder demonstrasies tydens individuele oefensessies ($p<0.01$) benodig. Die beduidend groter aantal korreksies met die grafiese metode ($p<0.01$) het in vergelyking met die slegs gebare metode, oor tyd verminder. Dit wil dus voorkom asof die illustrasies van die gebare oorbodig was gedurende die inisiële fase van die multimodale benadering. Daar is egter op hierdie illustrasies staatgemaak om tydens die oefen-fase die herroeping van gebare te fasiliteer. Die studie het dus die ondersteunende rol van grafiese simbole in die aanleer van Gebaretaal bevestig. Die gebruik van tema-gebaseerde grafiese voorstellings van gebare is dus 'n prakties uitvoerbare metode vir die aanleer van gebare. Die implikasies van hierdie resultate en aanbevelings vir verdere navorsing word bespreek.

Sleutelterme

Aangepaste Alternatiewe Behandelings-ontwerp, dowe kinders, gebaar illustrasies, gebare, Gebaretaal, grafiese voorstellings van gebare, grafiese simbole, horende ouers, multimodaliteit, onderwys vir Dowes, strategieë vir die aanleer van gebare, Suid Afrika, temagebaseerd.

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CHAPTER 1
PROBLEM STATEMENT AND RATIONALE

1.1 Introduction

This chapter provides a background to the study, describing the difficulty experienced by hearing parents of deaf children in learning to sign. The rationale for the sign teaching strategy explored in the study, that is the use of graphic representations of signs as an aid to sign learning, is discussed. An explanation of the terminology and the abbreviations used, and a brief overview of the chapters are also presented.

1.2 Background

Hearing parents of deaf children have the same needs as all parents to communicate with their child in order to fulfil their role as parents (Bouvet, 1990). However, parent-child interaction is seriously threatened when parents cannot communicate in their natural spoken language, and have to learn to communicate through a visual modality using Sign Language. More than 90% of deaf children are born to hearing parents who have had no prior experience with deafness and the use of signing (Bornstein, 1990). Parents must communicate (Bornstein, 1990, p.129). The importance of communication mode-match, early and consistently between deaf children and their hearing mothers in the light of promoting mental health - irrespective of communication modality - and success with the language acquisition of children, has been raised in the literature (Wallis, Musselman & Makay, 2004; Yoshinaga-Itano, 2000).

In South Africa, many parents are severely disadvantaged as they are unable to access Sign Language (Joseph, 1998; Cohen, 1996). This situation is highlighted by a study of 45 mothers of children attending signing schools in KwaZulu-Natal (KZN), South Africa (SA), which found that less than 5% of mothers had attended signing classes, and had poor signing skills, with 65% having a sign vocabulary of between 0-20 signs. These parents reported having to learn to sign from their children or by using a sign dictionary (Joseph, 1998). Cohen (1996) found impoverished signing at a school in Gauteng, SA, and attempted to develop a sign booklet to assist parents to learn to sign. This was because many of the parents, even after being in a signing programme for a year, had poor signing skills and experienced difficulties in attending classes, citing time-constraints as a hindrance.

Therefore, a lack of resources, support systems and policy to assist parents in learning South African Sign Language (SASL) is a challenge in SA (DEAFSA, 2006).

Although signing has been used in the education of the deaf since the 17th century, it is only modern education of the deaf in the 20th century that appears to have encouraged the practice of parents signing, with attempts to teach parents to sign (Moores, 1996). While successes have been reported in parents learning to sign, for example in Sweden, where a bilingual approach in education of the deaf is implemented (Mashie, 1995), literature repeatedly reveals poor signing skills of parents generally (Mindel & Vernon, 1987; Bess & Humes, 1995; Gregory, Bishop & Sheldon, 1995; Mashie, 1995; Lane, Hoffmeister & Bahan, 1996). It is suggested that more than half of the number of children in signing programmes may not be exposed to signing in the home (Bess & Humes, 1995). The lack of communication through signing, as well as impoverished oral language as a result of the hearing loss, has lead to descriptions of Deaf children as strangers in their own homes (Mindel & Vernon, 1978; Joseph & Alant, 2000). Parents' use of signing is said to be related to their attitude towards signing, their ability to sign, and access to learning to signing, all of which are inter-related (Bornstein, 1990).

While the need for parent training in signing is evident, studies on teaching strategies are virtually non-existent. The debates about the type of signing used in the education of the deaf, that is sign systems versus natural Sign Language, have further complicated the case for sign learning by parents. Further, the traditional methods of sign learning, such as signing classes offered at school, have been challenged (Swisher & Thompson, 1985; Lane et al., 1996). One of the criticisms is that this system does not prepare mothers with signing skills adequate for spontaneous and meaningful communication (Swisher & Thompson, 1985). These authors suggest that the difficulty experienced by parents in learning to sign has been underestimated, and recommend that alternative strategies be considered in assisting parents learn to sign. These include exposure to signing other than the traditional sign classes at school, increased practice with signers, and consideration of conceptual signing, that is, Key Word Signing (KWS) as opposed to Manual Codes of English (MCE) (Grove & Walker, 1990). In addition, the methods currently available seem to favour a small group with resources in terms of time and finances (Moores, 1996), especially within the early intervention approach. While group learning via Sign Language classes for hearing individuals has a place in learning Sign Language as a second language, this may not be a

format readily accessible or suitable to parents of newly diagnosed, and specifically late identified deaf children, as parents may have very specific language needs pertaining to communication with their child.

Sign Language is a visual-gestural language which occurs in three-dimensional space. Thus, although Sign Language is best learned through observation and from demonstrations by a signer, the need for support via graphic aids to assist with practice and self learning appears to be critical. Graphic aids, such as photographs and line drawings (sign illustrations), in learning to sign have long been used as supplements to signing classes, and continue to be popular (Flodin, 1994; Costello, 1995). The demand for signs in graphic format as an aid to sign teaching became evident in the 1970s and 1980s during the era of Total Communication (TC), when many "Sign Language" dictionaries and "Sign Language" story books for children were published for use with the pedagogical sign systems developed. Currently, there are many Sign Language dictionaries and manuals in print. However, the impact of these graphic representations as an aid to sign learning has not been researched.

The use of communication displays, using graphic representations of signs, has been widely practiced within the field of Augmentative and Alternative Communication (AAC) as an aided communication approach providing access to language and communication for individuals with little or no functional speech (Beukelman & Mirenda, 1998; Bornman, 2005). While there are many display options, the use of thematic displays include graphic symbols for all items needed for a particular scenario (Burkhart, 1993; Goossens', Crain & Elder, 1995). Communication partners have also been trained to use the displays through specific approaches, such as Aided Language Stimulation (ALS) (Goossens', 1994). The approach is one of pointing to key symbols while speaking. The parallel to KWS is evident.

Thus it appears that theme-based graphic communication displays could be used as a sign teaching strategy for hearing parents of Deaf children. The use of a graphic display, with sign illustrations of signs relevant to a specific context, and arranged for easy access and recall, could assist parents in learning to sign meaningfully, and with relevance to daily living. The vocabulary arrangement in this format could present a variety of syntactic structures that would facilitate interactive communication, instead of simply being an exercise in vocabulary acquisition. The communication display lends itself to the construction of spontaneous messages, while the theme-based format promotes quick access

to relevant vocabulary. In addition, signs presented on a graphic display offer visual permanence, and could allow the individual a measure of independence in the learning of signs by assisting with recall and practice of signs. Also, the print medium is believed to be a cost effective and accessible medium for the majority of South Africans.

This study therefore aims to place sign illustrations into a meaningful context and to determine their influence on sign learning. While the use of sign illustrations has a long history in sign teaching programmes, their contribution to sign learning has been mainly anecdotal. There is a lack of information on the actual contribution of sign illustrations in learning signs. Thus the study will investigate the influence of sign illustrations in the context of a graphic display as a sign teaching strategy for hearing parents of Deaf children.

1.3 Terminology

Chereme: The term refers to the sub-lexical structure of signs, with regard to grouping of sign parameters such as handshapes, locations and movements, similar to the concept of phonemes in spoken language (Fischer, 1982).

Deaf: The use of the uppercase "d" will be used to refer to persons who belong to a minority group were Sign Language is central to group functioning (Lane et al., 1996).

deaf: The use of the lower case "d" in the word deaf will be used to refer to the degree of hearing loss in the categories of severe (71-90 dB) and profound (91 dB or greater), based on the pure-tone average of the better ear unaided (Scheetz, 1993).

Gloss: The translation of a sign into the English word or words which represent the same concept (Costello, 1995).

Iconicity: Refers to the visual relationship between a symbol, either a sign or graphic symbol, and its referent. It relates to both transparency and translucency (Lloyd, Fuller & Arvidson, 1997).

Key Word Signing: The practice of signing only the main words and concepts in a sentence while speaking (Loeding, Zangari & Lloyd, 1990).

Manual communication: The generic term used to refer to any form of signing communication including Sign Language, fingerspelling, and the systems which use signs to represent English (Costello, 1995).

Sign: A unit of Sign Language which represents a concept. A sign is made with one or both hands formed in distinctive handshapes. The sign has a location, orientation, and movement that is unique to it (Costello, 1995). In this study, a sign will be denoted by a single word in uppercase (Rosenstock, 2008).

Signing: The term refers to the modality of signing and will be used to refer to both Sign Language and sign systems (Fischer, 1982).

Sign illustration: Refers to the graphic representation of the sign and will be denoted by the word in uppercase and italicized (von Tetzchner & Jensen, 1996).

Sign Language: Is a visual-gestural system of communication. It has no spoken correlate. It is the native language of Deaf people and was created by Deaf people for the purpose of communicating with each other (Costello, 1995).

Sign system: The term refers to manual codes developed for educational use. The syntax is that of the spoken language, with speech accompanying signs. It involves using the signs from a Sign Language to represent the spoken language (Kyle &Woll, 1988; Loncke & Bos, 1997).

Translucency: A type of iconicity which refers to the ability to recognize the physical relationship between the sign and the referent when the referent is known (Loncke & Bos, 1997).

Transparency: A type of iconicity which refers to the direct recognition of the sign and can be operationally defined as the "guessability" due to some physical resemblance of the referent, or some aspect of the referent (Loncke & Bos, 1997).

1.4 Abbreviations

AAC	-	Augmentative and Alternative communication
AATD	-	Adapted Alternating Treatments Design
ALS	-	Aided Language Stimulation
ASL	-	American Sign Language
DEAFSA	-	Deaf Federation of South Africa
KZN	-	KwaZulu-Natal
KWS	-	Key Word Signing
MCE	-	Manual Codes of English
SA	-	South Africa
SASL	-	South African Sign Language
USA	-	United States of America
SEE I	-	Seeing Essential English
SEE II	-	Signing Exact English
TC	-	Total Communication

1.5 Chapter Outlines

Chapter 1: The chapter introduces the study. Background information is presented in terms of providing a context for the study. In addition, terminology is explained and an outline of the chapters that will compose the research report is presented.

Chapter 2: This chapter will focus on the theoretical underpinnings of the study by exploring the literature related to strategies used to teach Sign Language, the issues facing parents of deaf children in learning to sign, and the use of graphics in sign learning.

Chapter 3: This chapter will present the methodology used in planning and executing the study. Issues of reliability and validity are discussed with regard to the various procedures conducted. The design and strategies used are presented and defended in terms of the literature.

Chapter 4: The results are presented and discussed in terms of the stated goals. Methods of analysis used and the data obtained in the study, with interpretation, are made available for scrutiny.

Chapter 5: This chapter addresses issues raised in the discussion, with conclusive comments on the study. The research implications arising from the outcomes are presented and recommendations are made with regard to future research in this area.

1.6 Summary

This chapter presented the rationale for the study by highlighting the difficulties experienced by parents of deaf children in learning to sign. The use of the graphic medium, with a format of sign representations in a graphic display, drawing from the field of AAC is suggested as a strategy to teach parents to sign. Finally, an outline of each of the chapters was given.

CHAPTER 2
THE TEACHING OF SIGNS

2.1 Introduction

Concern for the use of signing by hearing parents to communicate with their Deaf children has been repeatedly expressed in the literature (Bornstein, 1990; Gregory et al., 1995; Mitchell & Karchmer, 2005). The inadequacy of an oral language alone for communication with the Deaf child whose primary mode of communication is signing, clearly suggests the need for a visual-gestural form of communication to be learned by the family. This is particularly important for children committed to an educational methodology that uses a signing approach. A contributing factor is that although Sign Languages have been in existence for many centuries, they have been studied and accepted only relatively recently (Stokoe, 1971; Lane et. al., 1996; Moores, 1996). There is therefore a paucity of information in the literature with regard to teaching hearing parents of Deaf children to sign.

The unique characteristics of Sign Language require non-mainstream methods in teaching hearing individuals. These include taking cognisance of visual techniques and methods suited to learning a language in a visual modality (Thoutenhoofd, 2003), as well as the learning of Sign Language as a second language across modalities. The concept of learning language across modalities has been referred to as bilinguality (Von Tetzchner, Grove, Loncke, Barnett, Woll & Clibbens, 1996). Hearing individuals who are learning to sign need to observe signing in its natural medium of three-dimensional space and have the opportunity to practice in the context of observation rather than of listening. Whilst spoken languages are learned as second languages not only through interaction with speakers of the language, but also through support aids providing auditory input of the target language, Sign Languages rely on visual aids. The use of both sign videos and sign illustrations are commonly used as aids in the learning of signs. However, the impact of these measures in sign learning has not received attention in the literature.

This chapter therefore attempts to place the study in context by examining the issues involved in sign teaching with the use of a visual aid, viz. theme-based graphic displays of sign illustrations (graphic representations) to teach signs from SASL to mothers of sign-dependent deaf children. This investigation is seen as part of an overall strategy to assist parents of Deaf

children to access signing, while assessing the contribution of sign illustrations in teaching signs, which is the primary focus of the study.

2.2 Teaching of Sign Language to hearing individuals

The teaching of Sign Language has become a popular activity since it's recognition in the 1960s as a real language used by people who are Deaf, and the subsequent increased exposure of the public to Deaf signers. Flodin (1994, p.9) states that "each day the popularity of Sign Language becomes more evident". Signing has found its way into drama, singing presentations, movies, TV, and even water sports, such as scuba diving, and a more recent trend of teaching signs to typically developing hearing babies to facilitate their expressive language through manual communication and thereby decrease frustration (Goodman, Acredolo & Brown, 2000). There is therefore a proliferation of signing courses. Courses may be offered at various levels in keeping with the needs of the signer and the motivation for such a course.

Colleges and universities that offer course credits in Sign Language approach sign teaching from the perspective of linguistic study, as part of an academic qualification. An example would be the curriculum developed by the Deaf Federation of South Africa (DEAFSA, 1997) for teaching SASL at Levels I, II, and III. This course is designed for teachers of the deaf and for the training of SASL interpreters. While the course meets the needs of teachers of the deaf, it is considered a starting level for interpreter training. The course is said to be designed for beginning signers who wish to progress to a proficient level, and does not preclude parents of deaf children or other interested hearing people who may want to progress through the levels and become interpreters.

In addition to the above courses, more basic courses are available to the community at large, for example a basic 10 week course offered by the KZN Sign Language Academy to those who may also want to learn SASL as a "hobby". This agency is also involved in the teaching of SASL to teachers at schools for the deaf in KZN. The content of courses varies depending on the level of the course and the needs of learners such that content is taught within categories, with vocabulary generally suited for the context. For example, the *Preliminary Course (Medical Field and Basic),* a ten week course offered by the KZN Sign Language Academy to undergraduate students in the disciplines of Speech-Language Pathology and

Audiology at the University of KwaZulu-Natal, includes the following topics: 1) introductions/family and one-hand fingerspelling; 2) home, place, colours; 3) work, animals, 4) numbers, time, calendar; 5) food, drink; 6) showing emotions; 7) medical terminology; 8) medical scenarios; 9) Deaf community/Deaf culture; and 10) a final test (written), assessing: a) the ability to fingerspell words, b) answer simple questions based on vocabulary learned, and c) understanding of a signed presentation. The model developed by Kyle and Woll (1985) and used in the United Kingdom applies in terms of methods, viz. Deaf people as tutors, using a direct approach to language learning. It is believed that teachers of Sign Language should be fluent in the language and have something very close to native competence as knowledge of the language is not enough, and a person must know how to teach, having credentials over and above fluency in the language (Hoemann, 1978; DEAFSA, 2006). Sign Language is said to be a modern language, requiring the teacher to be as qualified as other teachers of modern languages (Hoemann, 1978).

Costello (1995) with regard to learning Sign Language states "Sign language is not so very difficult to learn; in fact a student can probably express simple thoughts after only a few lessons. However, total proficiency in American Sign Language as used by native signers will probably take years and years of study and practice" (p. xiv). She also states that Deaf people are usually pleased with a hearing person's attempts at sign communication, and are patient and willing to assist.

2.2.1 The needs of adult learners of Sign Language

Hearing persons learning Sign Language usually do so within the context of second language learning as adults. Von Tetzchner et al. (1996) in their discussion of bilinguality refer to cognitive aspects that include cognitive organisation and stages of learning that affect the competence of an individual learning language across different modalities. Babbini (1974) specifically spells out the needs of adult learners that teachers of Sign Language need to be aware. These include the need to: 1) be interested, stimulated, and motivated; 2) feel respected and responsible and regarded as equals by instructor; 3) feel confident in the instructor to achieve mastery; 4) participate actively in classroom learning, learning by themselves and with assistance; 5) feel the instructor is interested in them personally; 6) feel they are progressing steadily; 7) excel, be noticed and praised for outstanding work, receiving constructive criticism; 8) be encouraged and develop faith in their own ability to master the

subject matter; 9) feel a sense of accomplishment in mastering a new skill, and 10) know their skill can be put to practical use. Babbini further states that adults have a need to know "why" and instructors must be prepared to answer questions regarding deafness, the Deaf community, and signing. Further, the tutor is advised to answer each question as honestly and completely as possible, with referral to books, articles and journals for more information. Kaufman (2003) also mentions assumptions in the field of andragogy which include consideration that adults value learning that integrates into the demands of everyday life, learning that is immediate and problem centred, and are driven by internal motivation.

2.2.2 Second language teaching approaches

A number of second language teaching approaches that are used for spoken languages and which could have relevance to Sign Language were reviewed by Hoemann (1978). These included: 1) the grammar-translation method, which was taught by recitation, dictionary usage, parts of speech, and memorization of declensions and grammar rules. This method is summarily described as a failure; 2) the direct method, which bans the first language from the classroom and puts students in meaningful situations in which the second language could be used and practiced; 3) the audio-lingual method, in which the emphasis was removed from learning about the language, to "establish as habits the patterns" of the language rather than individual sentences, by means of drill; 4) the cognitive code method, based on the generative-transformational assumption that language learning and use required knowledge of the underlying phonological, morphological, and syntactic rules of language; and 5) the semiotic method which considers language to be another form of cultural behaviour, and which emphasises the social activity and context that surround and affect language use. The direct method is currently favoured in the teaching of Sign Language (Kyle & Woll, 1985). Stokoe (1971) suggests a semiotic approach be adopted with Sign Language.

Glass (1997), in describing second language acquisition, proposes five stages that account for the conversion of input to output: 1) apperceived input, 2) comprehended input, 3) intake, 4) integration, and 5) output. Strategies include attention, storage, pattern-matching and general problem-solving. According to Glass (1997), inherent in the term *acquisition* is a degree of ambiguity. On the one hand, acquisition can be viewed as an end point. Varying criteria have been used in second language acquisition research for this purpose, e.g. percentage accurate and first occurrence. On the other hand, acquisition can be viewed as a process beginning

with input apperception and culminating with integration of new linguistic information into an existing system. Output then becomes the manifestation of newly integrated or acquired knowledge, reflecting a dynamic view of the process of acquisition.

In addition to the above considerations, Hoemann (1978) highlights the principles of teaching Sign Language, in this case American Sign Language (ASL), which should include: 1) a period of readiness and preparation for learning the language, 2) development in receptive skills before expressive skills, 3) fingerspelling be taught relatively late in the course, 4) a Deaf informant be included in every course, 5) students be exposed to as wide a variety of signers as possible, and 6) care be exercised in the selection of materials for a course in Sign Language.

The above practices and principles appear in many programmes offering Sign Language courses. While these principles and approach to teaching a Sign Language has undoubted application to parents learning to sign, the available literature presents a very different scenario to the teaching of Sign Language to parents of deaf signing children generally. Broder-Johson (2001) refers to the need to accommodate parents of deaf children as adult learners, but with regard to intervention within a family-centred approach. For implementation of this approach, the clinician has to keep in mind the life circumstances of the parents, their social roles, responsibilities, experience, and learning related to transitions in the adult life cycle within the framework of transformational learning. The approach embraces the practice in which parents move from being receivers of information towards a partnership with professionals who collaborate with and support them (Mahoney & Beela, 1998, Turnbull & Turnbull, 2002, cited in Broder-Johnson, 2001). Families are therefore included in programme planning and provision with respect for their level of participation. In addition they receive help to prioritise needs and to recognize and use their strengths and resources. The literature in adult learning favours a holistic perspective on parents' life situations (Broder-Johnson, 2001).

2.2.3 Teaching parents to sign

Meiers (1961, cited in Moores, 1996) proposed that mothers be trained to use the manual alphabet with children as young as 18 months. Dactylology, that is fingerspelling accompanying speech, was used as a method of manual communication early in education of

the deaf, traceable to the 16th and 17th centuries (Padden & Gunsauls, 2003). In the 1970s, with the era of Total Communication (TC) came the introduction of MCE and the teaching of signs accompanying speech to teachers, parents of deaf children, and the general public. In 1979, two thirds of all classes for the deaf in the USA were using some form of manual communication; in 1978, the pedagogical system, Signing Exact English (SEE II) was reported to be the most frequently used text; and by 1985, the majority of programmes using signs, sought teachers skilled in a generic TC approach (Moores, 1996).

However, little is known about the curricula used to teach parents to sign. It appears that group signing methods, individual tutoring in parent guidance programmes and the various materials, "dictionaries" and resources such as posters and story books were used. Moores (1996), comments on the system whereby many programmes, established in the 1960s, adopted the concept of mother as teacher. The programme required the mother to come to school or clinic several times a week for training with her child with a Speech-Language Therapist or a teacher of the deaf, with training involving interacting with the child in a home-like setting. He argues that this approach favoured the situation where the mother stayed at home and transportation to and from the facility was available. "It was never viable for poor families that lacked access to transportation. With the increase in single-parent families, and families in which both parents work, the model becomes less feasible" (Moores, 1996, p. 134). Christensen (1986) also raised the issue of cultural and language barriers that prevented parents from accessing the sign system used by their children within the school system. Swisher and Thompson (1985) also refer to the challenges faced by parents in learning sign systems, highlighting the inadequacies of the methods used to teach signing during this time, stating that most often, when the child is young, the mother's source of sign vocabulary is a single sign teacher and a sign book, with occasional group interaction. The amount of teaching time was usually limited to one or two hours a week and, "Against this meagre input, stands the rest of the mother's life and challenges" (Swisher & Thompson, 1985, p.214).

The current bilingual approach, issued into education of the deaf in the 1990s (Moores, 1996), advocates that parents of deaf children learn Sign Language, by attending Sign Language courses offered by Deaf Sign Language instructors, by interacting socially with Deaf adults and Deaf children, and when the child is young, having Deaf adults and professionals visit the home for the purpose of teaching parents Sign Language through

interaction with the young child (Lane et al., 1996; DEAFSA, 2005). This practice is adopted in Sweden within a bilingual framework, and is reported to be successful for parents acquiring Sign Language (Mashie, 1995). In the United States, intensive ASL-oriented, total immersion programmes based on the concept of "family learning vacations" in which hearing parents gain exposure with respect to linguistic, cultural, and social aspects of the Deaf community have been proposed (Moores, 1991).

Thus, the type of signing taught to parents has become a contentious issue as a result of the challenges posed by learning speech-based systems such as MCE, or non-speech based natural Sign Language. Moores (1996) summarizes these arguments by describing the opponents of sign systems being concerned that parents cannot master MCE and therefore do not provide a complete model of English which is necessary. This is countered by the defence that parents learn sign systems easier than they do Sign Language which is a totally different language. The opponents of ASL, on the other hand, argue that hearing parents cannot learn a new language quickly enough to facilitate language development in their child, while the proponents of ASL counter that ASL, being a natural language, is more easily learned than an artificial system. Moores (1996) states that most professionals, including himself take an intermediate position, pointing out that there is strong evidence that ASL and MCE can be complementary aspects in the lives of deaf individuals, although he personally believes that ASL is "more powerful and efficient"(p.193). The apparent question is how to bridge the gap between Sign Language and spoken language or the purpose of communication.

Other authors have also commented on this dilemma. Gustason (1990), as a developer of the SEE II system, explains that the developers are Deaf signers themselves and are not ignorant of ASL or opposed it, but rather have followed the principles of ASL in inventing signs as more knowledge had become available through research. These authors hold the view that the native language of the child is any language to which the child is exposed in the home and school during the early language learning years. For many children in the USA this is English. SEE II therefore, gives the parents the means to expose the child to their own native language in a modality that can be taken in. By the same token, Sign Language may also be learned in the home from Deaf parents who use Sign Language. Development of skill in any language is said to be dependent on the degree of exposure and opportunity to practice it in everyday meaningful situations. Stewart (1990, cited in Moores, 1996, p.207), a psychologist

and board member of the National Association for the Deaf in the USA, with regard to the practice of Simcom, states " let us open our arms to any and all forms of communication". Stokoe (1971), in addressing the issue from a sociolinguistic perspective, points to variation among all languages, especially within the bilingual context. He defines bilingualism as the use of two or more languages with possibly different degrees of proficiency in different situations. Stokoe appears to take a common sense approach in stating that the Deaf are not opposed to the use of spoken language. He adds that many of the debates regarding educational methodology appear to serve the interest of some professions and do not acknowledge the socio-linguistic realities facing the Deaf individual.

It therefore appears that hearing parents of deaf signing children are in a unique situation when consideration is given to how they should be taught to sign. This dilemma does not arise with Deaf signing parents who have acquired Sign Language naturally in their homes from Deaf parents (intergenerational) or through association with the Deaf community at school or socially. For hearing parents who have to learn a visual-gestural language in a modality totally different to what they use naturally and daily, special procedures need to be considered. Storbeck (2000) concedes that the issue of modality in sign bilingualism requires special consideration. This would include the use of visual media which has been widely used in teaching hearing individuals, including parents of deaf children, to sign.

2.3 The role of graphic representation in teaching signs

During the era of TC the field serving children with severe communication disorders, viz. AAC, drew from the pedagogical systems in the education of the deaf to teach manual communication in the form of KWS to hearing children with little or no functional speech. The signs from Sign Language were used in the word order of spoken language grammar, with only the main words in the sentence being signed (Karlan, 1990). Within the field of AAC, a multi-modal approach using graphic symbol systems together with manual signs was introduced in intervention with children with cognitive and physical impairment, to teach language and communication. The graphic representation of signs was not used to teach signs per se. In addition, systems were developed specifically to combine graphic symbols with signs to produce sign-linked symbols. These symbols have elements of sign illustrations e.g. Sigsymbols (Cregan & Lloyd, 1990; Cregan, 1993). Bornstein (1990) noted that many of

the issues on the use of manual communication have been researched within the field of AAC, more so than in the field of education of the deaf.

Graphic symbols allow for a representation of a referent in concrete form, linked during training in a multimodal format. The symbol thus triggers recall of the linguistic item for the purpose of communication for both the user of the system and the communication partner. Thus graphic symbols are believed to promote learning (Cregan, 1993; Sevcik, Romski & Wilkinson, 1991; Cregan & Lloyd, 1990). Cregan & Lloyd (1990), with reference to Sigsymbols, state that the availability of the graphic symbol, and the speech accompanying the sign, present multimodal input that facilitates comprehension, learning and memory. Further, language learning is facilitated as signs are more representative than pictures for certain lexical items, for example verbs (Burkhart, 1993). The symbols provide a kind of concreteness since they relate to the real world and thus cue to meaning (Cregan & Lloyd, 1990). The authors of Sigsymbols, however, point out that in order to ensure simplicity and clarity, and decrease visual overload, the symbols are memory aids and not complete sign representations. The Makaton Vocabulary (Walker, 1987), which is considered a combined symbol system (Beukelman & Mirenda, 1998), is a system of teaching language and communication through combining speech, signs and graphic representations, using a key word approach. For the 7000 concepts in the programme, all signs taught have line-drawings (sign illustrations) which are used for learning and maintaining of learned signs, while the graphic representations (symbols) are used for those needing a graphic system of communication. The system is widely used in the United Kingdom with persons with disabilities.

Within the field of deafness, sign illustrations are used to teach signs. There is, however, a lack of theory and research with regard to the development and use of sign illustrations for the purpose of both communication and of teaching signs. This is part of a general lack of studies in the area of sign teaching, with most reports being anecdotal. This has influenced understanding and methodologies in teaching hearing individuals to sign. Table 2.1 presents a summary of the studies related to sign teaching with hearing persons, which are very few, and not all directly related to teaching methodologies or parents of children with hearing loss. There are however links to support aids in sign teaching, including graphics in some studies.

Table 2.1 Studies on teaching of signs to hearing individuals

Authors & year	Goals of research	Outcomes and recommendations
Swisher & Thompson (1985)	To assess for completeness of signing ability in six mothers who were signing for an average of three years, having taken three signing courses.	The training was believed to be inadequate. Recommendations were made for intensive programmes to be developed that were geared to specifically help mothers learn to sign with young deaf children.
Christensen (1986)	To teach signing to monolingual Spanish parents of deaf children though a 2 year televised trilingual class (Spanish, English and Sign Language). Fifty eight families took part in a 30 minute programme, repeated twice per week.	Positive outcomes were achieved through parents' reports of achievement of conceptual sign communication. There was also positive attitudinal change observed.
Loeding, et al. (1990).	In-service training to teach signing to staff in a school for children with disabilities. Four half day workshops using a KWS approach was used to teach 25- 30 participants in three small groups of seven to nine.	This working party approach for group training was positive. The programme in terms of selection of vocabulary and signs, the development of materials, the format, and activities in group training provide a framework for sign teaching to hearing individuals.
Spragale & Micucci (1990)	Training of direct care staff in an adult home-setting to facilitate signing in a natural context. Staff provided the vocabulary, learning two signs per week. The Speech-Language Therapist taught the signs, with the use of sign pictures as a reminder. A reward system of tokens was used.	Sign achievement reached a plateau after the first 30- 40 signs; most functional signs were learned.
Cregan (1993)	To determine if signing might come to serve as a bridge between a graphic cue and independent speech in an adolescent with severe mental retardation. System taught by symbol to referent, and match to sample activities, practiced sign-labelling the Sigsymbol, and signing with sign-linked symbols.	Graphic symbols from the Sigsymbols system helped to elicit multiword utterances. Dual instruction in manual signing and a graphic system, such as Sigsymbols offered options for expression.
Iacono & Duncan (1995)	To compare the use of sign alone and sign in combination with an electronic device in early language intervention. An Alternating Treatments Design, using one subject control of scripted play approach used.	The combined use of signs and the electronic device was more effective than sign alone in eliciting single word productions.

Table 2.1 Studies on teaching of signs to hearing individuals (Cont.)

Authors & year	Goals of research	Outcomes and recommendations
Cohen (1996)	South African study to develop a printed aid to assist 15 parents of young deaf children to learn some basic Sign Language. Vocabulary to be included in a booklet was sought and used to determine the most successful mode presentation (photos/ line drawings, descriptions or combination)	Previous exposure to sign learning was not an advantage. Parents had difficulty attending sessions, influenced by diversity factors (race, language, educational) – There was a problem of attrition. Visuals with description were more effective than visuals alone when signing from a booklet and the visual mode was significantly better than a description only. These were significant difference between photos only and drawings only. It was recommended that a combination of different modalities such as auditory, sign, and videos should be considered. There was a need to develop booklets to support sign learning.
Fourie (1997)	A South African study to determine the efficiency of a hearing person learning SASL vocabulary from media versus a teacher. A single subject time-series, control versus multiple treatments design was used to compare learning signs (80) from a Deaf teacher using written words versus 3 types of media: SL booklet, SL video and CD-ROM.	Vocabulary improved with all four methods. More signs were learned everyday, irrespective of the method. However, signs were learned most efficiently from the teacher, then the video, the CD-ROM, and then the written descriptions of signs. The clarity of photographs was a problem.

2.3.1 Graphic representation of signs in sign teaching with the deaf

Stokoe, in 1960, was the first to use symbol notations to denote signs in graphic modality (Wilbur, 1979). This method was adopted with some adaptation in one of the first pedagogical sign systems, Seeing Essential English (SEE I) by David Anthony in 1971 (Gustason, 1990). The method was however found to be inaccessible to potential learners attending signing classes. The disagreement over the most accessible way to represent signs for the purpose of sign learning was so severe that there was a split in the team, resulting in a breakaway group who went on to develop the SEE II system which used pictures of sign production in the form of line drawings accompanied by written descriptions (Gustason, 1990). The objective was to have a permanent record of the visual-gestural elements of the signs, primarily for the purpose of teaching signs. Thus, the practical aspect of learning to sign dictated the format of recording signs on paper.

Sign illustrations attempt to capture elements involved in the production of a sign in print. As signing occurs in three-dimensional space, characterized by both manual and non-manual features, attempts to capture signs for the graphic media have posed a challenge. The difficulty depicting signs in two-dimensional print medium for sign learning is referred to in the literature. Early views on the sign illustrations can be seen in the comments by Babbini (1974) on available resources. Examples of this include comment on the illustrations in the *Signs for instructional purposes* by Bornstein, Hamilton, and Kannapell in 1969, where it is stated that illustrations are clear so those familiar with signing should be able to reproduce the signs without further help. Further, the "reading" of illustrated signs and reproducing them accurately becomes more difficult when there is no body orientation to rely on. While eliminating the body outline makes illustrations "crisp and uncluttered (there is no noise)", it also eliminates the background locus that is the basis of the location elements in signing (Babbini, 1974, p. 341). The use of red arrows to capture the movement aspect is described as facilitative.

More recently, Costello (1995) refers to the fact that sign selection for her sign learning guide was influenced by its graphic representation when there was more than one regional sign to choose from. Sign illustrations generally do not stand alone. Costello (1995) presents each sign illustration in terms of four aspects: 1) the sign illustration, 2) English gloss, 3) instructions for forming the sign, and 4) a hint or memory aid which frequently provides information on iconicity. Each part is intended to make the sign as clear as possible and help the learner produce and recall the sign. It must be borne in mind that illustrations represent a snapshot of sign formation at some point in the execution. Many illustrations show the position where the hand begins making the sign and the position where it ends, others only the beginning. In either case, arrows are used to present the action more fully and the direction in which the hands move. Movement is depicted by the use of multiple images along with possible arrows to describe the sign formation and movements as accurately as possible. To keep the drawing uncluttered, numbers or letters, e.g. "1" and "2" indicate sequencing in a compound sign. These devices are used to show order in a changing handshape or movement in the sign. Illustrations show the front view of the signer and need to be reversed from the way a person reading them would perform them. For clarity some signs, are drawn from an angle. Illustrations usually show a right-handed signer, and descriptions written for right hand dominant persons. Left handed signers need to reverse the signs.

With regard to the print media in South Africa, there have been two major resource developments sponsored by government structures. The first is the book *Talking to the Deaf. Praat met die Dowes. A visual manual of standardized signs for the Deaf in South Africa* by Nieder- Heitman (1980). The book is a compilation of 1500 signs, said to be drawn from the South African Deaf community. The format and style appear to be largely influenced by contemporary literature at the time, and incorporation of Sign Language research available. Sign entries are photographs of the models, both male and female, from different ethnic backgrounds; with arrows to reflect the movement aspect in either white or black for contrast, the English and Afrikaans gloss, and for some signs, a written description is given, e.g. *GIRL* - "Draw F-H down own side several times", *BRIDE* – "indicate veil down back". The descriptions appear to be a kind of explanation, either as a memory aid or for describing how the sign is formed, or with an example sentence e.g. "*WHAT* you say is true". But this is not in a consistent format. The signs are arranged in categories.

The above book has been supplemented by an illustrated version called *Talking to the Deaf*, available, it is believed, since the late 1980s. No documentation regarding the origins of the book is available. According to the principal of Sezwile School for the Deaf, where the book was printed, the illustrations were done by Brother Augustus Sanders, from Sezwile School for the Deaf, who has since retired to Belgium (Mr Walker, personal communication, September 19, 2005). This illustrated version is used and referred to in local Sign Language courses, viz. Worcester Institute for the Deaf who also offer a course to undergraduate students in Speech-Language Pathology at Stellenbosch University. Monique Sutcliff, a Sign Language instructor at KZN Sign Language Academy, states that the illustrations are suitable for learning signs at the basic level (Ms M Sutcliff, September 22, 2005, personal communication). The book is also recommended as a resource by the KwaZulu-Natal Deaf Association according to the resident social worker, as people enquiring about resources to learn SASL are referred to this illustrated version of *Talking to the Deaf* (Ms I Rambally, personal communication, September 12, 2005). It appears the book is also being used as a resource by Deaf signers involved in teaching SASL. The illustrations are simple line drawings, including the torso and aspects of facial expression as in the original version. Signs are however, accompanied only by the English gloss, while the arrows use the same conventions as in the original text. Thus the drawings are close approximations of the originals. There are no descriptions accompanying the drawings. They are difficult to follow unless one has been taught the system of interpreting arrows and has had the signs

demonstrated. The illustrations seem to serve the purpose of aiding recall, similar to Sigsymbols (Cregan & Lloyd, 1993) and Makaton (Grove & Walker, 1990), as well as manuals used to teach signing with sign illustrations presented in phrases and sentences (Fant, 1983; Vold, Kinsella-Meier & Hughes Hilley, 1990). It appears the illustrations cannot be used independently in learning to sign. This book is also widely used in the field of AAC in the region of KZN.

The other publication, The *Dictionary of Southern Africans Signs* (Penn, 1992), a compilation of 3000 signs, was commissioned by the Human Sciences Research Council and the South African National Council for the Deaf (now DEAFSA) in the late 1980s to document a standardized SASL (Aarons & Akach, 2002). The dictionary notes the many variations of SASL. The sign representations are in the form of photographs. The quality of the photographs has been an issue because of a lack of clarity on items, noted by both the author and others (Cohen, 1996; Fourie, 1997).

Thus consideration has to be given to the graphic representation of the sign used as a support to sign learning. Loeding et al. (1990), in teaching signs to hearing staff at a special school, selected sign illustrations on the basis of clarity of handshape, clarity of movement, and contact. These sign illustrations were used as a cue during sign teaching, and were given to the staff as a resource to keep on completing the training. Fuller et al., (1997) note that graphic symbols, which could be extended to sign illustrations, should consider the characteristics of iconicity, complexity, perceptual distinctiveness, size, level of abstraction, and degree of ambiguity.

2.3.2 Arrangement of sign illustrations for contextual teaching

The arrangement of sign illustrations for learning has received some attention (Flodin, 1994; Costello, 1995). While Sign Language dictionaries present signs in alphabetical order, manuals organize signs in semantic or syntactic categories. According to Costello (1995), signs are grouped by topics for two reasons: 1) topics comprise a manageable number of signs that might easily be learned by a student in one sitting, and 2) signs in a category often share certain aspects of forming them that will assist in remembering them. However, it is noted that if the book is to be used as a dictionary or resource manual, the index is indispensable in that it provides an alphabetic listing of English glosses for quick and easy

access to any sign in the book. Flodin (1994) points out that the chapters in his book are arranged in the order they would be taught in a classroom setting, although there is no particular order that must be followed in learning Sign Language. He further recommends that the manual alphabet be learned first as it expands the ability to communicate with others. However, skipping from chapter to chapter, picking out signs which one wishes to learn first is also acceptable.

Some earlier compilations of signs have been arranged in the categories of handshapes, for example the book, *Say it with Hands* by Fant in 1964; while some manuals and guides teaching signing have been presented in phrases and sentences rather than as individual lexical items. An example is the phrase book to learn ASL by Fant (1983). Here, a series of signs are presented in ASL grammar. An English translation accompanies the string of illustrations depicting the sign construction. Costello (1995), in her signing manual, begins by introducing 60 phrases, most being depicted by only one sign. Vold et al. (1990) produced a manual using a sentence format with signs from ASL using KWS, with the full English translation below the signed sentence. The format is said to be in keeping with the fluid and co-articulated nature of signing with signs in context. The material relates to actual diagnostic and rehabilitative sessions most frequently used, and useful to clinicians in the professions of Speech Language Pathology and Audiology. The resource is said to have been developed out of a frustration with the lack of resources in the field with regard to undergraduate training (Vold et al, 1990). It includes a glossary of signs that can be used to create original sentences. Users of the text are strongly urged to attend Sign Language classes and are advised that as signing improves, to move away from the format to using the glossary to form original sentences. Practical considerations include an "easy-to-use flip card format" that leaves the hands free to sign the sentences. During the era of TC there was extensive use of sign illustrations in teaching material for children with the development of story books and posters. Signs from MCE accompanied the script (Bornstein et al., 1990). Niemann et al. (2004), use sign illustrations arranged vertically in a block with KWS, when advising parents on how to combine signs for meaningful communication. It is therefore evident that various formats have been used to depict and present sign illustrations for the purposes of sign teaching.

With regard to teaching language and communication across modalities to hearing individuals, the Makaton Vocabulary is arranged in nine stages with more functional

vocabulary for communication taught earlier, and in what is considered manageable amounts (Grove &Walker, 1990). Fuller et al. (1997) refer to display options with regard to using graphic symbols in the field of AAC. They state that choosing how to display graphic symbols is one of the challenges faced in the field. Organisational strategies (Fuller et al., 1997) include: 1) frequency of use of a symbol which determines its placement in a most strategic position - influenced by logic in terms of visual, perceptual and motor needs. Frequently used symbols are typically placed in the upper left corner of displays arranged in rows and columns for quick access; 2) taxonomic/categorical arrangement: symbols belonging to the same categories are grouped in a similar area on the display. Many communication books and boards are arranged categorically. However this does not facilitate expression of relational concepts or support syntactical use; 3) Syntactic arrangements: displays often have a noun + verb + object organisation (e.g. Fitzgerald key). This method is also referred to as syntactic-semantic. It is said to expose users to the logic of generative language and afford communication partners rich modelling opportunities; 4) Schematic/ topic arrangement: displays symbols for all items needed for a particular activity e.g. snack-time at school. This arrangement is often referred to as a topic board arrangement (Burkhart, 1993; Goossens', Crain and Elder, 1994). Topic boards are not highly supportive of syntactical structures, but offer representation which may facilitate recall; 5) influence of partners: displays are sometimes organised to accommodate the needs of partners. Communication displays using the technique of ALS are said to have application in acquisition of a second language, where the picture cues serve as a bridge to understanding the new language as the technique lends itself to interaction through scripts and is more than a command board (Goossens' et al. 1994). Cregan and Lloyd (1990) linked Sigsymbols to construct phrases and sentences by joining the sigsymbol boxes in a line using key words only. A written script accompanies the graphics to provide an English translation as needed. More recently, Nigam, Schlosser and Lloyd (2006) described the matrix procedure in combining graphic symbols of linguistic elements in systematic combination matrices to induce generalized rule-like behaviour in children with cognitive disabilities.

While the above does not have a direct reference to the teaching of signs, the use of sign illustrations for training purposes may, it seems, be arranged in various ways to facilitate use and learning. Related to this is the issue of syntax when signs are combined, i.e. signing in spoken language or Sign Language word order. Recent texts seem to take a flexible approach. For example; Flodin (1994) who states with regard to the signs in his book, that

one can use either, the decision rests with the signer as to which method to use. He goes on to suggest that the Deaf people with whom the individual associates, or the instructor, will exert an influence. Moores' (1996) definition of Total Communication reflects an expansion of this view in that he states there is now a trend towards code switching, that is, alternating between MCE and ASL. This concept is in keeping with a bilingual framework.

Pidgin Sign English, resulting from the contact of spoken language and Sign Language is widely observed in the communication between hearing and Deaf signers. This communication involves elements of both languages – and is highly variable. Deaf signers are said to adjust their signing in the direction of signing in English word order to accommodate hearing individuals attempting to communicate with them. Akamatsu, Stewart and Mayer (2002) refer to this contact-signing as a legitimate sociolinguistic phenomenon, having a biologic and motivational function, and possibly a synergy in the way signing and speaking aid in the comprehension of simultaneous communication messages. KWS is an example of such a scenario. However, should speech accompany signs, an even flow of speed between vocal and manual languages must be maintained (Costello, 1995).

Even though sign illustrations are used for the recording of signs in a dictionary as well as to learn signs, their use as a training strategy has not been scrutinized in the literature. Focus has rather been on sign production, with the assumption that access to a sign illustration would be beneficial once the sign has been demonstrated or explained.

2.4 Sign characteristics influencing learning

Both linguistic aspects and the manual characteristics of signs have been considered in sign learning. The characteristics of signs related to manual production are considered to influence sign learning, especially in the initial stages of learning (Beukelman & Mirenda, 1998). It has been suggested that signs, especially in an initial lexicon, be sequentially arranged to increase ease of, and success in learning (Doherty, 1985). Loeding et al. (1990) in teaching hearing adults to sign (Table 2.1), loaded the first and second training sessions with a large percentage of signs that could be easily learned. Signs that were highly translucent, one-handed or symmetrical, visible and involved contacting another part of the signer's body featured prominently in the first and second sessions of the four scheduled sessions of the training programme to teach 122 signs selected for linguistic relevance.

2.4.1 Sign parameters

Signs serve the function of words in spoken languages. There are four parameters that make up signs in Sign Language. They are the handshape, the location, the movement and the orientation of the hands (Wilbur, 1979; Loncke & Bos, 1997). An alteration or omission of any one of the four aspects may cause the sign to become a completely different sign (Costello, 1995). At least two parameters are involved in the production of a sign (Hoffmeister, 1990). There are limits to the number of locations, movements and handshapes that can be incorporated into a single sign, and there are rules that govern which of the hands may assume which configurations (Hoffmeister, 1990; Stokoe, 1971). These four aspects are said to comprise the manual characteristics of the sign.

2.4.1.1 Handshape

Signs may have more than one hand configuration or may change from one to another hand configuration during the execution of a sign. There are only a few handshapes that are relevant to a particular Sign Language, and only a small subset of locations are actually used, and some with movement (Stokoe, 1971; Kyle & Woll, 1988). With regard to signing in South Africa, Penn (1992) states that many different handshapes have been observed and classified according to the fingerspelling convention. It is stated that many of the handshapes are equivalent to the signs used in the one-handed fingerspelling alphabet as used in America, with others having their origin in Irish or British fingerspelling systems historically used in South African schools for the deaf.

For two-handed signs, the signs may not be symmetrical. When one hand assumes the dominant role, the non-dominant hand assumes only a limited number of hand configurations. These include the A, C, 5, O, G, and B handshapes. According to Battison et al. (Bornstein, 1990), these non-dominant handshapes are found in all Sign Languages studied so far, and are the earliest handshapes acquired by Deaf children (Doherty, 1985). The influence of handshape on learning of signs has been considered in teaching signs to hearing individuals, both with and without disability. Loeding et al. (1990) were influenced by handshape in their sequencing of signs for their sign teaching workshops in terms of level of difficulty of signs as “easy, medium and hard”. The classification was based on the work of Doherty (1985) and the 1973 work of Boyes Braem (1994) on stages of handshape acquisition. Stage I signs

include handshapes: A, S, L, baby O, 5, C & G; Stage II: B, F & O; Stage III: I, D, Y, P, 3, V, H, W; and Stages IV - V: 8, 7, X, T, R, M, N, E (Boyes Braem, 1994). The depiction of these handshapes, and the handshapes observed in SASL (Penn, 1992) are presented in Appendix 1.

Related to handshape, are the aspects of number of hands and the symmetry of handshapes in two-handed signs, which have also been considered in terms of ease of signing (Granlund et al., 1989, Loeding at al., 1990). Symmetrical two-handed signs are considered to be of a similar level of difficulty as one-handed signs (Doherty, 1985). Granlund et al. (1989) found symmetry to be a significant predictor of productive recall of signs.

2.4.1.2 Movement

There are a large range of movements that can occur in the formation of a sign. Movements could involve a change in handshape, movement from one location to another, or movements could be embedded inside one another – for example, the whole hand may be moving while the fingers wriggle simultaneously. The movements may be large, or small, and the orientation of the hand may be altered. In addition, the direction of movement, the speed of movement and the type of movement are relevant (Fischer, 1982; Hoffmeister, 1990). Constraints have been noted with regard to the interaction of parameters of handshape and movement to produce a lexical item that is recognised as a natural sign. Symmetric signs are executed by alternating movements that have the same hand configurations on both hands, except for rare exceptions (Hoffmeister, 1990). The same rule applies to symmetric signs executed away from or toward the midline.

The influence of movement on ease of signing was considered by Granlund et al. (1989) in that signs with two or more different movements and signs combining two different signs in a lexical item were considered to make signs more complex with regard to production. Others have also looked at this aspect in terms of repetition of movement and multiple movements (Doherty, 1985; Karlan & Lloyd, 1983).

2.4.1.3 Position

Signs may be situated at a location on or near the body or in a location on or near the hands. On the hands, contact is made on surfaces and edges of the hand. Sign locations also contain links to meaning, for example, those near the eyes link to seeing. The position of the hand is always described in relation to the signing space. The hands and arms usually perform in what is called the signing space or "sign bubble", the space within 12 inches of either side of the body, 18 inches in front, and extending from the waist to 6 inches above the head (Penn, 1992; Hoffmeister, 1990). The sign-space relates to and influences the production of signs. For example, signs performed at the outer edges of the signing space tend to be two-handed and use large or whole forearm movements, and have identical handshapes. This has a bearing on perceptual predictability, reducing visual scanning during input and so time-effectiveness. As signs move towards the centre of the signing space more detailed movements are possible, for example, wriggling of the fingers. Handshapes may differ, and single-handed signs may involve multiple movements. To reduce visual perceptual load when both hands have different handshapes, the constant or base hand (usually the one that does not move) uses one of the basic handshapes: A, B, O, G, S, and C (Hoffmeister, 1990). Signs formed on or near the head may have more complicated handshapes and movements, as the eyes of the listener are focussed on the chin and helps prevent overloading of the perceptual system. Signs on or near the face have shorter movements along a path. It thus becomes evident that what has typically been considered as motoric complexity in sign production very much relates to constraints placed on the visual perceptual system in terms of sign comprehension. With regard to ease of learning, signs that have contact with another part of the body, and those that are visible to the signer, are considered to facilitate sign learning (Granlund et al., 1989, Loeding et al., 1990; Doherty, 1985; Karlan & Lloyd, 1983).

2.4.1.4 Orientation

Orientation refers to the direction in which the palm and the hand point. The palm orientation may be towards or away from the signer, left, right, diagonal, downwards or upwards. The hand orientation may be different from the palm orientation, and is described in terms of the position of the back of the hand. The orientation is closely related to handshape and movement aspects relating to the production of the sign. Thus, its influence in sign learning is not considered separately.

In addition to the above parameters, non-manual aspects have also been considered in the production of signs (Hoemann, 1978; Penn, 1992, Costello, 1995; Loncke & Bos, 1997). These include facial expression, eyes, head and body movements or posture. Non-manual features occur simultaneously and can change or emphasise the meaning of the sign, for example, raising of the eye brow to indicate a question. Signs that display emotions have facial expressions that accompany them. There are also a number of aspects of sign syntax that are expressed non-manually. The syntax of signing - sign morphology - allows for the linking of signs for production of meaningful sentences in a visual-gestural language. Hoemann (1978) stresses the fact that knowing a language means much more than knowing its vocabulary. However, while cognizance is taken of this critical aspect, it is beyond the scope of this study to describe the syntax of signing other than to acknowledge the complexity of a visual-gestural language and one that is totally different to a spoken language.

2.4.2. Iconicity

Sign Languages, like spoken languages, are relatively arbitrary systems of symbols. However, according to Costello (1995) many signs are natural gestures and iconic, making them culturally relevant. Other signs are based on some characteristic of the sign's concept, for example, CUP in ASL, where one hand represents the saucer and the other circles the shape of the cup. According to Costello (1995), with regard to ASL, no data exists to show how persons who use ASL use this feature, and data that does exist, suggests that people unfamiliar with ASL cannot guess the meanings of most of the signs from its lexicon. According to Russo (2004) transparent and translucent signs are frozen iconic forms whose iconicity is determined by different constraints such as language, culture, modality and universal constraints. There also seems to be a historical trend towards more abstractness and less iconicity in ASL as signs lose their idiosyncrasies and pantomimic origins. Hoemann (1978), states that the value of using the iconicity of signs is as a mnemonic device for learning their meanings. Sign teachers often call attention to the extent to which signs resemble what they mean, since resemblances may help students remember the signs and their meanings. According to Costello (1995) iconicity makes Sign Language easier to learn and knowing historical origins contributes to the fun of learning Sign Language. Flodin (1994) suggests beginning sign learning with topics such as food, sport and animal signs

because their movements have an apparent relationship to their meaning, making them easier to recall. Granlund et al. (1989) reported that translucency had a significant influence on productive recall of signs. Loeding et al. (1990), in teaching signs to school staff, maximized the introductory sessions with highly translucent signs to facilitate sign acquisition and success early in the sign programme. The Makaton program has been criticized for not taking iconicity into consideration in sequencing signs for teaching (Grove & Walker, 1990). Sevcik et al. (1991) note that, although comparative data is required, it appears that while iconicity may aid learning initially, long term generalization may be better with arbitrary symbols.

2.4.3 Relevance of vocabulary to the individual

It is an accepted notion that signs have to be selected from the general set, and be presented in manageable chunks to the learner in the form of an initial lexicon. Of critical importance also is the issue of functionality. The learning of functional vocabulary serves communication needs, and as such is motivating both for the user and partners (Loeding et al., 1990; Spragale & Micucci, 1990). Arranging signs into units to teach is generally within themes, selected from an identified vocabulary set. Semantic similarity is said to facilitate sign learning and semantically related signs are therefore grouped in signing exercises (Loeding et al., 1990; Costello, 1995). However it has been recommended that signs that are similar with regard to formation, that is cheremic similarity, should not be placed in the same teaching set early in sign learning as they can be confused (Loeding et al., 1990).

Selecting vocabulary for an initial lexicon requires familiarity with language development, communicative competence, symbol systems, their constraints, and the communication needs of the individual user. It is also critical to select vocabulary that is functional and motivating (Grove & Walker, 1990). Various methods have been suggested to assist with the selection of an initial lexicon. Arvidson and Lloyd (1997) specify using the following: 1) informants such as partners; 2) vocabulary lists that are available to develop a core list, and supplementing by means of fringe vocabulary, obtained through interviews; 3) environmental inventory, reflecting activities and interests in meaningful observable contexts, for example, enquiring of parents how children like to spend their time; 4) ecological inventories, identifying environments through a task analysis to obtain information on communication demands in different environments; 5) daily routines diary, for scripting by breaking an

activity down into smaller steps and recording what words and expressions are needed, thus including words from a variety of parts of speech, serving a variety of functions; and 6) the dialogue method. A vocabulary selection protocol for school children, as suggested by the Purdue University Technical Team (Arvidson & Lloyd, 1997), further notes that vocabulary refers not only to words, but to phrases, sentences, and longer utterances, and that vocabulary could be prioritized using a scale from 1-4, considering frequency of use and power (level of interest and motivation).

The Makaton programme appears to be more prescriptive with the use of a selected vocabulary for training purposes. The system itself is said to be open-ended and based on a common core of functional concepts. The approach advocates the use of a core vocabulary of 300 words arranged for introduction in nine stages. It is argued that the core vocabulary is a realistic goal as vocabulary is presented in a consistent and balanced manner, for example, vocabulary in Stage One allows for construction of sentences based on the variety of syntactic structures available (Grove &Walker, 1990). Further, the authors argue that the use of a core vocabulary is also recommended for teachers of second languages, and assists with a common reference in teaching vocabulary. Interactive partners are said to need a system that is simple to learn, immediately useful, and which allows them to build up their confidence quickly, and such that their task is manageable, as unrealistic demands are bound to result in failure (Grove & Walker, 1990). Loeding et al. (1990), in selecting signs to be taught to staff at a special school, used the staff as informants, using a three-step open procedure. Firstly, by listing 50 signs considered needful in their context; secondly, expanding the list by providing vocabulary needed within 11 given school environments, and thirdly generating vocabulary for a list of given categories. A total of 1063 vocabulary items were elicited, which were finally reduced to 122 signs based on frequency of requests for the particular sign. Spragale and Micucci (1990) also consulted staff in a home facility in formulating a list of signs to be taught within a group. Joint listing of vocabulary was used, including vocabulary suggested by the Speech-Language Therapist, supervisor and direct care staff. A list of 300 signs was compiled and then prioritised for implementation, two at a time. The finding was that the different groups had different vocabulary needs, although there was a small core of 20 common signs.

Thus it appears that while signs need to be selected for linguistic relevance, the sign characteristics also have an influence on acquisition, especially early on in learning to sign.

The dynamic nature of signs as evident in the description of sign parameters (Section 2.4.1) requires that signs be presented in three-dimensional space during sign teaching. However, the use of graphic representations of signs in a static format has the potential to aid sign learning by capturing signs for recall. This has been the assumption with using sign illustrations in signing classes. It must be acknowledged that depicting a dynamic sign in static form cannot capture all parameters of the signs, and this would appear to influence its impact. Never-the-less, this form of presenting signs to parents to assist with sign teaching appears to be relevant in exploring methods to facilitate access to signing.

2.5 Conclusion

Parents of signing children need to learn to sign, with all the implications and challenges this may bring. Special efforts must be made to assist them in this process. The issue of parents of deaf children as adult learners with regard to intervention is raised by Broder-Johnson (2001) within the approach of family-centered intervention. Transformation learning theory within family-centered intervention requires the provision of information and support to assist parents in making the transition to a new role – that of being parents of a deaf child. It promotes the process of parents becoming aware of their assumptions and beliefs about deafness, disability, and related concepts, and revising these assumptions, and consequently their behaviour, based on critical self-reflection. This has implications for commitment to learning a new mode of communication.

The issue of parents of deaf children learning Sign Language from the perspective of second language learning is a unique situation, presenting a serious challenge. The motivation for learning the language is related to their child's hearing loss, and the issues of acceptance that accompanies this. Parents need to be assisted in understanding the implications of the hearing loss, the need for learning Sign Language, the nature of Sign Language, the issue of Deaf culture, and their role in the process of acquiring a language that facilitates communication between themselves and their deaf child. This must be done with sensitivity and support. Further, special consideration has to be given to their learning Sign Language within a context that is functional and meaningful in their everyday lives. Vocabulary must have relevance and be seen as having direct application. Efforts must be made with regard to supporting learning through available resources. The use of sign illustrations specifically has been widely used in sign learning. Signs represented in graphic form provide a static view of

a dynamic sign, capturing the sign in time. The exact role of this aid in sign learning has not been explored from a research perspective. This study aims to explore the use of sign illustrations in graphic displays in the context of acquiring an initial sign lexicon by parents of deaf children who are reliant on Sign Language. There is a lack of information in the literature with regard to the contribution of sign illustrations in teaching signs.

2.6 Summary

The chapter attempted to place in context the learning of signs by hearing parents of deaf signing children. The use of a visual aid, that is theme-based graphic displays of sign illustrations, in supporting sign teaching, was explored from the perspective that graphic representations provide multi-modal input, and thus support learning. Signs were described in terms of their manual characteristics and depiction through graphic representation with regard to sign learning. The importance of selecting a relevant initial sign lexicon that would be motivating to mothers was considered.

CHAPTER 3
RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the methodology used to determine the influence of sign illustrations on sign learning. The participants are described, and the procedures used for the development of the training material, the sign teaching strategies and the outcome measures are discussed.

3.2 Aims

3.2.1 Main aim

To determine the influence of using graphic representations of signs in teaching signs to hearing mothers.

3.2.2 Sub-aims

To compare the strategies of sign teaching with and without sign illustrations with regard to:
(a) Sign acquisition
(b) Trainer assistance required during self practice

3.3 Research design

A single-subject experimental design, with four participants was used. An Adapted Alternating Treatments Design (AATD) was implemented, as two training strategies were alternated, counter-balanced and compared using equivalent sets of training material (Barlow & Hersen, 1984; McReynolds & Kearns, 1983; Richards, Taylor, Ramasamy & Richards, 1999; Schlosser, 2003). The value of single-subject studies, as in this case, lies in their application within clinical settings where access to large sample sizes that allow matching and comparisons are limited. With the AATD participants serve as their own controls. Further, the use of replications lends to the design not only reliability, but also the added advantage of performing analyses as in small group studies.

Four participants received individual training over four consecutive days. The training schedule was structured so that the four participants, the two sign teaching strategies, four theme-based sign sets, and four session time slots were all alternated. Outcome measures involved pre- and post-training probes, administered on all days of training and on follow-up sessions one day and one week post-training. The pre-training and immediate recall probes (P0, P1) were administered on days 1-4, the one day recall probes (P2) were administered on days 2-5, and the withdrawal probes (P3) were administered on day 12, a week after the completion of the training. Table 3.1 provides a schematic representation of the experimental design.

Table 3.1 Schematic representation of the experimental design

Participants	**Days**					
	1	2	3	4	5	12 (1week later)
1	A (S1, T1)	B (S2, T2)	A (S3, T3)	B (S4, T4)	Post-training probe (P2)	Post-training probe (P3)
2	B (S1, T2)	A (S2, T1)	B (S3, T4)	A (S4, T3)	Post-training probe (P2)	Post-training probe (P3)
3	A (S2, T3)	B (S1, T4)	A (S4, T1)	B (S3, T1)	Post-training probe (P2)	Post-training probe (P3)
4	B (S2, T4)	A (S1, T3)	B (S4, T2)	A (S3, T2)	Post-training probe (P2)	Post-training probe (P3)

A = Strategy of sign teaching with a graphic display of sign illustrations
B = Strategy of sign teaching without a graphic display of sign illustrations
S1 – S4 = Sign sets (in four themes)
T1 – T4 = Session order (Time slot 1- 4)
Probes (P0-P3) conducted on four occasions: P0 = Pre-training probe, Day 1; P1 = Post-training probe, immediate recall on day of training; P2 = Post-training probe, one day retention on day following training; P3 = Post-training probe, withdrawal on Day 12

3.4 Participants

3.4.1 Description of the context

The school that was selected for the study is located in KZN, and had introduced signing as a medium of instruction in 1995. A Total Communication approach and philosophy, using SASL rather than Signed English is practiced. The school was faced with many challenges, including the lack of a Speech Therapist and Audiologist for the previous five years.

A Deaf teacher was responsible for teaching SASL to the staff and pupils at the school. Parents of children in the junior primary phase were encouraged to attend a "Parent Guidance" programme in the first year of their child's schooling, where they could observe classroom interaction and learn Sign Language used in class. They were also encouraged to take private Sign Language courses.

3.4.2 Selection of participants

Participants were purposefully selected to meet the study criteria. Mothers were selected as they are considered to be the parent most likely to be involved in the intervention programme. Prospective participants were approached and offered the opportunity to participate. The first participants to agree were included. The selection criteria were:

- Fluency in English as this was the language in which the training was offered. The use of an interpreter, should non-English speaking participants have been included, may have affected experimental control.
- Lack of signing skills despite their child being in a signing programme for a number of years. The reason for this was to offer training to parents who would be motivated to participate, and who would also benefit from the training. The external validity (Leedy & Ormrod, 2005) of the learning task was thus considered.
- Participants with children in the same grade (in this case grade three), so that the signing content would be relevant to all the participants. The design called for equivalent sets in the training.

- Participants whose children used signing as a primary mode of communication, with little if any speech due to severe to profound hearing loss. This was to ensure that signing in the home context was important, serving as motivation for parents to participate.

3.4.3 Description of participants

Four biological mothers of four deaf children, three boys and one girl in a grade three class, took part in the study. All the participants were associated with the school for between 4-5 years. None of the participants had previously attended any signing classes. In terms of ethnic grouping, three mothers were Indian and one was Coloured. All spoke English as their first language and had normal hearing and normal vision, or corrected vision (one participant wore glasses). The mothers were between 32 to 42 years of age, and had all attended high school. Table 3.2 presents a description of the participants and their children.

Table 3.2 Description of participants
(Gender: M=Male; F=Female)

Participant	**Age**		**Educational level**		**Number of years child attending school**
	Mother	**Child (gender)**	**Mother**	**Child**	
R	33	10 (F)	Grade 11	Grade 3	4 years
D	35	8;5 (M)	Grade 11	Grade 3	4 years
SG	42	9 (M)	Grade 12	Grade 3	4 years
SA	32	10 (M)	Grade 8	Grade 3	5 years

3.5 Phases of the study

There were three phases in the study, namely a pre-experimental phase, an experimental phase and a concluding debriefing interview conducted on completion of the study. The pre-experimental phase comprised a number of procedures which were necessary for the development of the training content and strategies that were used in the experimental phase. The experimental phase involved the implementation of the AATD procedure to administer two sign teaching strategies.

3.5.1 Preliminary procedures

- Ethical clearance was obtained from the ethics committee of the University of Pretoria to conduct the study (Appendix 2).
- Three schools in the region were consulted with regard to feasibility of the study. One school, the only day school, lent itself to parent access, allowing for the design to be implemented with easier access to parents. This school was not currently running any formal Sign Language classes for parents. A description of the school was presented in Section 3.4.1.
- Permission was sought via the school principal from the relevant school authority to conduct the study (Appendix 3). Permission was granted verbally by the school principal.
- Class teachers played a major role in identifying possible participants who met the selection criteria described in section 3.4.2. This was done in consultation with the Head of Department at the school. Class lists were scrutinized and mothers who were considered to be competent in English and who would benefit from introductory signing classes were identified. Mothers were identified for participation in pilot studies as well as the main study.
- Participants were requested to consider participation via a letter, and a follow up telephone call. Informed consent was obtained from all participants (Appendix 4).

3.5.2 Pre-experimental phase

As the participants were mothers of deaf children who needed to learn to sign to improve communication with their children, it appeared appropriate to approach the training from a broad perspective. Thus, the training content addressed two aspects. The first and primary focus being the need for the chosen research design, the AATD, with the requirement of equivalent sign sets which would allow for reliable comparison of the sign teaching strategies. The second was to offer sign teaching to participants in a cohesive format that matched typical introductory signing classes. The procedures carried out in the pre-experimental phase therefore reflect this dual demand.

The steps in the development of the two sign teaching strategies in the pre-experimental phase of the study are shown in Figure 3.1. The procedures included the development of the training content, viz. the selection of vocabulary, the selection of signs and the development of equivalent sign sets; the development of the training procedures, viz. development of the training material, including interview schedules that were associated with the three phases, and the development of sign teaching strategies and evaluation procedures.

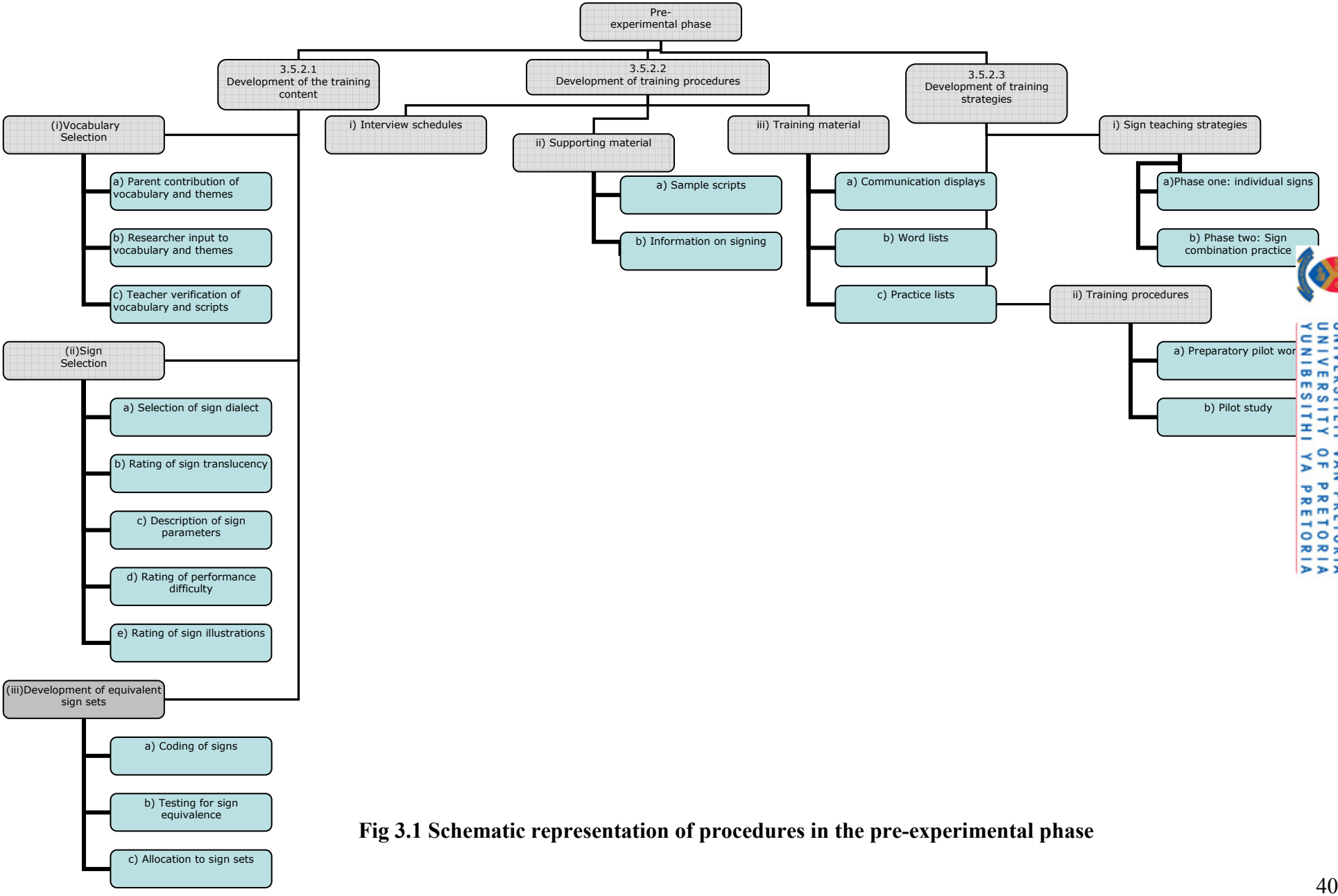

Fig 3.1 Schematic representation of procedures in the pre-experimental phase

3.5.2.1 Development of the training content

This aspect refers specifically to the signs used in the study, and included vocabulary selection, sign selection, the development of sign sets and the allocation of signs to sets. Each of these sections is described to facilitate understanding of the major issues addressed, while detail on procedures and outcomes are included in the appendices of the study.

i) Vocabulary selection

The context of the participants with regard to the older, late diagnosed deaf child within the SA context precluded not only a developmental approach, but also the use of available prescribed vocabulary lists. Vocabulary that was relevant for parent-child interaction was important. A number of procedures were conducted prior to the finalization of the vocabulary selected for the four theme-based sign sets used in the main study.

Firstly, two pre-pilot procedures were conducted to determine strategies that could be used to select a core vocabulary for the main study. The first involved a parent-child dyad which was compared to teacher input on vocabulary. It became evident that mothers would be more suitable to submit relevant vocabulary. The second procedure involved consultation with nine mothers, five in a small group, and four mothers interviewed individually (Details on these procedures are presented in Appendix 5). The results indicated that a very structured format was needed to ensure a sufficiently large vocabulary pool for spread over themes, with researcher input and teacher verification being follow-up procedures. The procedure used for vocabulary selection in the main study involved multiple steps (Refer to Appendix 6 for a detailed description of this process). The main issues with regard to the selection of vocabulary are summarized as follows.

a) Participant contribution of vocabulary and themes

The vocabulary and themes used in the study were derived from interviews conducted individually with participants. The procedure was influenced by literature in the area (Arvidson & Lloyd, 1997; Loeding et al., 1990; Spragle & Micucci, 1990). Four mothers contributed to the vocabulary, three from the main study and one from the pilot study as one participant was not available over a protracted period. However, prior to commencement of

the study, this participant was also consulted. Her responses however were minimal and matched those of the other participants, making the selected vocabulary applicable to her. A total of 289 words were generated (Appendix 7), within broad themes (Appendix 8).

b) Researcher input to vocabulary and themes

Researcher input to vocabulary and development of the themes submitted by parents resulted in the themes being condensed. Literature in the field was consulted (Ling & Ling, 1977; Grove & Walker, 1990; Fristoe & Lloyd, 1980; Penn, 1992) to add vocabulary to four dominant themes which emerged. The four themes were: Theme 1-Going Out, Theme 2-Meal Related, Theme 3- Behaviour Related, and Theme 4- Evening Routine. The vocabulary was reorganized to facilitate greater commonality of vocabulary within a theme where this was applicable. Scripts were used to establish a semantic context for these words and allocation to the themes (Ling & Ling, 1977). This resulted in a further 92 words being added, and four sets of words organised in themes. The vocabulary within the themes was arranged so that there was a spread across grammatical categories of: miscellaneous, verbs, descriptors, and nouns (Goossens', 1994). The ratio of the words in the syntactic categories was guided by Owens (2001) (Appendix 6) and was influenced by parent input. Analysis of parent vocabulary revealed 47% nouns, 31% verbs, 18% descriptors and 4% of miscellaneous words. This translated into 15 nouns, 10 verbs, 6 descriptors and 1 miscellaneous word, for a total of 32 signs in the set. The goal at this stage was to teach four sets of 32 signs. Four themes were developed from a total of 283 words, which then became the core vocabulary, with all other words being excluded. The vocabulary was organised as follows: Going out (61); Food related (66); Behaviour related (82), and Evening routine (64).

c) Teacher verification of vocabulary and sample theme scripts

Teacher rating of vocabulary and comment on sample theme scripts was conducted to ensure that the vocabulary was within the children's experience and to also comment on the suitability of the selected scripts for themes (Spragale & Micucci, 1990). Two senior teachers (Heads of Department) and the Deaf teacher, who taught SASL to the children in the junior primary phase, rated the vocabulary in terms of whether the sign would be known by a child in grade three. The categories were: Yes, No and Maybe. In addition, teachers commented on whether the sign should be included in the training programme according to

the following categories: 1 = not at all, 2 = not really, 3 = maybe, 4 = recommended, 5 = highly recommended (Appendix 9). The result was that some words were eliminated, and ratings influenced the choice of the vocabulary. A total vocabulary of 202 words was obtained within the four themes. All participants felt that the scripts were appropriate, providing functional vocabulary. The 202 vocabulary items were then considered in terms of their sign characteristics to facilitate allocation of signs to equivalent sets.

ii) Sign selection

The selection of signs was complex as it involved five main aims focused towards a systematic process of establishing equitable sign sets to be used in the comparison of the sign teaching strategies. Firstly, a decision needed to be taken on the choice of sign dialect, which was influenced by the availability of sign illustrations. Secondly, a rating needed to be done to determine the translucency of the signs selected to allow the researcher to distribute signs with equitable iconicity equally among the sets. Thirdly, cognisance had to be taken of the sign production parameters for each sign. This was followed by a rating of the performance difficulty in producing signs. Finally a rating was needed to determine the level of difficulty of the graphic representation (sign illustration) of sign. The main findings of this process are summarized as follows.

a) Choice of sign dialect

With regard to the sign dialect, there were two variations of signing used at the school. While SASL was used predominantly, there were a few American signs from Signed English (Bornstein, Hamilton & Saulnier, 1983). The Deaf teacher assisted with the selection of signs and the graphic representation. The availability of a graphic illustration influenced the choice of sign (Loeding, et al., 1990). A video-recording was made of the 202 signs signed by the Deaf teacher for reference. This was to ensure consistency in the use of signs in the training. Differences in sign dialect were addressed with participants in the debriefing interview.

b) Rating of sign translucency

In order to obtain translucency ratings, a video-recording of the 202 signs signed by the researcher, were presented to a group of 30 sign-naïve university students for ratings of sign translucency using a seven point scale (Doherty, et al., 1985; Luftig & Lloyd, 1981; Granlund et al., 1989). All participants had either normal or corrected vision, as well as normal hearing and were between 18 - 35 years. Two were males. (The rating form is presented in Appendix 10). Mean scores and standard deviation scores were calculated. Only signs classified as having either low translucency (scores from 1-3) or high translucency (scores from 5-7) were included in the study, to ensure that signs were clearly differentiated in terms of translucency for equitable distribution. This resulted in a cohort of 122 signs, 52 (43%) high translucency and 70 (57%) low translucency signs. As the sign pool was, as a result of this process, relatively small, it was decided that future procedures to classify signs for the purpose of equal distribution would be used only to categorize signs and not eliminate them. (The results are presented in Appendix 11, together with ratings on other aspects considered in the categorizing of signs).

c) Description of sign parameters

The 122 signs were then described in terms of sign parameters considered to influence learning (Granlund et al., 1989; Karlan & Lloyd, 1983; Loeding et al., 1990). Sign parameters were described in Section 2.4.1. Two students who had done a basic course in SASL inter-rated the descriptions of sign parameters conducted by the researcher with regard to the number of hands, symmetry, movement, handshape, visibility, contact, and complexity (Granlund et al., 1989; Doherty, 1985). (Refer to Appendix 12 for the procedure used). Due to poor agreement among the three raters on the classification of complexity of sign production, signs were subjected to a rating of performance difficulty (Goodman & Remington, 1993).

d) Rating of performance difficulty

For the rating of performance difficulty 23 undergraduate students who had completed a basic Sign Language course rated the 122 signs on a 7 point rating scale in terms of perceived difficulty in executing the signs. Mean scores were calculated and used to classify signs for

distribution to sign sets. (Results are presented in Appendix 11). The majority (68%) of signs were considered *easy,* with scores ranging from 5 - 7, 22% signs were considered *average*, with scores from 4 - 4.9, and 10% *difficul*t with scores from 1 - 3.9. It was decided that scores below 5 points would not be considered as a first option in selecting signs within themes, as there were more low-translucency signs than high translucency signs in the sign pool. Further, the distribution of signs across sets would include equal numbers of signs in a particular range.

e) Rating of sign illustrations

With regard to selecting signs in terms of the graphic representations, it was crucial to the study that their contribution to the sign-learning process be considered with regard to the development of equitable sign sets. There is a lack of guidance in the literature with regard to characteristics of sign illustrations influencing learning. However, sign illustrations have been selected in terms of clarity, point of contact, and location (Loeding et al., 1990) and these were considered together with a rating. Twenty of the students who participated in the rating of performance difficulty participated in the ratings of the sign illustrations in terms of the ease of sign production following observation of the sign illustration, using a 7 point rating scale. Mean scores were calculated and used to classify the sign illustrations. The results (Appendix 11) indicated that about half (51%) were considered *easy* (scores from 5 - 7), 33% were considered *average* (scores from 4 - 4.9) and 16% were *difficult* (scores from 1-3.9). It was decided that signs with scores below 5 be kept to a minimum and be allocated equally across sets.

In summary, the selection of signs was determined primarily through rating scores obtained for translucency. Performance difficulty and sign illustration scores (graphic scores) were used as supplementary procedures. (Appendix 11 presents the composite list of 122 signs across the semantic categories, together with rating scores obtained for the various aspects). Signs were matched on these aspects with the goal of developing equivalent sets of signs through which the sign teaching strategies could be evaluated. This pool of 122 signs was then used to determine the sign sets.

iii) Development of sign sets

The ratings and descriptions of signs, together with the linguistic considerations in terms of syntactic categories (nouns, verbs, descriptors and miscellaneous) were considered in the equitable distribution of signs across the four selected themes such that independent sets with no repetition of signs were developed.

a) Coding of signs

All 122 signs were coded in terms of the following aspects:

- Translucency: High (H) or Low (L)
- Number of hands: One (1) or Two (2)
- Handshape difficulty: Easy (E) or difficult (D). The classification of handshapes difficulty was based on the model of handshape acquisition in ASL (Boyes Braem, 1994) described in Section 2.4.1.2. (Appendix 1).
    - Easy signs: the parameters used to describe easy signs were:-
        - Signs with hand-shapes from Stage I (A, S, L, baby O, 5, C, G), Stage II (B, F, O), and Stage III (I, D,Y, P, 3,V, H,W) (Boyes Braem, 1994; Doherty, 1989; Loeding et al., 1990)
        - signs without movement or simple movement in one direction
        - signs involving contact with the hand or body
        - symmetrical signs
    - Difficult signs: the parameters used to describe difficult signs were:
        - signs with handshapes from stage IV & V (8, 7, X, T, R, M, N, E) (Loeding, et al., 1990; Boyes Bream, 1994).
        - signs involving movement with changing handshape
        - non contact signs
        - asymmetrical signs

For example the sign EAT was coded as H-1-E (High translucency-One handed-Easy). (The coding of the entire set of signs is presented in Appendix 13). It became evident that certain themes were lacking signs in some categories using this coding system. Thus some signs were reallocated to themes if they could lend themselves to the new category. In addition, the

scores obtained from the ratings of performance difficulty and clarity of sign illustrations was used to match signs more closely. During this process, signs with cheremic similarity within the set were reallocated to other themes to prevent confusion of signs. Six possible categories of signs for the purpose of equivalence emerged, i.e. categories with an adequate number of signs for allocation to equivalent sets: H-1-E, H-2-E, L-1-E, L-1-D, L-2-E, and L-2-D. To determine whether this categorization would be adequate for balancing of sign sets within the themes, it was tested.

b) Testing for sign equivalence

Twenty-one sets of four signs were selected, 16 of which were considered equal in terms of the above codes, and five unequal in that they were not selected from within the same code category. Ten student volunteers, who considered themselves somewhat proficient in signing, having completed a basic SASL course the previous year, were invited to participate in the rating of the signs for equivalence by observing a video of the sign groupings. A seven-point rating scale was used to describe each of the sign groups in terms of their similarity in level of difficulty during the learning process. A score of 1 meant that the set was very dissimilar, 2 = dissimilar, 3 = somewhat dissimilar, 4 = average, 5 = somewhat similar, 6 = similar and 7 meant the set was very similar. Participants were also asked to note a particular sign/s that may not fit, i.e. were "off". Mean scores were calculated and compared. Refer to Table 3.3 for the results.

Table 3.3 Procedure for testing grouping of signs for equivalence
(Key: 1= very dissimilar, and 7 = very similar)

No.	Coded sign category testing sets													
	Proposed Equivalent sets												Proposed Non-equivalent sets	
	High translucency one-handed easy signs (H-1-E)		High translucency two-handed easy signs (H-2-E)		Low translucency one-handed easy signs (L-1-E)		Low translucency one-handed difficult signs (L-1-D)		Low translucency two-handed easy signs (L-2-E)		Low translucency two-handed difficult signs (L-2-D)		Mixed categories (not balanced in set)	
	Set	$\overline{X}$	Set	$\overline{X}$	Set	$\overline{X}$	Set	$\overline{X}$	Set	$\overline{X}$	Set	$\overline{X}$	Set	$\overline{X}$
1	COME EAT LISTEN SLEEP	6	DON'T WASH STAY WAKE-UP	4.8	WHO WHAT WHY WHEN	6	OLD WHICH BAD AGAIN	4.8	SHOPPING GREEDY TRAFFIC TIRED	4.6	CLEAN ENJOY HAPPEN USE	3.9	I (H-1-E) TODAY (H-2-E) TEA (L-2-D) THIRSTY (H-1-D)	3
2	GO THROW NOW CLEVER	6.1	COLD OPEN KEEP CLOSE	4.8	WANT BREAK- FAST SORRY SUPPER	6					WEEK- END CHICKEN BUY EARLY	4.3	WHICH (L-1-D) LOOK (H-1-D NAUGHTY (L-1-E) POTATOES (L-2-D)	3
3	WE CALL GOOD LIGHT	5	CLOTHES MILK AFTER HUG	4.8	WARM EASY NAUGHTY AFTER- NOON	5.1					MOVIES CHAIR SHARE TOILET	5.8	LATE (L-2-D) INSIDE (H-2-D LIGHT (H-1-E) GIVE (H-1-E)	2.6
4	NOW GIVE QUIET HOT	5.6									FRIEND CAKE HOME READY	4.9	MOVIES (L-2-D) YOU (H-1-E) TOUCH (H-2-D) CLOSE (H-2-E)	2.2
5													DIRTY (L-1-E) WHICH (L-1-D) BISCUITS (H-2-E) GOOD (H-1-E)	4

The results, as reflected in Table 3.3, indicated that of the five sets that were dissimilar, 4 were picked up with scores of 3 and below. Signs from different groupings were therefore judged as unequal. Of the 16 similar sets, only one set was below 4. Therefore, as only two of the 21 sets were not clearly in the predicted range, but being close to it, it was felt that this coding system was adequate for the equitable distribution of signs to the four sign sets. Following this procedure, some signs with handshape changes, and lack of contact were reallocated within the categories prior to a final allocation to sign sets based on themes.

Thus, using this procedure of allocation of signs to sign sets, there were 19 sets of potential signs that could be distributed equally across the four themes. However, 16 sets were finally selected and matched in terms of translucency, sign parameters and linguistic category. The rating scores on performance difficulty and clarity of graphic symbols influenced items, especially when there was a choice between items. However, only 15 sets were used in the main study, due to an error on a probe sheet during the training evaluation. Refer to Table 3.4 for the signs as allocated to the four themes sets depicting sign equivalence. These signs served as the probes for the different themes to assess the two sign teaching strategies.

Table 3.4 Description of probe characteristics across the four sign sets

(PD = Performance difficulty score, G= Graphic score; purple = scores from 4-5; blue scores from 3-4; H-1-E = High translucency-one handed-easy signs, H-2-E = High translucency–two handed- easy signs, H-2-D=High translucency-two handed-difficult signs, L-1-E= low translucency one-handed easy signs, L-1-D=low translucency-one handed-difficult signs, L-2-D=low translucency-two handed-difficult signs)

	Probe	**Theme 1: Going out**			**Theme 2: Meal related**			**Theme 3: Behaviour Related**			**Theme 4: Evening Routine**		
		Sign	PD $\overline{X}$	G $\overline{X}$	Sign	PD $\overline{X}$	G $\overline{X}$	Sign	PD $\overline{X}$	G $\overline{X}$	Sign	PD $\overline{X}$	G $\overline{X}$
H-1-E													
Verbs	1	GO	6.434	5.400	COME	6.565	6.250	LISTEN	6.130	6.444	SLEEP	6.826	6.888
	2	CALL	5.304	5.500	LOOK	5.636	5.500	GIVE	5.695	5.944	QUIET	6.391	*6.444*
H-2-E													
	3	HUG	6.347	*6.277*	WASH	6.086	*5.000*	DON'T	6.000	*6.111*	STAY	6.217	*5.500*
H-2-D													
Verbs	4	KISS	5.391	*5.555*	TOUCH	5.545	*5.55*	STOP	5.826	*5.05*	WAKE-UP	5.727	*5.35* 5
L-1-E													
Miscellan-eous	5	WHO	5.954	*5.277*	WHAT	6.136	*6.000*	SORRY	5.782	*5.833*	WHEN	5.826	*5.050*
Nouns	6	AUNT	5.086	*5.500*	UNCLE	5.217	*5.388*	SWEETS	5.826	*5.555*	SUPPER	5.391	*4.722*
L-1-D													
Verbs	7	HAVE	5.869	*4.411*	WANT	4.227	*3.600*	BEHAVE	3.652	*4.352*	WATCH	5.739	4.944
Descriptors	8	DIRTY	4.826	*4.277*	NICE	4.869	*4.055*	BAD	5.173	*4.056*	WARM	4.391	*3.722*
Nouns	9	NEIGH-BOUR	4.652	*3.722*	SUGAR	4.590	*4.388*	SATURDAY	5.190	*4.944*	AFTERNOON	4.260	*4.833*
L-2-D													
Verbs	10	VISIT	4.217	*4.833*	ENJOY	6.304	***4.222***	SHARE	**4.086**	*3.631*	DO	4.608	*4.588*
	11	USE	4.782	*3.500*	FRY	4.608	***3.555***	BUY	**3.782**	*3.250*	TRY	3.869	*4.611*
Descriptors	12	CLEAN	4.304	*4.350*	GREEDY	4.739	***4.722***	LATE	**4.826**	***4.722***	EARLY	3.909	*4.055*

Table 3.4 Description of probe characteristics across the four sign sets (continued)

	Probe	Theme 1: Going out			Theme 2: Meal related			Theme 3: Behaviour Related			Theme 4: Evening Routine		
		Sign	PD $\overline{X}$	G $\overline{X}$	Sign	PD $\overline{X}$	G $\overline{X}$	Sign	PD $\overline{X}$	G $\overline{X}$	Sign	PD $\overline{X}$	G $\overline{X}$
Nouns	13	HOLIDAY	4.913	*5.333*	BISCUITS	5.391	*5.555*	GRAND-MOTHER	**4.863**	*5.333*	CHAIR	5.043	*5.000*
	14	SHOES	4.913	***4.777***	CHICKEN	4.347	***4.277***	TRAFFIC	**4.173**	***4.333***	HOME-WORK	**4.347**	*5.529*
	15	MOVIES	3.913	***4.600***	RICE	5.217	***4.300***	PARTY	3.826	*3.333*	WEEKEND	**4.260**	*3.555*
Summary (signs out of easy range)													
	4-4.9		**7**	***6***		**6**	***6***		4	*5*		**5**	*6*
	3-3.9		**1**	***2***		**0**	***2***		3	*3*		**2**	*2*

As the signs appeared functionally similar across the sets, the system of allocation to equivalent sets was considered adequate. However, this was further supported by the statistical procedures that showed no significant effect of the sets on the sign- teaching strategies in the section on results, 4.4.1. These 15 signs per theme, 60 in total, then became the probes to test for sign acquisition across the training conditions and trainer assistance required during sign learning to compare the sign teaching strategies.

c) Allocation of signs to sets

The four sets of 15 signs available were distributed equally but within the constraints of the selected themes. However, the 15 probe signs in each set were supplemented by nine more signs to create sign sets which totalled 24, for a theme-based graphic display size compatible for graphic symbol use (Goossens' et al., 1995). These signs, and associated sign illustrations, were not formally selected for the purpose of equivalence but rather for congruence with the themes and for a spread of grammatical categories from the pool of 122 signs based on parent-submissions and researcher-input described previously in the development of themes to meet the criterion of semantic similarity (Loeding et al., 1990).

The linguistic considerations therefore resulted in an additional seven signs in the noun category and two in the descriptor category. To guide selection consistency, mainly high translucency signs, signs with easy and medium handshapes, and symmetrical over non-symmetrical signs were selected where there was a choice. Signs were reallocated to themes in the event of two or more signs being similar, to meet the criterion of cheremic dissimilarity of signs in a set (Loeding et al., 1990). The signs comprising the final four sign sets, including the probes are shown in Table 3.8.

3.5.2.2 Development of procedures

This section refers to the procedures used in terms of the materials developed to implement the sign teaching strategies as described in Fig 3.1. They include the interview schedules administered to the participants, the supporting materials that were included in the sign teaching sessions but not directly related to the outcome measures,

and the teaching material itself, that is the theme-based graphic displays and theme word lists that were directly linked to outcome measures.

i) Development of interview schedules

An understanding of the participants' backgrounds and their possible influence on sign learning was considered important to their participation. Consideration of parent context was also in keeping with the principles of adult learning and family-centered intervention by allowing and encouraging parents to feel part of the process (Alpiner & McCarthy, 2000). Therefore interview schedules were developed. The interview schedules were piloted via semi-structured interviews (Appendix14). The interviews were structured and consisted of open- and closed-ended questions and rating scales. (Appendix 15 provides a description of the schedules used in the study). The pre-training interview (Appendix 16) sought biographical information, information on diagnosis and intervention, signing ability and attitude towards sign learning in terms of interest and expectations. The post-training interview (Appendix 17) sought information on attitude towards signing, signing ability and the perceptions of the training. The debriefing interview guide (Appendix 18) was individualized and addressed issues that arose from the pre-training interview and during the training. It served as the formal closure of the study.

ii) Development of supporting material

The supporting material used in the study related to providing a context for the signs taught, as well as a context for the sign teaching strategies. The need for these procedures became evident in the pre-pilot tests, which are described in section 3.5.1.4. The procedures included two aspects, viz. sample theme-based scripts and four sets of information on signing presented to participants over the four days of training.

a) Theme sample scripts

Sample scripts which aimed at providing a context for the signs to be covered in the particular session, also served the purpose of allocating signs to themes as described in section 3.5.1.2. The scripts were considered, as some of the signs in isolation did not

appear to be related to the theme, since there were a range of grammatical structures rather than predominantly nouns which are more readily associated with a theme. In addition, the relevance of the vocabulary would be stressed as many items were taken directly from parent submissions. Scripts are used in language learning and teaching of hearing-impaired children (Ling & Ling, 1977), as well as in AAC programmes for children with little or no functional speech (Goossens' et al., 1995). The inclusion of this aspect also addressed the earlier phase of vocabulary selection where parents described scenarios. Thus the vocabulary in this set of scripts included sign vocabulary from parent submissions and researcher input, and included probe and non-probe signs, as well as signs not taught in the theme. Teacher verification of these sample utterances was described in Section 3.5.2.1 and in Appendix 9. The inclusion of non-probe signs was to encourage mothers to see additional novel utterances they could construct in the future using a small limited vocabulary. (The sample scripts used in the study are presented in Appendix 19).

b) Information on signing

The need for provision of this information, which was not directly linked to outcome measures, became evident in the pilot studies, and was tested during the third pilot study and the fourth (main) pilot study (Section 3.5.2.3). The literature describing Sign Language "classes" or sign learning programmes recommends that information be provided about the language, its history and issues of deafness (Flodin, 1994, Costello, 1995). Thus texts teaching Sign Language and basic courses on signing were consulted in the selection of topics to cover. As a result four sets of information were developed:

- Session One: How are signs formed? (Hoffmeister, 1990)
- Session Two: What is Sign Language? (Hoffmeister, 1990; DEAFSA, 2005; Niemann, Greenstein & David, 2004).
- Session Three: Fingerspelling in the context of signing (Bornstein; 1990; Moores, 1996)
- Session Four: Users of Sign Language: the Deaf culture (DEAFSA, 2005; Niemann, et al., 2004).

The presentation of the information on sign formation and the nature of signing also had direct relevance to the teaching, offering information in a controlled format on signing. The pilot studies revealed that the participants felt that the information should be retained in the sessions, with minor changes made to clarify wording in places. The information was presented to participants in a two minute slot during the training. (Refer to Appendix 20 for the four sets of sign information).

ii) Development of training material

The sign teaching material included the theme-based graphic displays, the corresponding lists of sign glosses (word lists), and practice scripts of the signs for each theme as described in Fig 3.1. Words were selected and arranged to meet the requirements of a graphic display using a syntactic-semantic arrangement based on the Fitzgerald key (Arvidson & Lloyd, 1997; Burkhart, 1993; Goossens' et al., 1995). The categories were:

Miscellaneous: 1 sign (4%)
Verbs: 7 signs (30%)
Descriptors: 4 signs (of which two were probes) (16%)
Nouns: 12 (of which 5 were probes) (50%)

The ratio of the grammatical categories was closely matched to the results of the parent submissions of nouns (47%), verbs (31%), descriptors (18%) and miscellaneous (4%) (Described in 3.5.2.1 and Appendix 6). Although initially sets of 36 signs were planned, following feedback from the preparatory pilot work, described in Section 3.5.2.3, 24 signs were believed to be more realistic for these introductory signing sessions. The material used to present the signs during the training sessions was either graphic displays or the lists of sign glosses related to the theme, depending on the teaching strategy being used.

a) Graphic displays

Four theme-based displays with 24 signs were constructed. Decisions regarding the size of the display and the sign illustrations were made based on current literature and input from three pilot studies described in section 3.5.2.3. These pertained to the clarity of individual items, size of the display, and colour-coding for grammatical categories. As a result, a display format using a grid size of 36 was selected so as to allow space to

arrange the vocabulary of 24 sign illustrations. The Boardmaker Version 5 - Mayer-Johnson (Peake, 2003) was used to produce standard displays. Sign illustrations (Nieder-Heitman, 1980; Bornstein, et al., 1983; Costello, 1995) were scanned and then copied onto the displays. Signs were arranged within categories as per the Fitzgerald key, but following the sense of the script (Burkhart, 1993). All signs were labelled in English. A printout was then made on an A4 page, and then copied onto A3 size paper. The final grid size was 4, 5 cm x 4, 5 cm. The size of the illustration was close to the original – 3, 2 cm in height. The sign categories were colour-coded as per Goossens' et.al. (1995) to facilitate location of signs: miscellaneous = orange, verbs = pink, descriptors = blue and nouns = yellow. (The theme-based graphic displays developed are presented in Appendix 21).

b) Word lists

Word lists comprising 24 sign glosses to be used in the teaching of the sign sets were constructed and tested in the third pilot study, (described in Section 3.5.2.3). Recommendations for increased font size and colour-coding became evident. Four lists of sign glosses were constructed for use when teaching signs without communication displays. Again, the signs were arranged in grammatical categories, and colour-coded in blocks, as were the displays. The same colour-coding system, as with the displays, was used. This was to ensure that the materials in the sign teaching strategies were matched. Font size was 14, as indicated by the fourth pilot study. (The word lists developed are presented in Appendix 22).

c) Practice lists of sign combinations

Participants needed to practice the signs taught in the session and receive feedback from the trainer (Babbini, 1974; Loeding et al., 1990). These signs were taught in sign combinations for context. Therefore twelve two-sign combinations in the form of a short phrase or sentence were constructed for each theme. These essentially carried only two information-carrying words to restrict the influence of information overload in the bimodal (speaking and signing simultaneously) format of KWS. Each sign only appeared once on the list to ensure equal practice opportunity for all signs, for both probe and non-probe signs. The lists were tested both in the third pilot study and the fourth

pilot study, described in 3.5.2.3. (The practice scripts developed are presented in Appendix 23).

3.5.2.3 Development of training strategies

This section includes a description of the development of the sign teaching strategies and the development of evaluation strategies as described in Fig 3.1.

i) Sign teaching strategies

In keeping with the research design, two sign teaching strategies, using either graphic displays or word lists, were developed and tested in the preparatory pilot work and the final pilot study (Table 3.5). These procedures were important to clarify instructions and to set teaching criteria. The procedure involved participants being given clear instructions as to which method was being used in a particular training session (Schlosser, 2003). The strategies were matched very closely on all other aspects of the training. This meant that the format of the sessions was identical, the supporting material was the same except for the use of either a graphic display or a word list, both with identical colour coding of syntactic categories which were presented in the same order and sequence of signs for all themes, and that the same practice scripts relating to the theme were used with both strategies. The instructions were consistent, and participants were advised not to introduce any queries or conversation that may alter the session, but that they should rather defer these for a later time. The procedure involved demonstrations by the trainer and imitations and practice of signs by the participant, during which time assistance in the form of repeated demonstrations or corrections to signs was provided by the trainer if required. No iconicity clues were given. The use of associations is known to facilitate sign learning. To ensure consistency in the teaching of the signs, teaching criteria which emanated from the pilot studies were set. The training methods developed, irrespective of the sign teaching strategy being compared, were as follows:

a) Phase one: learning of individual signs

Demonstrations: The sign was first pointed to in the graphic display or the word list, and then demonstrated. Signs were demonstrated once without voice to focus the participant on the visual properties of the sign, and once with voice to link it to the English word. The bimodal mode of presentation has been raised as being more effective than a single-mode presentation in language learning in some populations (Barerra & Sulzer-Azaroff, 1983; Kouri, 1988; Remington & Clark, 1983; Sisson & Barrett, 1984, in Cregan, 1993). Signing and speaking at the same time is thought to enhance receptive language (Burkhart, 1993). The participants were then encouraged to imitate the sign, also once without voice and once with voice. Signs were corrected during this time. Verbal feedback was given, albeit minimally, by either affirmation "okay", or correction "Do it like this". No other verbal input was given which could contaminate the set procedures, while acknowledging performance which is important in adult learning.

Practice: On completion of the entire sign set of signs, the participant then practiced sign production by reference to the displays or the word lists. The sign needed to be produced four times, twice with voice, and twice without voice. The voiceless condition helped the participants focus on the visual modality alone. Assistance in the form of a correction or repeated demonstration was provided as required. The teaching criterion was thus set as correct production on imitation and four correct productions during practice.

b) Phase two: practice of sign combinations

The pre-pilot studies showed that additional practice was necessary. Therefore signs were practiced in a real context using the practice scripts of sign combinations developed for the purpose, and described earlier. Each sign was combined with another sign in the set. Signs should be taught in context during sign learning, even when signing skills are minimal (Babbini, 1974; Hoemann, 1978). A KWS approach was used, with two signs in a short utterance being signed. The method of backtracking to combine signs was used by Babbini (1974) in Sign Language classes. The combination of symbols on graphic displays to teach aided communication in context is also used extensively in the field of AAC (Goossens' et. al., 1995). Signing in English word order with KWS is

considered acceptable for novice signers (Grove & Walker, 1990; Loeding et al., 1990; Cregan & Lloyd, 1990; Costello, 1995). Bouvet (1990) views Pidgin Sign as a bridge and initial strategy in communication between hearing parents and their Deaf children.

Demonstrations: Sign combinations were demonstrated, after they were read out and pointed to on the graphic display or the word list. Sign combinations were demonstrated twice, once with voice and once without voice. Again, the participant imitated the sign twice. Signs were corrected if it was required.

Practice: The participant practiced the entire list of sign combinations four times, twice with and twice without voice. Assistance was given as required. This was then followed by a final practice of the sign combinations twice with voice, as indicated by the third pilot study. Thus, the teaching criterion in this phase was correct production of sign combinations on imitation and six correct practice opportunities.

In summary the teaching criteria were correct production of signs at word level and sign combination level during imitation and 10 correct practice opportunities for each sign, four at word level, and six at sign combination level. The teaching material was not given to the participant to take away. This was in order to control for practice effects influencing the teaching strategies. (The instructions given during the two teaching strategies are presented in Appendix 24). The implementation of these strategies was measured on completion of training by treatment integrity measures (described in 3.6.4.3). The measurement of sign acquisition and assistance required was conducted via probe measures which were tested during the pilot studies (described in 3.5.2.3), and described in 3.6.4.

ii) Training procedures

The development of the training procedures involved pilot studies conducted to test the material that was developed in terms of appropriateness and use in training. A series of procedures were developed and tested using four pilot studies. The first two pilot studies were conducted early in the study, prior to the finalization of the equivalent sets. The third pilot study was an assessment of aspects considered critical to the study following

the development of the equivalent sets. This was then followed by the fourth and final pilot study prior to the main study.

a) Preparatory pilot work

The following is a brief summary of the aspects considered in the first three pilot studies conducted prior to the final pilot study, presented chronologically. The first pilot study was an alpha test to get insight into an adult's response to sign learning with sign illustrations. The use and influence of video-equipment in the process was also evaluated. It became evident that a context needed to be established for sign-learning, that only signs and not the manual alphabet should be taught, detailed descriptions of sign illustrations would be confusing, and that video-recording of the training had to be carefully planned, so that whilst being non-intrusive, it would clearly capture both the trainer and the participant.

The second pilot study focused on the use of a graphic display in learning to sign. An undergraduate student volunteer who had done a short course on SASL a year earlier, but who had had no practice since and considered herself a poor signer participated. Aspects emerging for consideration related to the display size, with an A3 format being recommended, the number of signs to be taught and probed, with the initial 36 signs being too many, and the actual practice opportunities in the process of learning, with a higher number of practice opportunities being recommended.

The third pilot study was a comprehensive assessment of various aspects using two sign-naive undergraduate student volunteers. This pilot study was used to evaluate the implementation of the AATD as a trial run, as well as to test a range of other aspects related to the training programme. It was also seen as an important step in providing the trainer with practice with the procedures. The aspects considered included the control of the physical environment and video-recording settings, the format and order of the training programme, evaluation of the clarity of the materials and the instructions in the two sign teaching strategies, data recording procedures and preliminary comparison of training strategies for data analysis. Changes were made to the training programme as indicated and it was then piloted on one participant prior to the main study. (Details of the first three pilot studies are given in Appendix 25).

b) Pilot study prior to main study

The fourth pilot study was conducted on a mother of a signing deaf child at the selected school following the development of the sign teaching strategies, and was used to evaluate a number of aspects. Training was provided over four consecutive days with follow-up sessions on day 5 and day 12, as planned for in the main study. Thus both sign teaching strategies were piloted. The participant was a 29 year-old mother of a profoundly deaf boy (6.9 years) in his second year at school (Grade R). The pilot study is described in Table 3.5.

Table 3.5 Pilot study prior to the main study

Aim	Procedure	Results	Recommendation
1. To assess the format in terms of the order of the procedures in the session	The participant was asked after each session to comment on this.	The session flowed smoothly	The sequence of components was adequate.
2. To assess clarity of materials	The researcher observed for difficulties and also asked the participant to comment on the clarity of the material.	Both the displays and the word lists appeared easy to follow	The colour- coding and the size of the graphic symbols and words would be retained.
2. To assess instructions for both training conditions	The participant commented on this aspect at the end of the session and was asked for suggestions	There were no difficulties or suggestions	The instructions did not need to be altered.
3. To assess teaching strategies	The researcher observed the adequacy of the teaching and learning criteria	For both conditions – the number of practice opportunities needed were more than anticipated. This was later given as a suggestion by the participant. Some phrases did not flow smoothly.	Re-wording of some phrases. The practice using phrases was to be increased by two more opportunities. Thus the teaching criterion was changed.
4. To assess the information about Sign Language provided to the participant	The participant was asked about the clarity and relevance of the information provided	The participant found this an interesting part of the session, followed the information without difficulty, and felt it should be retained in the programme.	The information regarding signing should be retained as is.
5. To assess data capturing methods	Both the score sheets and the capturing of data on Excel were given a trial run and discussed with the statistician.	The recording of the all the probes on one sheet was confusing on post training especially. The score sheet for Theme 1 had an error, one of the probes was replaced by a non-probe sign. The proposed variable listings on the excel spreadsheet were adequate to capture the required data.	A separate probe sheet should be used for each probe set. Probe sheet for Theme1 be corrected.

3.6 Main study

3.6.1 Training procedure

The training was conducted in the video-recording studio of the disciplines of Audiology and Speech-Language Pathology, University of KwaZulu-Natal, Westville Campus. This facility is designed and used for clinical training and was considered non-threatening. The facility is described in Section 3.6.5.2. The participants attended six scheduled sessions. Training was conducted on four consecutive days, with follow-up sessions on day 5 and day 12 (one week later) to probe sign acquisition and to conduct interviews.

Table 3.6 Training schedule displaying AATD
(Participants: SG, D, R SA)

Day	Slot 1	Slot 2	Slot 3	Slot 4
1	SG: Graphics (Theme 1)	D: Signing-only (Theme 2)	R: Signing-only (Theme 1)	SA: Graphics (Theme 2)
2	D: Graphics (Theme 1)	SG: Signing - only (Theme 2)	SA: Signing- only (Theme 1)	R: Graphics (Theme 2)
3	R: Signing- only (Theme 3)	SA: Graphics (Theme 4)	D: Signing- only (Theme 4)	SG: Graphics (Theme 3)
4	SA: Signing- only (Theme 3)	R: Graphics (Theme 4)	SG: Signing- only (Theme 4)	D: Graphics (Theme 3)
5	Post training probe	Post training probe	Post training probe	Post training probe
12	Post training probes	Post training probes	Post training probes	Post training probes

3.6.2 General procedures

- Pre-training interviews (Appendix 16) were conducted for three mothers before the development of the training programme when they had agreed to participate in the study. One participant was interviewed a week before the training, during which time she was asked about vocabulary needs (as had the other three

participants as described in the procedure of vocabulary selection described in Section 3.5.2.1 and Appendix 6). Although her input did not influence the selected vocabulary, this was done to ensure she underwent the same procedures as did the other participants and that her individual needs were considered in the debriefing interview.

- Participants (three) were provided with transport.
- With regard to the training, all participants were seen on each day for half- hour sessions scheduled an hour apart. Each participant was seen at a different time slot over the four days of training. This was to accommodate for trainer effects.
- The two training strategies were alternated for all the participants over the four days. The training sets were alternated so that two participants were first trained with Theme 1 and two with Theme 2, alternating on the second day of training. Theme 3 and Theme 4 were alternated in a similar way on days three and four. This was to allow for replication and the control of order effects. A detailed presentation of the design was made in Table 3.1.
- Each set of signs was probed four times (See Appendix 26 for a sample score sheet). Both receptive and expressive signing was probed. The first was a pre-training probe (P0), followed by a post-training probe (P1) for immediate recall following the training, a second, post-training probe (P2) for retention one day post training, and a final post-training probe (P3) for withdrawal one week post-training
- The session format was kept constant across all participants and across the entire training programme. Except for day one each session commenced with a post-training probe (P2), followed by a presentation of information on signing, the sample script related to the theme, then the pre-training probe (P0), the teaching of 24 signs, and finally the post training probe (P1). A session format sheet was used by the trainer to ensure consistency in the order of components of the session (Refer to Appendix 27). The procedures are presented in Table 3.7.

Table 3.7 Procedures followed during training
(Strategy A = Graphics-Sign teaching with sign illustrations in graphic display; Strategy B = Signing only- Sign teaching without graphic display)

Day	Sign training	Presentation of sign information topics	Probes of sign acquisition	Other
Day One	Strategy: A or B Theme:1 or 2	*How signs are formed*	P0 & P1 of training set	Sample script read prior to training
Day Two	Strategy: A or B Theme:1 or 2	*What is Sign Language*	P2 (previous set) P0 & P1 (of training set)	Sample script read prior to training
Day Three	Strategy: A or B Theme: 3 or 4	*Finger-spelling*	P2 (previous set) P0 & P1 (of training set)	Sample script read prior to training
Day Four	Strategy: A or B Theme: 1 or 2	*Sign Language users- Deaf culture*	P2 (previous set) P0 & P1 (of training set)	Sample script read prior to training
Day Five	No Training	----------	P2 (previous set)	Post training questionnaire
Day 12 (1 Week later)	No Training	----------	P3 (sets 1 to 4)	Debriefing interview

- Post-training interviews were conducted a day after the last training session. This was to obtain participants' perceptions of the training (as reflected in Appendix 17). The interviews coincided with the one-day recall probe of the last set taught.
- A debriefing interview (Appendix 18) which coincided with the one week post-training probe was conducted
- The trainer observed the videotapes and scored the probe signs, for sign acquisition and assistance required with the two teaching strategies.
- The training was assessed for treatment integrity across sessions by an inter-rater on conclusion of the training (Section3.6.4.3).
- Probe sign measures for sign acquisition and assistance required by participants during self practice were inter-rated by an independent rater (Section 3.6.4.3).

3.6.3 Training with the different teaching strategies

The specific training strategy used on the day was brought to the attention of the participant at the commencement of the training session, viz. the use of either the graphic displays or the word lists. (The instructions pertaining to the training conditions are described in Appendix 24). Instructions were on hand and read out during the training with each strategy. In addition, the session format sheet (described in Appendix 27) guided the session and ensured consistency in the training sessions.

3.6.4 Measurement of the teaching strategies

Two aspects were evaluated, that is sign acquisition and assistance required during self practice by the participants.

3.6.4.1 Sign acquisition

Participants were tested for their ability to produce probe signs (expression) and to comprehend the probe signs for each theme (reception). They were asked to sign the 15 probe signs in each theme as they were called out by the trainer, as well as to identify the probe signs through verbalization when presented by the trainer. Carrier phrases such as "What is this?" or "Can you sign (gloss)?" were used. Responses were recorded on the score sheets and then later verified by the researcher (trainer) on observation of the video-recording of the session. This resulted in a score out of 15 for each of the four probes (P0-P3) per theme (1-4). Thus for each theme there were 60 opportunities for expression scores and 60 for reception scores, when all probes (P0-P3) were included. On completion of the training these scores were subjected to an inter-rating procedure described in section 3.6.4.3.

3.6.4.2 Assistance required during training practice

This data was obtained from the video-recorded training sessions. The trainer observed the video recording and noted if any assistance was provided during participant practice of signs, and the nature of the assistance. The score categories were: a) no assistance as the sign was produced correctly, b) a repeated demonstration, as the participant failed to

attempt the sign or produced another sign or c) a correction (of handshape, location, movement or orientation) for an approximation of the sign. Only the scores for the probe signs were used in the analyses, although non- probe signs were also practiced and inter-rated because of the difficulty in separating the data. Both the amount of assistance in terms of the number of probe signs where assistance was given, and the nature of the assistance were inter-rated.

3.6.4.3 Treatment integrity and inter-rater reliability

To ensure that the data reflected in the results was reliable, both treatment integrity and inter-rating of probe measures were conducted. Two inter-raters (Inter-rater 1 and Inter-rater 2) were recruited due to the high time demands of the tasks. (Refer to Appendix 28 for details on the procedures conducted). The following formula was used to calculate inter-rater agreement (Schlosser, 2003):

$$\text{Inter-rater agreement} = \frac{\text{Number of Agreements}}{\text{Number of agreements + number of disagreements}} \times 100\%$$

Inter-rating of 20-40% of data is considered adequate (Schlosser, 2003)

i) Treatment integrity

Inter-rater 1 observed video-recordings of 37.5 % of 16 randomly selected sessions with equal representation of the two sign teaching strategies (Schlosser, 2003) and the follow-up sessions (Appendix 29). Inter-rater scores were obtained for two aspects: the components of the training sessions (Appendix 30) and adherence to the teaching criteria and instructions (Appendix 31).

ii) Inter-rater reliability for sign acquisition and assistance scores

Inter-rater 2 observed 100% of the data on video-recordings with regard to the sign acquisition probes. Inter-rater 1 observed 37, 5% of the video-recorded data with regard to assistance scores. The results of these procedures are presented in the results in Section 4.2.

3.6.5 Materials and equipment

3.6.5.1 Training material

The materials used for sign teaching consisted of graphic displays, word lists and practice lists as describe in Section 3.5.2.2. Table 3.8 presents the theme-based sign sets across the four themes.

Table 3.8 Sign sets across four themes

Linguistic category	Theme 1: Going out	Theme 2: Meal related	Theme 3: Behaviour related	Theme 4 : Evening routine
		Probes		
Miscellaneous	1. WHO	1.WHAT	1. SORRY	1. WHEN
Verbs	2. GO 3. CALL 4. VISIT 5. USE 6. HUG 7. KISS 8. HAVE	2. WANT 3. COME 4. WASH 5. LOOK 6. FRY 7. TOUCH 8. ENJOY	2. LISTEN 3. GIVE 4. DON'T 5. STOP 6. BEHAVE 7. SHARE 8. BUY	2. SLEEP 3. QUIET 4. STAY 5. WAKE-UP 6. TRY 7. DO 8. WATCH
Descriptors	9. DIRTY 10. CLEAN	9. NICE 10. GREEDY	9. LATE 10. BAD	9. WARM 10. EARLY
Nouns	11. FRIEND 12. AUNT 13. NEIGHBOUR 14. SHOE 15. HOLIDAY	11. UNCLE 12. BISCUIT 13. SUGAR 14. RICE 15. CHICKEN	11. TRAFFIC 12. SWEETS 13. SATURDAY 14. PARTY 15.GRANDMOTHER	11. SUPPER 12. AFTERNOON 13. CHAIR 14. HOME-WORK 15. WEEKEND
Sign characteristics of probes: ***Translucency*** **- Low (73%)** **- High (27%)** ***Handedness*** **- one (47%)** **- two asymmetrical (23%)** **- two symmetrical (20%)** ***Handshape*** **-easy (33%)** **-difficult (67%)** ***Visible (100%)*** ***Contact (60%)***	 11 4 7 5 3 5 10 15 9	 11 4 7 5 3 5 10 15 8	 11 4 7 5 3 5 10 15 9	 11 4 7 4 4 5 10 15 8
Graphic characteristics of probes: ***SASL(Text 1)*** ***Signed English (Text 2)*** ***Compound signs (13%)***	 14 1 1	 14 1 1	 14 1 1	 13 2 1

Table 3.8 Sign sets across four themes (continued)

Non-probes				
Linguistic category	**Theme 1: Going out**	**Theme 2: Meal related**	**Theme 3: Behaviour related**	**Theme 4 : Evening routine**
Descriptors	16. READY 17. NOW	16. THIRSTY 17. HOT	16. GOOD 17. AGAIN	16. CLEVER 17. TIRED
Nouns	18. JACKET 19. TOWN 20. MOVIES 21. SHOPPING 22. WEDDING 23. BEACH 24.TOMORROW	18. TEA 19. CAKE 20. POTATO 21. STOVE 22. SALT 23. LUNCH 24. MEAT	18. SISTER 19. YOURSELF 20. NIGHT 21. INSIDE 22. OUTSIDE 23. ROAD 24. TRAFFIC	18. YOU 19. TIME 20. CLOTHES 21. BLANKET 22. CUPBOARD 23. TV 24. WEEK-END

3.6.5.2 Equipment

Video-recording of sessions was crucial to the study. All sessions were recorded, using a separate video-tape for each participant - to facilitate access to data for transcriptions and inter-ratings. Three-hour VHS video cassettes were used. The twin-room recording facility is described below:

Room 1 – Interview room – semi sound proofed

- 1X Panasonic CCD Video Camera F15 (wall mounted), with a pan/tilt head – WV-PH10.
- 1X Panasonic CCD Video Camera F15 (on a tripod stand), with a pan/tilt head – WV-PH10.
- 2X Sound Grabbers [flat microphone] - Hanging from the ceiling.

Room 2 – Audiovisual Operation Room – not sound proofed

- 2X monitors/television sets - One for monitoring the actual audiovisual recording [70 cm Philips], and the other for general monitoring [37 cm Supra]. During the recording sessions the split screen display facility (55/45) was used to capture the interviewer and interviewee from different angles.
- 1X National Hifi Stereo VCR NV-F70 HQ (with a Jog & Shuttle search facility).
- 1X Panasonic Digital Production Mixer WJ –MX10.

- 2X Panasonic Camera Remote Controller WV – GR12 (Fixed to the control desk).
- 1X Boss BX – 60 6Channel Stereo Mixer (Fixed to the control desk).

The training was organised around a low children's table with the trainer and participant sitting at a wide angle to each other on adult size chairs. The material was placed on the table during the training to free the hands for signing. The trainer faced the participant during the sign demonstrations. The participant and the trainer were captured on different cameras facing them respectively, and this was recorded on a split screen to allow for simultaneous viewing of the footage for data capturing. The trainer wore dark clothing to ensure that the signs were clearly visible in contrast.

3.7 Data analysis

Both descriptive and inferential statistical procedures were used to compare the teaching strategies. The means procedure was used to obtain scores across probes for the sign teaching strategies and these were tested for significance. The use of inferential statistics was applicable as there was no serial dependency in the data. As there was no serial dependency, and there were more than three phases/treatments, the ANOVA was used (Richards et. al., 1999). F ratios were calculated to determine significant differences - by combining scores in phases and measuring differences in means, looking at group variation. Both the theme sets and the two sign teaching strategies were observed for effects on the acquisition of signs. The assistance scores were assessed for influence of the two sign teaching strategies. The statistical procedures conducted are presented in Table 3. 9.

Table 3.9 Statistical procedures conducted

Test	Purpose of test
ANOVA	i) Sign acquisition To determine the influence of: a) The sign teaching strategy and b) the theme set on the differences between the recall probes and the baseline probes for both expression and reception. ii) Assistance during practice To determine the influence of sign teaching strategy on: a) The amount of assistance and b) the type of assistance (corrections or demonstrations) provided during training.
Wilcoxon	A non-parametric test to determine the difference between the modes (expression and reception) for the graphics strategy and the signing-only strategy.
Mann-Whitney	A non-parametric test to compare the differences in modes (expression and reception) between the two sign teaching strategies.

3.8 Summary

This chapter presented a detailed account of the procedures developed and tested to determine the influence of using graphic representations of signs in teaching signs. The aspects included the selection of a relevant vocabulary using parents as the primary source, the selection of signs to meet the needs of four equitable sign sets for comparisons in the experiment, and the development of procedures and strategies to teach signs in the two defined strategies. The stringent methods used to conduct comparisons of the two training strategies to meet the needs of an experimental design were described.

CHAPTER 4
RESULTS AND DISCUSSION

4.1 Introduction

In this chapter the results of the study are presented and discussed with reference to the aim of the study, which was to determine the influence of using graphic representations of signs in teaching signs to hearing mothers. The two sub-aims - the first to compare the acquisition of signs by teaching signs with and without sign illustrations, and the second to compare these strategies of sign teaching with regard to the assistance provided by the trainer during sign learning - form the main comparisons in the evaluation of the impact of sign illustrations. These aspects were described in the previous chapter that presented the methodology used in the study.

The research design, viz. the AATD (described in Table 3.1) had to be closely adhered to in order to determine the influence of the sign illustrations on sign learning. Four participants attended four half-hour sign training sessions over four consecutive days, during which they all learned the same four pre-selected theme-based sign sets, which were alternated together with the two teaching strategies. Two themes were taught using the strategy of graphics, in which sign illustrations in a theme-based graphic display together with signing was used, and two themes were taught with the strategy of signing-only, in which only lists of the sign glosses were used. The training strategies were described in Table 3.7. A total of 96 signs, 24 in each theme, were taught. Of these, 15 signs per theme, i.e. 60 signs per strategy served as probes for the comparison of strategies with regard to the acquisition of signs and trainer assistance required during sign learning. (The signs sets are presented in Table 3.8).

As the design was specifically chosen to allow for comparison of the sign teaching strategies, the accuracy of the scoring of signs and the assistance provided as measured by the probe signs was critical. The scoring was thus subjected to reliability measures to ensure accuracy and thus confidence in the data. (A description of the procedures used is presented in Section 3.6.4.3). These results will be presented first.

4.2 Reliability of data

Reliability measures involved both the evaluation of the treatment integrity of the training to determine the extent to which procedures were conducted as stipulated in the training schedule, and the inter-rating of sign acquisition scores and assistance scores.

4.2.1 Treatment integrity of the training

Two aspects were considered with regard to treatment integrity. Firstly the consistency of the training was assessed to determine whether all components in a session were conducted, and secondly the adherence to the training strategies in terms of the teaching criteria was conducted, as described in Section 3.5.2.3 of the methodology.

As described in Section 3.6.4.3 (and shown in Appendix 28), 37, 5% (six randomly selected sessions of 16 video sessions) were observed for treatment integrity. The result was that a total of 52 items were checked (Appendix 32). In addition, these same sessions, 37.5% of the total number of sessions were also observed for implementation of the teaching strategies (Appendix 33) with regard to instructions (30 items were checked), demonstrations by the trainer (360 items were checked), the participants' imitations (360 items were checked) and self practice (900 items were checked) to determine the extent to which teaching criteria were observed. The results of the ratings for treatment integrity are presented in Table 4.1. Note the scores were added and averaged where necessary for presentation.

Table 4.1 Results for treatment integrity ratings

Aspect	**Inter-rater agreement**
1. Treatment integrity of training sessions	96% (desirable consistency)
2. Treatment integrity of training procedures - Instructions - Sign demonstrations - Sign imitations - Sign practice	 100% (desirable consistency) 99% (desirable consistency) 98% (desirable consistency) 99% (desirable consistency)

These results, with scores ranging from 96 - 100%, indicate high inter-rater agreement, implying that the training was essentially administered as planned and that the results can

therefore be interpreted with confidence with regard to the training being consistent across the four participants and across the different sessions.

4.2.2 Inter-rater reliability of scoring

4.2.2.1 Inter-rater reliability of sign acquisition scores

As described in Appendix 28, all probe signs, i.e.100% of the data (15 per set, 60 across the four sets), were inter-rated for all probe measures, pre-and post-training (P0-P3) by Inter-rater 2. Thus 960 signs were observed for sign-production (expression) and 960 for sign-understanding (reception). (The results of the inter-rating procedure across themes and participants are presented in Appendix 34). A summary in terms of expressive and receptive scores is presented in Table 4.2.

Table 4.2 Inter-rater reliability ratings of sign acquisition scores

Aspect	**Inter-rater agreement**
Inter-rating of sign acquisition scores	Sign production: 95% (desirable consistency) Sign understanding: 98% (desirable consistency)

The above ratings exceed 90%, which reflects a desirable consistency in the inter-rater scoring of the probe signs (Richards et al., 1997), and thus the sign acquisition data is considered reliable.

4.2.2.2 Inter-rater reliability of trainer assistance scores

These measures looked at the procedural aspects of the training related to Aim Two - to determine the amount and nature of assistance required during self practice. Inter-rater 1 observed six sessions - 37.5% of the data - evaluating the assistance provided for the 15 probe signs per session during self practice of signs trained to criterion (Appendix 28). As there were three phases of practice for each sign, 270 signs were observed and the kind of assistance required noted. An inter-rater agreement score of 88% was obtained. (The results are presented in detail in Appendix 35). Whilst the score of 88% for trainer assistance is lower than the desirable consistency (90%), it does fall within the "adequate" margins of 70-89% (Richards et al., 1997).

In summary, the inter-ratings on the various aspects ranged from adequate to desirable and indicate that the sign teaching strategies were implemented as planned, and the participant responses are reflected accurately in the calculations of sign acquisition and assistance received during training.

4.3 Comparison of the effectiveness of the two sign teaching strategies

The comparison of the teaching strategies which related to the two sub-aims of the study essentially involved comparing the number of signs acquired with each of the teaching strategies, as well as the number of signs with which assistance was required and the nature of that assistance. Sign acquisition was approached in terms of three post-training measures which were adjusted to account for initial baseline scores. The three post-training measures were recall (immediately following training on the same day), retention (one day post-training) and withdrawal (one week post-training) as described in Section 3.6.4 of the methodology

4.3.1 Set equivalence

An additional consideration prior to the above comparisons was the influence of the sign sets on sign acquisition. This was important as the AATD called for the use of equivalent sets in the comparisons - four in this case. Thus the ANOVA was used to verify this. The comparisons considered the influence of sets on the scores related to the three post-training probes. The results of the statistical analyses indicated that there were no significant differences on the acquisition probes for both sign production and sign understanding that could be attributed to the sign sets used in the training, as the p-values were greater than 0.05 as reflected in Table 4.3.

Table 4.3 Influence of theme probe sets on sign acquisition

Sign acquisition probes compared across themes	Sign Production (p-value)	Sign Understanding (p-value)
Immediate recall	0.967	0.634
One day retention	0.895	0.712
One week withdrawal	0.753	0.997

* All statistically significant values on the 5% level of confidence are indicated with an asterisk

It is therefore evident that the probes for the four sign sets were balanced for equivalence as required for the AATD, and therefore allowed for reliable comparisons. This lack of effect of set on the training conditions confirms the procedures used to develop and test equivalence of probe-sign sets, as described in the pre-experimental phase of the study in Section 3.5.2.1.

4.3.2 Sign acquisition

Sign acquisition was examined in terms of both production and understanding of individual probe signs. The results on these aspects for both sign teaching strategies will be presented in this section.

4.3.2.1 Sign production

It must be noted at this stage that the participants were not sign-naïve and although they were matched as closely as possible, there were slight differences in their baseline skills which may be seen to have a bearing on the results, despite their serving as their own controls in the study. The participant knowledge of probe signs in the different conditions pre-training is presented in Table 4.4. (Detailed individual results across the sign sets are presented in Appendix 39).

Table 4.4 Signs produced by individual participants pre-training

	Graphics (N=30)		Signing-only (N=30)	
Participant	**Frequency**	**Percentage**	**Frequency**	**Percentage**
SG	3	10%	4	13%
D	1	3%	3	10%
SA	6	20%	8	27%
R	4	13%	3	10%
Total	14	11.6%	18	15%

Pre-training SA knew the most probe signs, i.e. six (20%) of the 30 signs in the graphics strategy, and eight (27%) of the 30 signs in the signing-only strategy. In fact three participants knew more signs in the signing only strategy as reflected in Table 4, resulting in four extra signs known in this strategy. This overall higher pre-training score in the signing-only strategy is evident when comparing the mean sign production acquisition scores comparing the conditions as shown in Table 4.5.

Table 4.5 Sign production: comparison of means across teaching strategies

	Strategy			
Probes	**Graphics (N=8)**		**Signing-only (N=8)**	
	$\overline{X}$	STD	$\overline{X}$	STD
Pre-training Probe (P0)	1.62	1.30	2.25	1.16
Post training probe, day one (P1)	11.87	2.23	11.87	2.16
Post training probe, day two (P2)	11.12	2.23	11.12	2.43
Post training probe, one week (P3)	8.87	2.47	8.37	1.76

The two post-training probes (P1& P2) in the graphics strategy reflect a catching up with, and then overtaking of this superiority of the signing-only strategy in the withdrawal probe (P3) a week later. This difference in gains measured on post-training measures, taking into account pre-training scores, was tested using the ANOVA. The results however, reflected no significant differences on all three post training measures (recall, retention and withdrawal) although greater gains were made in the graphics condition as reflected in Table 4.6.

Table 4.6 Sign production: comparisons of the two teaching strategies

Gains in sign acquisition	**Strategy**				**p-value**
	Graphics (N=8)		**Signing-only (N=8)**		
	$\overline{X}$	STD	$\overline{X}$	STD	
Immediate recall	10.25	2.12	9.62	1.76	0.55
One day retention	9.50	2.32	9.00	2.39	0.70
One week withdrawal	7.25	2.54	6.12	1.55	0.34

* All statistically significant values on the 5% level of confidence are indicated with an asterisk

Although the differences are not significant, the graphics strategy was stronger on all three post-training probes, with the biggest difference on the final withdrawal probe. It would appear then that the graphics strategy is somewhat stronger in promoting sign production. It is possible that with a larger sample a more significant effect could have emerged. These higher scores for the graphics condition could explain the perception of the benefit of the graphics strategy over the signing-only strategy reported by the participants. All participants commented on the benefit of the sign illustrations. Three participants actually felt it was more useful than the word lists. The following comments were made by the participants - R: "*The pictures were more helpful - show you the sign"*; SG: "*From where I started, I needed illustrations - show me how to grasp it. I am not really that good at knowing how the sign is positioned as such;* D: "*Only words, was a little hard";* R*: "Seeing the pictures helped me a lot. Because even if don't know anything about sign language by seeing the picture - gives you as idea about how to go about it... I found it a very big help looking at the pictures"* (Appendix 36).

The reasons for this lack of significant effect with regard to sign production, despite the reported benefit, and the initial assumption that this multi-modal input would enhance learning of signs may be explained as follows:

Firstly, it could be speculated that the low demand of the evaluation task was a factor. Only 24 signs were taught on a day, with just 15 of these being probed, as the design constraints had reduced the number of signs that could serve as probes (as described in Table 3.8). Thus, a total of 60 signs learned over a period of four days, were used to compare the two teaching

strategies. This is a relatively small number of signs, given the fact that the participants were not sign-naïve. This could have been compounded by the fact that the probes themselves, especially in the receptive mode, served as additional input and as an alert of their importance in the post-training measures. An attempt to control for this was made by changing the order of the signs on the probe lists for expression and reception, and by probing for sign production first.

However, it must be noted that the signs themselves were not "easy" as the majority of signs were low translucency signs (73%) with 67% being classified as having difficult handshapes (as described in Table 3.8). This is evidenced by the fact that only one participant, SA, received a 100% score, and this on only one occasion (P1, Set One), and that having had a pre-training score of four (as reflected in Appendix 39). In addition, two sets of signs were probed on a day making the task somewhat challenging.

Another factor was the training procedure itself which, although developed out of a series of pilot studies that indicated a need for many practice opportunities, could have contributed to the guarantee of success with both strategies. The total of 10 available practice opportunities as stipulated by the teaching criteria, with opportunities for assistance throughout, could have masked difficulties which could have arisen with a particular strategy.

Also, the theoretical underpinning of the study, namely the issue of multimodality in the learning task, could have had an influence on the lack of a significant effect of the graphics condition. First, the bimodal input with regard to signing and speaking during sign learning in both conditions could have assisted with learning of signs, by recoding of the speech message into graphic or sign modality (Smith, 2006). Fourie (1997) noted that the participant in his single subject study of comparative media, used speech to mediate learning of sign vocabulary. Secondly, the use of the graphics together with the signing could be seen as redundant (Alant, Bornman & Lloyd, 2006; Loncke, Campbell, England & Haley, 2006), when initially learning to sign over a short period of time as the participants could be more focused on the demonstration of the sign to master production in three-dimensional space rather than the graphic representation which could be perceived as providing additional and non-essential information. The value of the graphic representation might thus be more apparent over prolonged training.

Finally, the training procedure required minimal focus on the graphic display by providing additional input through both signing and speech. The participants only pointed to the display during the training as a point of focus. Arrows depicting movement were not explained, and participants' attention was not overtly drawn to sign parameters reflected in the sign illustration. The participants were expected to link the illustrations to the signs, without any direction on how to do so. The reason for this was the consideration of experimental control to ensure that additional information on sign formation was not given in the graphics condition and thus possibly lead to contamination of the design. It is possible that greater focus on the sign parameters reflected in the sign illustrations could have assisted in the recall of the signs. Additionally, the elicitation of the signs using the sign illustrations as cues could also have more clearly reflected the impact of the graphic representation on the recall of the signs. However, to more fully address the acquisition of signs, the ability to understand the signs was also probed.

4.3.2.2 Understanding of signs

Once again, prior knowledge of signs had to be considered to establish gains made with implementation of the two sign teaching strategies. A relatively high number of probe signs were understood by participants pre-training as reflected in Table 4.7. (Individual results across the themes and teaching strategies are presented in Appendix 40).

Table 4.7 Signs understood by individual participants pre-training

Participant	**Graphics (N=30)**		**Signing-only (N=30)**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
SG	9	30%	8	26%
D	2	6%	6	20%
SA	7	23%	5	16%
R	5	16%	5	16%
Total	23	19%5	24	20%

The initial scores comparing the strategies are similar, with just a percentage higher in the signing-only condition. Two of the participants knew more signs with the graphics strategy, while the other two knew more signs with the signing-only strategy. It therefore appears that scores were spread almost equally over the two strategies. This close matching of conditions pre-training translated into closely matched gains post-training, as reflected in Table 4.8.

Table 4.8 Understanding of signs: comparison of means across teaching strategies

	Strategy			
Probes	**Graphics (N-8)**		**Signing-only (N-8)**	
	$\overline{X}$	STD	$\overline{X}$	STD
Pre-training Probe (P0)	2.875	1.726	3.000	1.690
Post training probe, day one (P1)	13.000	1.690	13.125	1.807
Post training probe, day two (P2)	12.750	1.581	13.000	2.203
Post training probe, one week (P3)	11.375	2.326	11.500	2.828

The ANOVA showed no significant differences ($p>0.05$) on the understanding of signs when the two strategies were compared across the four probes as reflected in Table 4.9.

Table 4.9 Understanding of signs: comparisons of the teaching strategies

Gains in understanding of signs	**Strategy**				**p-value**
	Graphics (N=8)		**Signing-only (N=8)**		
	$\overline{X}$	STD	$\overline{X}$	STD	
Immediate recall	10.125	2.531	10.125	2.695	1.000
One day retention	9.875	2.167	10.000	2.976	0.929
One week withdrawal	8.500	2.828	8.500	3.338	1.000

* All statistically significant values on the 5% level of confidence are indicated with an asterisk

This finding could be explained by the fact that the training procedure was identical with regard to the input of signing via demonstrations for both strategies, with a high number of observation opportunities as stipulated in the teaching criteria. Once again, the role of the sign illustrations was minimal in terms of input with participants required to point to, while assisted by the gloss, rather than comprehend the graphic representation. The evaluation method matched the input of manual signing as the focus was almost entirely on the real time observation of the sign. Thus, it could be argued that there was less multimodal input influencing outcomes, although the graphic representations were available.

In addition, the testing procedure itself, with the first three probes presented over two consecutive days, could have served as additional learning opportunities. As a limited number of signs were probed in each session, participants could once more, as discussed in the production aspect earlier, have associated sign demonstrations with the probes linked to them, using these as additional input practice.

In summary, it was evident that there were no significant differences between the strategies for both the production and understanding of signs. However, the production of signs did show a tendency for graphics to have been advantageous. Thus a comparison of the conditions with regard to the difference between production and understanding of signs was further explored.

4.3.2.3 Difference between production and understanding of signs

When considering individual scores, it is evident that pre-training more signs (20%) were understood than produced (13%), as reflected in Table 4.5 and Table 4.8 respectively. These higher receptive scores are also evident in the mean scores for all other post-training measures across the conditions, as reflected in Table 4.10.

Table 4.10 Comparison of sign production and sign understanding across strategies

Probe	**Graphics (N = 8)**		**Signing-only (N = 8)**	
	Expression	**Reception**	**Expression**	**Reception**
	$\overline{X}$	$\overline{X}$	$\overline{X}$	$\overline{X}$
Pre-training Probe (P0)	1.62	2.875	2.25	3.000
Post training probe, day one (P1)	11.87	13.000	11.87	13.125
Post training probe, day two (P2)	11.12	12.750	11.12	13.000
Post training probe, one week (P3)	8.87	11.375	8.37	11.500

These differences, when explored on the Wilcoxon test, were significant for both strategies, as shown on in Table 4.11.

Table 4.11 Comparison of strategies with regard to differences between sign production and sign understanding

Probe	**Difference between sign production and sign understanding**					
	Graphics			**Signing-only (N=8)**		
	$\overline{X}$	STD	p-value	$\overline{X}$	STD	p-value
Pre-training Probe (P0)	1.250	1.38	0.06	0.750	1.90	0.37
Post training probe, day one (P1)	1.250	1.24	0.07	1.250	1.03	**0.03***
Post training probe, day two (P2)	1.625	1.92	0.07	1.750	0.46	**0.00***
Post training probe, one week (P3)	2.500	1.30	**0.00***	3.125	1.88	**0.01***

* All statistically significant values on the 5% level of confidence are indicated with an asterisk

With the graphics strategy, the difference between sign understanding and sign production was only significant for the final probe a week later (p-value was < 0.01). With the signing-only strategy, all post-training measures showed that sign understanding was significantly better than sign production. However, the final probe was significant at the 0.05 level compared to the graphics strategy, which was significant at the 0.01 level. Thus at withdrawal, it appears the gap was more significant with graphics. It may be that sign understanding was retained better over time with sign illustrations. However with the signing-only strategy there were significant differences between reception and expression, with the gaps indicating a persistence of better sign understanding than expression.

Possible explanations could be that the production of signs, which is demanding in terms of motor requirements and judged on all sign parameters on assessing for accuracy of signs, could be viewed as more stringent compared to the task of identifying the sign. It must also be noted that signs were selected for both cheremic dissimilarity and semantic similarity to promote ease of learning, and to prevent confusion in learning signs. These factors then could have had a positive influence on the understanding signs. However, the fact that the

understanding of signs was superior to producing signs (Table 4.10) also seems to indicate that language learning had occurred as comprehension is considered better than expression in language acquisition in second language learning (Glass, 1997). This further supports the impression of the participants that they had benefited from the training. Pre-training, participants unanimously described their signing as inadequate with descriptions such as "*pathetic", "very bad"* and *"basic"*. Post-training all participants felt their signing had "*definitely"* improved (Appendix 37).

In summary, the hypotheses for the superiority of the graphics over the signing-only strategy in learning to produce and understand signs were not proven. However, the graphics strategy showed a tendency towards supporting sign production, as reflected in Table 4.7, indicating its possible benefit in teaching signs. Further, the graphics strategy was equally strong in acquiring an understanding of the probe signs, which also appeared to be better retained than with the signing-only strategy. This tendency when seen in an AATD in a clinical setting could indicate the continuation of the strategy in further intervention.

As descriptive participant feedback (Appendix 36) indicated that the graphics strategy was beneficial, despite this not being clearly evident in the acquisition of signs, the nature of the training was explored with regard to the benefit of the graphics condition. Schlosser (2003) notes that while strategies being compared in Alternating Treatments Designs may not show superiority of one over the other on acquisition measures, other effects relating to efficiency of strategies may emerge.

4.3.3 Trainer assistance during practice

The participants needed to be taught to produce signs despite the fact that they had all started with knowing at least a few signs (Section 4.4.1). In other words, they were not sign-naïve. This was done in the context of the teaching criteria. The teaching criteria had involved teaching accurate production following demonstrations and imitations of the sign as described in Section 3.5.1.4. There were 10 practice opportunities during which time the participants used the training material to practice the signs. This was done for both probe and non-probe signs, individually and in two-sign combinations using a KWS approach. Two thirds (four) of the signs were without voice and six were voiced as described in Section 3.5.1.4 of the methodology. Each probe sign was observed at three self-practice

phases. In each of these phases assistance was provided as the need arose. The participants were assisted either at their request or by the trainer in the case of an incorrect production. All assistance was categorized as either another demonstration of the sign or a corrected production of an attempted sign. The inter-rater agreement of the scoring was presented in Table 4.3. In this section, the results for the two training strategies are presented in terms of two aspects: a) the number of signs per set for which trainer assistance was required, and b) the type of assistance, viz. corrections or demonstrations provided.

4.3.3.1 Number of signs requiring assistance

Assistance required was either demonstrations or correction of signs during participant self-practice. For the purpose of comparison, the probe signs (15) taught in a particular theme, were combined with the 15 probe signs from the other theme taught using the same strategy. Thus there were 30 signs per strategy for which assistance scores were calculated for the total of 60 probe signs. It is evident from Table 4.12 which reflects individual participant scores that a high number of signs, more than 60%, had to be repeated by the trainer, as participants could not recall them spontaneously after having learned how to produce them. This high number of signs that needed assistance could have been influenced by the sign characteristics as the majority of signs (73%) were low translucency, while two thirds (67%) of the signs had difficult handshapes (as described in Table 3.7 of the methodology). It is evident, however, that the graphics strategy required less assistance by participants overall, despite two participants (D and R) having scores closely matched for the strategies. (Appendix 41 presents the assistance scores of individual participants across the themes and teaching strategies).

Table 4.12 Number of signs for which assistance was required

Participant	**Graphics**		**Signing-only**	
	Frequency (N=30)	**Percentage**	**Frequency (N=30)**	**Percentage**
SG	18	60%	25	83%
D	19	63%	19	63%
SA	20	66%	24	80%
R	21	70%	20	66%
Total	78	65%	88	73%

It is interesting to note that participant SA who had stated that she did not look at the sign illustrations but relied more on the signing, only "peeking" at the sign illustrations (Appendix 36), needed the most assistance overall, and especially in the signing-only condition. This was in spite of the fact that she had the highest number of signs pre-training. SG showed a similar high number of signs requiring assistance, also having a high number of signs pre-training. It could be that these individuals relied more on sign demonstrations than graphics to learn as they had more experience with signs and could take advantage of the cues.

The difference in the extent to which assistance was required for the conditions was explored using the ANOVA. The graphics strategy ($\overline{X}$ = 9.75) required less input from the trainer, than the signing-only strategy ($\overline{X}$ = 11.00), with a significant p-value of 0.03 ($p < 0.05$). This finding clearly indicates that the sign illustrations provided support in learning to sign. However, the number of signs that were actually produced still appears relatively low, given the fact that the participants were not sign-naïve, and knew a few signs pre-training. The sign illustrations seemed to provide cues that aided the participants in producing more signs independently compared with the list of sign glosses used in the signing-only condition when the sign model was removed. Thus, the sign illustrations could be seen as triggering recall of signs and assisting with sign production in the absence of a sign model. This finding therefore supports the participants' perception that the graphics assisted in the learning of signs. The graphic representation appeared to facilitate recall of signs during self practice. This has long been an assumption in the literature (Cregan & Lloyd, 1990). However, an exploration of the nature of the assistance required provided a clearer understanding of the contribution of the sign illustrations in the sign learning process.

4.3.3.2 Nature of assistance required during sign practice

The nature of the assistance required was explored by looking at whether an additional demonstration of the sign was required or whether a correction of an attempted sign was needed. As there were three phases of practice (as described in Section 4.4.2.1), each sign was observed three times. Thus in a particular theme, with that training strategy, there was a potential total score of 45 (3 x 15 probe signs). For the comparisons of strategies, the probe signs were combined, thus the total scores were out of 90 (45 per theme, two themes per

strategy). The summary of results for the individual participants is reflected in Table 4.13. (Appendix 42 presents detailed results across themes and strategies).

Table 4.13 Nature of assistance given to participants

Participant	Type of Assistance	Graphics		Signing-only	
		Frequency (N=90)	Percentage	Number (N=90)	Percentage
SG	Demonstration	0	0%	27	30%
	Correction	32	35%	26	28%
D	Demonstration	8	8%	27	30%
	Correction	21	23%	14	15%
SA	Demonstration	3	3%	22	24%
	Correction	24	26%	13	14%
R	Demonstration	6	6%	19	21%
	Correction	25	27%	15	16%
Total	Demonstration	17	5%	95	26%
	Correction	102	28%	68	19%

It is evident that there is a marked difference between the graphics and the signing-only strategies for all participants. Fewer demonstrations were needed with graphics strategy, while both corrections and demonstrations were needed for the signing only strategy. The difference between the types of assistance needed was compared using the ANOVA to determine if there were significant differences between the strategies. The results are reflected in Table 4.14.

Table 4.14 Nature of assistance required: demonstrations

Phase of practice	$\overline{X}$		**p-value**
	Graphics (N=15)	**Signing-only (N=15)**	
Practice 1	1.62	7.37	**0.00***
Practice 2	0.50	2.62	**0.00***
Practice 3	0	2.00	**0.00***

* All statistically significant values on the 5% level of confidence are indicated with an asterisk

There were significant differences in the type of assistance required by the participants, in terms of demonstrations versus corrections of signs. It is clear that significantly fewer demonstrations were required for the graphics strategy at all levels of practice ($p<0.01$). Also, the number of demonstrations decreased as the practice increased as shown in Figure 4.1.

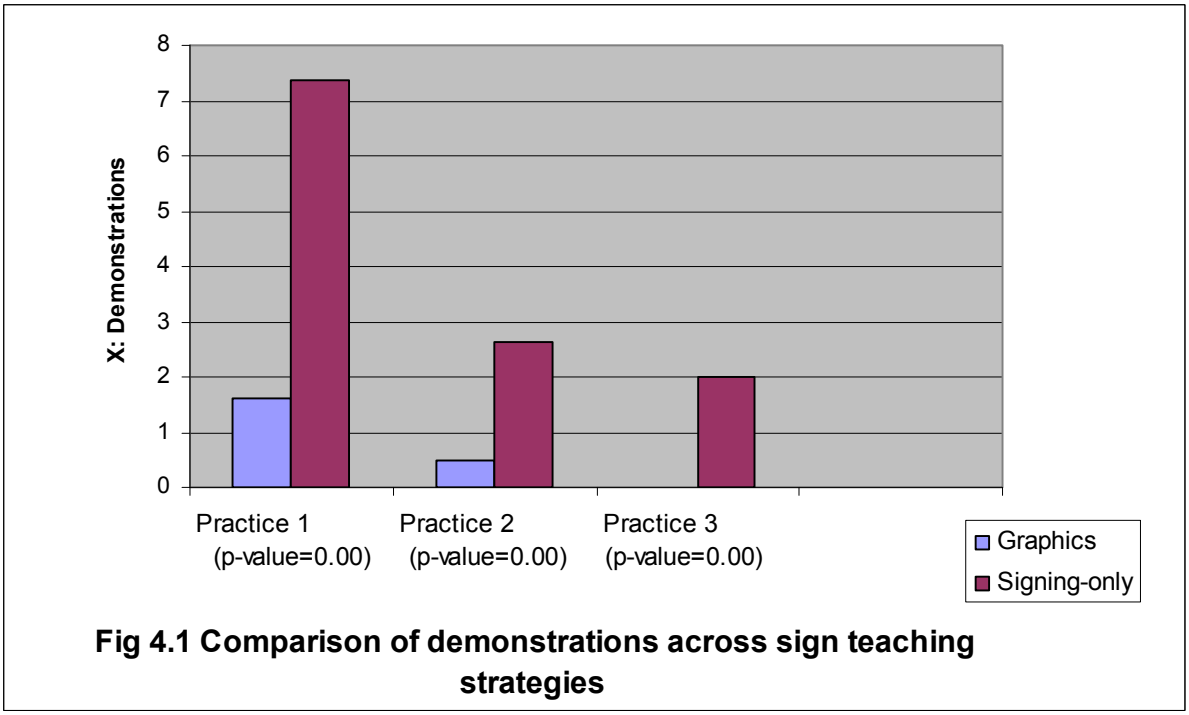

Fig 4.1 Comparison of demonstrations across sign teaching strategies

From this figure, it is clear that as the participants continued to practice there was decreased reliance on the trainer, possibly due to access to the graphics which assisted in the recall of signs. This therefore could make the graphics strategy more efficient, as demonstrations continued to be requested with the signing-only strategy.

With regard to the correction of signs, there was a significant difference between the strategies only during the initial phase of practice with single signs. The graphics strategy had significantly more corrections as opposed to demonstrations (p-value < 0.01) as shown in Table 4.15.

Table 4.15 Nature of assistance required: corrections

Phase of practice	$\overline{X}$		**p-value**
	Graphic symbols (N=15)	**Signing only (N=15)**	
Practice 1	7.00	3.00	**0.00***
Practice 2	3.75	2.75	0.36
Practice 3	2.00	2.75	0.49

* All statistically significant values on the 5% level of confidence are indicated with an asterisk

The correction of signing by the trainer for the graphics strategy however, progressively decreased as is evident in Figure 4.2. The higher number of corrections with the graphics strategy appears to indicate an attempt by the participants to produce the sign, using the sign illustration as a cue. With the signing-only strategy, corrections remained relatively constant. This, together with the high number of demonstrations required with the signing-only strategy, led to greater input being required by the participants during self-practice.

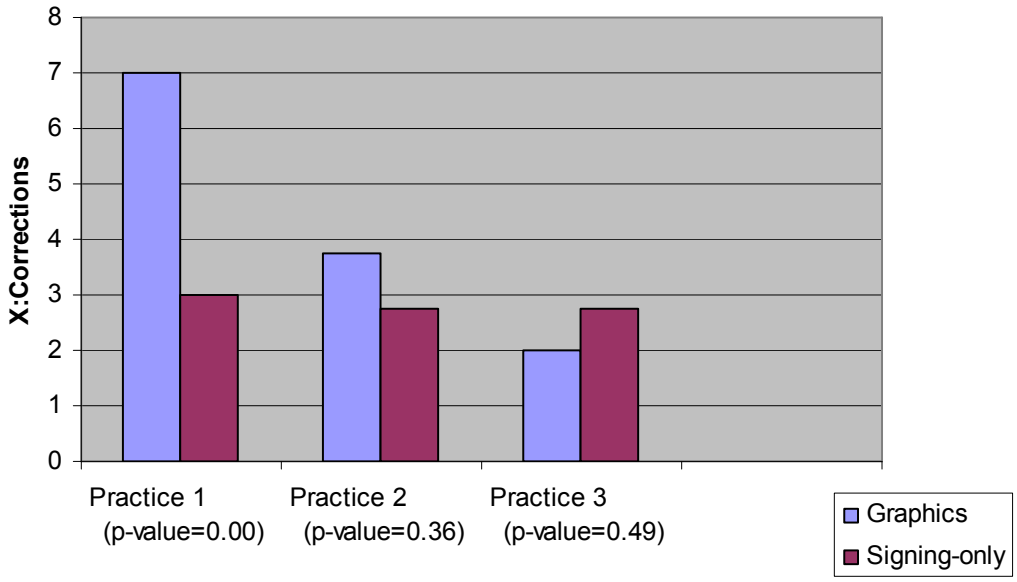

Fig 4.2 Comparison of corrections across sign teaching strategies

It appears that with the graphics strategy, as practice increased participants learned to produce the signs accurately by looking at the sign illustration. This did not occur with the signing-only strategy, where increased practice did not influence the number of corrections required. It is therefore evident that the graphics could have served a supportive role in recalling signs, that the written words used in the signing-only condition did not. The interaction of the corrections and demonstrations of signs during the practice phase of sign learning appeared to contribute to the positive impact of the graphics strategy during training. It is interesting to note that this supports the participants' perception (as described in Appendix 37), whereby participants felt that the graphics were more beneficial even though this was not proven in the first sub-aim looking at the acquisition of signs. It therefore appears that the graphics strategy, with multimodal input was beneficial with regard to self learning. The benefit of using multiple modalities, such as speech, signing, speechreading and graphics, including writing in communication has been the philosophical approach of Total Communication. Further the need for a static representation of signs in sign-learning has been a demand in practical applications of individuals learning to sign (Gustason, 1990).

4. 4 Relationship between sign acquisition and assistance with signs

The two sub-aims, as described in section 3.2, were important to assess the influence of graphic displays on the learning of signs. However, only one of the aspects investigated resulted in the finding of the benefit of the graphics strategy in teaching signs. The first sub-aim, which measured the difference in sign acquisition as an indication of the benefit of the graphics, did not translate into superiority of graphics in sign acquisition when looking at the acquisition of individual signs in terms of sign production or sign understanding. There appeared though, to be a tendency towards the graphics strategy on the production of signs as discussed in section 4.4.1.

The benefit of the graphics strategy became evident on the second sub-aim which probed trainer assistance, comparing the two sign teaching strategies. It emerged that the participants performed better and more independently with regard to practising signs with the use of the graphic displays. Significantly fewer signs required assistance from the trainer when the graphics strategy was used. This is perhaps what is reflected in the participants' reports of the graphics strategy being useful, more so than the signing-only strategy in learning to sign. Further, comments relating to the need for graphics together with teaching sign formation indicate the supplementary nature of the graphics when looking at trainer assistance as opposed to redundancy which appeared to influence learning in the initial stages learning to sign. The participants appeared not to rely on the graphics at that stage, but rather on the sign demonstrations. This raises the question about the point at which graphics take on a supplementary role in learning to sign. It was observed that there were progressively fewer demonstrations and corrections with the graphics strategy as practice increased. This was not evident with the signing-only strategy, where corrections and demonstrations continued to be needed, with continued reliance on the trainer.

4.5 Conclusion

The effect of using graphic representations of signs in sign learning was explored by comparing the teaching of signs with either sign illustrations in graphic displays (graphics strategy) or word lists (signing-only strategy). Both sign glosses and the sign illustrations were visual cues supporting sign learning. The two main areas in which the differences were measured were the acquisition of signs, reflected in the first sub-aim of the study, and trainer

assistance that had to be provided during the practice phase, as reflected in the second sub-aim.

The results indicated that there was no superiority with regard to the acquisition of signs post-training in that there were no significant differences between the two sign teaching strategies. There appeared however, to be a tendency with the graphics strategy, for improved sign acquisition scores with regard to sign production. There was not a similar trend with the understanding of these signs with the graphics strategy. Both strategies appeared to work equally well with regard to acquiring signs receptively. There were however, significant differences between acquiring signs receptively and expressively and this applied to both conditions, especially at one week withdrawal. It appeared also that the signs were retained better in the receptive mode with the graphics strategy on withdrawal of training.

The influence of the graphics was however evident during the sign learning process as measured by trainer assistance. With the graphics strategy, significantly fewer probe signs per set required assistance from the trainer to produce them accurately during the stipulated practice opportunities. This indicated the ability of the participants to use the graphic displays to produce signs. Further, this strategy required fewer demonstrations and corrections in order to produce the signs. In addition, the number of corrections and demonstrations decreased over the practice phases, unlike with the signing-only strategy where these continued to be needed. This in effect, meant that the displays played an important role in teaching signs, making for greater independence and perhaps efficiency in participants learning to sign. The fact that participants felt that the sign illustrations assisted with sign learning further supports its use as an aid in learning to sign.

The use of sign glosses, as used in the signing-only condition, is used extensively by Deaf instructors in Sign Language classes with the direct approach to sign learning. Thus it can be seen that sign illustrations may be as powerful in acquiring signs. However, the graphic displays make for greater efficiency in the learning process. It appears that the use of the format of presenting signs in a graphic display can be seen as both an economic and viable method of teaching relevant vocabulary in context.

It must also be noted that parent interviews, the results of which where not presented in detail in the results section, were valuable in placing sign learning in context for the study

population of interest in this research. The information obtained from the pre-and post training interviews, the details of which are presented in the appendices (Appendix 36, Appendix 37 & Appendix 38), highlights aspects of self perception of signing ability, views on sign learning including motivation and expectations, and the sign learning experience generally and with regard to the two training strategies. It appeared that parents were motivated to learn to sign, perceived the need to improve their signing ability, and reported improved signing, albeit to different degrees as well as benefit from participating in the sign teaching project. In this way they contributed to our understanding of the sign teaching strategies in context.

4.6 Summary

This chapter presented the results and findings of the study with regard to the two sub-aims comparing the learning of a core sign vocabulary with and without theme-based graphic displays with regard to the number of signs learned, and the assistance required during the learning. The reliability of the data and participant perceptions were considered. The use of sign illustrations in graphic displays emerged as a viable support aid to sign learning.

CHAPTER 5
CONCLUSION, EVALUATION AND RECOMMENDATIONS

5.1 Introduction

The closing comments on the study are presented in this chapter, providing an overview and conclusion of the research endeavour. The study is examined in terms of both its contribution to the field and its limitations. Recommendations are made with regard to aspects that could be explored in future research, especially within the context of hearing parents learning to sign as part of their children's intervention.

5.2 Conclusion

Parents of deaf children who are dependent on signing also have to sign, to ensure communication mode-match, a perspective well supported by research (Yoshinaga-Itano, 2000; Wallis et al., 2004; Mitchell & Karchmer, 2006). These parents need to not only embrace a visual language which is suited to a visual modality, that is a Sign Language, but also to develop a level of proficiency in it. For many, this is a very difficult task (Christensen, 1986; Swisher & Thompson, 1985; Gregory et al., 1995). The need for special procedures and innovations for teaching hearing parents to sign cannot be overemphasized. This need has been raised in the literature, with methods of sign teaching to hearing parents of deaf signing children a cause for much debate (Grove & Walker, 1990; Gustason, 1990; Moores, 1996; Lane et al., 1996).

There is a paucity of research in the area of sign learning generally with few studies addressing the issue. Information on the actual teaching of signing has been mainly anecdotal with only a few studies on the training of communication partners (Swisher & Thompson, 1985; Spragale & Micucci, 990; Loeding et al., 1990; Grove & Walker, 1990). In the AAC field, the focus has been on the characteristics of signs and their influence in learning signs (Bornstein, 1990; Loeding, et al., 1990; Granlund et al., 1989; Karlan, 1990). The use of visual support aids has received minimal attention, despite acknowledgement of their role in learning. Whilst many commercial resources, for example story books and

posters depicting signs, are available, and sign illustrations are commonly used in the learning of signs, their contribution to sign learning has not been researched.

This study was motivated by the observation of the need in the region of KZN for mothers of Deaf children to learn and to use SASL (Joseph, 1998; Joseph & Alant, 2000; Cohen, 1996). The consideration of a support-aid, suited to a visual medium, lead to the concept of using theme-based communication displays with sign illustrations. However, the main aim of this study was to describe the role of graphic representation of signs (sign illustrations) in the teaching of signs to hearing parents. Two sub-aims were formulated to compare the conditions of sign learning with and without the use of sign illustrations in terms of (a) understanding and producing signs and (b) the amount and nature of assistance required in learning signs.

The results revealed no significant differences between the two sign teaching strategies for sign reception or sign production post-training. It was speculated that the graphic representations used together with the signs, could have been a factor due to redundancy. There were however, significant differences between the strategies in both the amount and the nature of assistance provided during sign teaching. The graphics strategy required significantly less assistance from the trainer, than the signing-only strategy. With regard to the nature of the assistance, significantly fewer demonstrations were required with the use of sign illustrations during practice. Further, the need for demonstrations decreased as the practice increased. With the signing-only strategy however, corrections and demonstrations by the trainer continued to be required. Thus the participants performed significantly better with regard to practicing signs more independently with the use of graphic displays. It appeared that graphics took on a supplementary role during practice. It was therefore evident that the use of sign illustrations supported sign learning. This finding has implications with regard to resources in sign learning from both the perspective of trainer involvement and self learning, and the cost effectiveness of a print medium in learning to sign.

5.3 Evaluation of the study

The following are considered strengths of the study:

- The framing of the study within an experimental design, firmly addressed the issue of evidence-based intervention. Also, the AATD allowed for comparisons of two strategies in a relatively short period of four training sessions in just four consecutive days. This served both the design requirements and allowed participants access to a short training programme despite their time constraints. The development of equivalent sets, a requirement of the AATD, highlighted and controlled for influences on sign learning in terms of the signs selected for comparisons. This resulted in innovative steps being implemented to acquire translucency ratings for SASL, ratings of performance difficulty of signs, and the rating of sign illustrations which could be of interest to researchers and clinicians using SASL signs.

- The vocabulary in the study was carefully selected for relevance through a series of steps to especially address the vocabulary needs as perceived by mothers of older deaf children. Although mothers were the primary suppliers of the vocabulary within themes, input was also obtained from teachers and the researcher. This was a unique aspect of the study as existing vocabulary lists were not adequate to address the specific needs of this population. Furthermore, the use of themes to meet the needs of communication displays allowed for a range of grammatical structures, other than the typical nouns and verbs. The attention to vocabulary selection which had a direct benefit to the participants enhanced the external validity of the study. This was confirmed by participant views that the vocabulary was highly relevant to their daily living, which has been a contention in general signing courses for parents.
- There was consistency of training across the participants as evidenced by high treatment integrity measures, thus supporting the acceptance of the study outcomes.

- The study embraced the concept of the centrality of visual methods in learning a visual language (Thoutenhoofd, 2003). The use of sign illustrations as a resource in sign learning has been addressed as a viable method despite other modern methods such as those using video and computer technology, as it is cost effective and as a

print medium, an accessible aid to sign learning, especially in developing countries. It must be noted however, that the use of the sign illustrations as a teaching strategy was embedded into a more complex strategy of using a graphic display format and motivational vocabulary, with additional supporting procedures in a teaching scenario approximating signing classes, the impact of which may be synergistic.

- The researcher, who was also the trainer, is a Speech-Language Therapist and Audiologist, and an experienced signer, having worked in the field of aural rehabilitation with children who sign for 15 years, which included three years of full time employment at a signing school for the deaf in KZN. These insights were brought into the development and implementation of the training strategies. However, to ensure objectivity with implementation of procedures and measurement of outcomes, inter-rating procedures were conducted and indicated high agreement.

The limitations of the study:

- While the research design, the AATD, was critical to examine the effectiveness of sign illustrations in sign learning, it placed constraints on the training due to the stringent controls of an experiment. These effects were seen in the limited number of signs that could be used due to the criterion of sign equivalence across the four sets while maintaining the selected themes, thus having an impact on the external validity of the study.

- The design further influenced the evaluation of the signing ability by restricting measures to individual probe signs in the data collection procedure which revealed no differences between the strategies.

- The lack of differences between the strategies could also be attributed to the relatively short period of training which is not typical in sign learning. This period of training met design requirements but could be seen to influence the study outcomes.

- The characteristics of the signs, namely predominantly low translucency signs which were influenced by design constraints, are not typical in introductory sign learning

programmes. This could be considered a difficult task for parents just introduced to sign learning and may have masked differences between the two teaching strategies.

- The provision of many demonstrations and modeling opportunities to parents, designed to strictly control input in terms of the design, could have masked the differences with the strategies especially as these were not sign-naïve participants.

5.4 Recommendations for further research

The following aspects could be explored in future studies:

- Change in the design for application to a group design using a control and experimental group. This would then allow for an increase in the number of signs taught with a particular teaching strategy, as well allow for more in-depth assessment such as sign combinations and rating scales to assess the effectiveness of the graphics strategy.

- To explore more fully the influence of graphics strategy, the assessment could be refined by direct linking of the sign illustration to the manual sign parameters in the training and the evaluation procedures. The sign illustrations themselves could be used to cue both sign understanding and sign production.

- Training over a longer period in a more natural sign learning process. This could involve participants taking the training material home to practice with. This might highlight the impact of having a stronger visual aid to remind parents of the signs taught over a period of time.

- It would be interesting to assess the use of sign illustrations in graphic displays with parents who are African language speakers who speak English as a second language or not at all, and who make up a large percentage of parents at schools for the deaf in SA.

- Theoretical implications which could be explored in future studies include the exploration of the actual cues provided by sign illustrations in learning signs, as well as the representation of signs in memory, from the perspective of a visual language.

5.5 Summary

This final chapter briefly revisited the rationale for the study before presenting a summary of the main findings of exploring the role of sign illustrations within the context of theme-based graphic displays in learning to sign. The strengths and weaknesses, together with recommendations for future research were presented. The study, it is believed confirmed the priority of exploring more dedicatedly strategies for addressing the need of hearing parents to sign to facilitate their communication with their deaf signing children.

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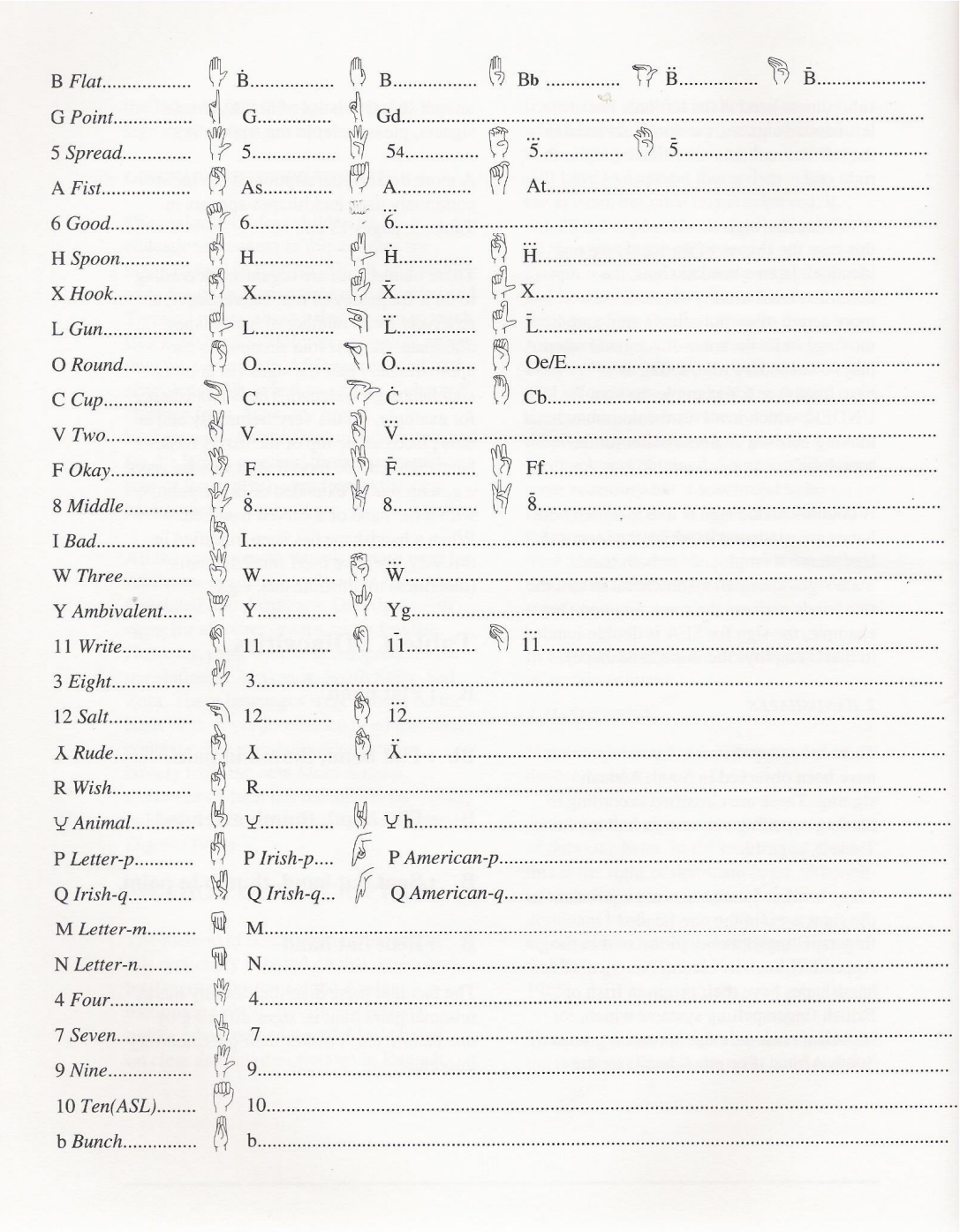
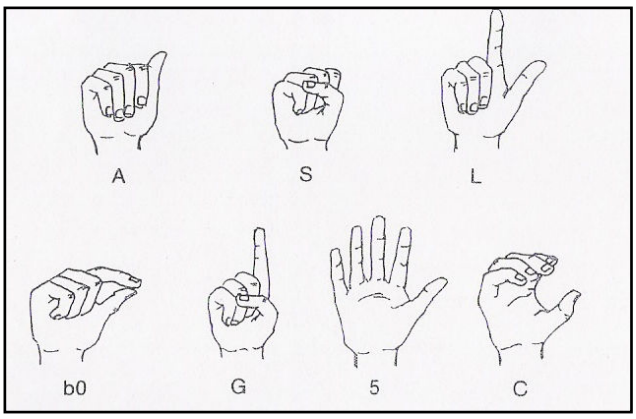
APPENDIX 1
Handshapes

1. Handshapes in SASL (Penn, 1992)

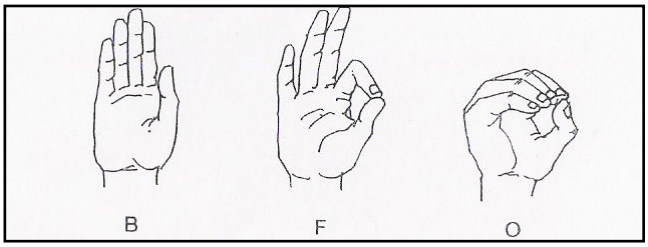


2. Stages of handshape acquisition in ASL (Boyes Braem, 1994)

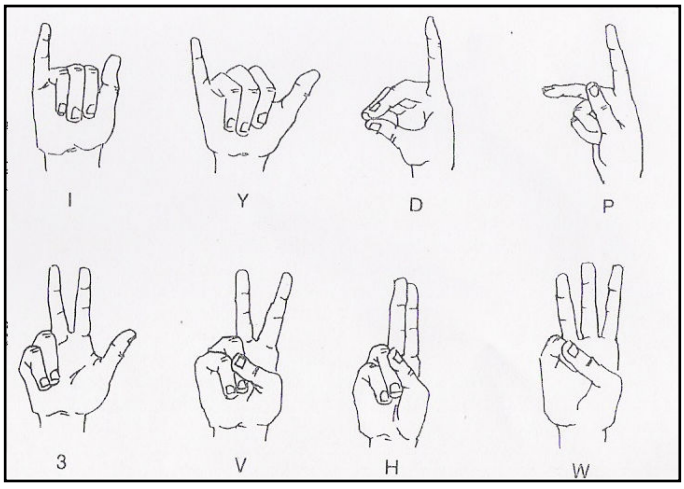
a) Stage I Handshapes (A, S, L, Bo, G, 5, C):



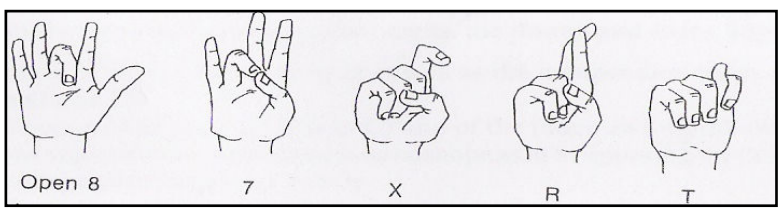
b) Stage II Handshapes (B, F, O):



c) Stage III Handshapes (I, Y, D, P, 3, V, H, W):



d) Stage IV & V Handshapes (8, 7, X, R, T, M, N).
Note: "N" and "M" are variations of "T", with the thumb inserted either after the second or third fingers respectively.



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Appendix 2
Ethical clearance

2001-02-14

Mrs L Joseph
10 Constance Cawston Road
WESTVILLE
3630

Dear Mrs Joseph

APPLICATION : ETHICAL PROCEDURES FOR RESEARCH

Your application to the Research Ethics Committee of the Faculty regarding appropriate ethical procedures for your PhD in Augmentative and Alternative Communication has been reviewed. I have the pleasure to inform you that your application has been approved.

We wish you everything of the best in the execution of the research.

Yours sincerely

.....
Prof D Beyers
CHAIRPERSON : RESEARCH ETHICS COMMITTEE

cc. Prof E Alant
Department of Communication Pathology
University of Pretoria

Appendix 3
Letter to school requesting permission to conduct study

Centre for Augmentative and Alternative Communication
Sentrum vir Aanvullende en Alternatiewe Kommunikasie
&
INTERFACE

University of Pretoria

2002 *Shirley McNaughton Award for Exemplary Communication received from the International Society for Augmentative and Alternative Communication*
1998 *Rolex Award for Enterprise: Associate Laureate*
1995 *Education Africa Presidential Award for Special Needs*

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Centre for Augmentative and Alternative Communication
Sentrum vir Aanvullende en Alternatiewe Kommunikasie
University of Pretoria, Lynnwood Road
PRETORIA, 0002
SOUTH AFRICA

The Principal

RE: PERMISSION TO CONDUCT RESEARCH AT _____

Our brief telephonic conversation earlier this year bears reference. Thank you for kindly agreeing to consider _____ as a possible site for inclusion in the research I am undertaking.

As you are aware, I am a Speech Therapist and Audiologist, currently registered for a PhD in Augmentative and Alternative Communication (AAC) at the University of Pretoria, with Professor E Alant as supervisor.

My area of interest is the communication between deaf signing children and their hearing parents. Many researchers have commented on the generally poor use of signing within the home context. Studies undertaken in South Africa have observed that many parents have little if any signing skills (Cohen, 1996, Storbeck, 1994, Joseph, 1998). The reasons for this are complex, and often related to access and attitude.

The present study acknowledges that the deaf child has the right to communicate in his/or her own natural language, i.e. sign language. It appears, however, that many of them are unable to use this form of communication with those closest to them, viz., their families. This is especially the case with the late diagnosed deaf child whose parents typically do not attend parent guidance programmes and have difficulty catching up and keeping up with the child who soon begins to sign fluently. This is a common scenario in South African.

This study aims to investigate one strategy to facilitate signing in the home for this specific population. Methods of intervention from the field of AAC, viz. communication displays as an introduction to signing is to be investigated, using participants based at schools for the deaf in Kwa-Zulu Natal. The primary outcome of the study is seen as the development of a training method that could be used to facilitate the learning of signs. The immediate benefit to parents will be participation in a programme to assist in learning to sign.

With regard to _____, this would require:

1) My obtaining access to children (possibly 3-4 children in the Bridging or Junior Primary phase) and their non-signing mothers who meet specific criteria
2) A half- hour interview with teachers in the Junior Primary phase.
3) A consultation with the resident Speech therapist/Audiologist/Head of Department with reference to (1) and (2) above.

Ethical clearance has been obtained for the project from the University of Pretoria Ethics Committee. Please refer to the attached letter. All participants, will be guaranteed anonymity and confidentiality. The results of the study will be made available to the school on completion. I look forward to your favourable response.

Yours sincerely

Mrs Neethie (L.) Joseph

Prof Erna Alant
Supervisor

Appendix 4
Letter to school

Centre for Augmentative and Alternative Communication | **Sentrum vir Aanvullende en Alternatiewe Kommunikasie**
&
INTERFACE

University of Pretoria

2002 *Shirley McNaughton Award for Exemplary Communication received from the International Society for Augmentative and Alternative Communication*
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SOUTH AFRICA

Dear parent

PARTICI PATION IN STUDY: "The impact of using theme- based graphic communication displays on the learning of signs by mothers of deaf children"

Thank you for agreeing to participate in this study.
Many parents experience difficulties in learning and using sign language with their children. This study involves looking at strategies to assist parents of deaf children to learn some basic signs as an introduction to sign language. By participating you will be helping us to have a better understanding of methods that can be used in sign language learning by hearing mothers who have children who are dependent on sign language.

You are required to take part in 6 half hour sessions. During this time, you would be required to participate in:
1) An interview
2) Four half – hour lessons over four days, during which you will learn a set of basic sign vocabulary,
3) Two follow up sessions: the first, a day after the training; then a follow- up interview a week later.
The sessions will be video-taped, to assist me in monitoring the training. The videos will be used strictly for the purpose of the research. Note your participation is totally voluntary and you can withdraw at any stage. If you do take part in the study, you will remain anonymous, and your information will be kept confidential. Your participation is much appreciated. Please feel free to call me if you have any queries.

Sincerely

Mrs Neethie (L) Joseph
Tel: 2664510 (home)
260 7625 (work)
0826891412 (cell)

Prof Erna Alant
Supervisor

CONSENT FORM

I have been informed about the nature of the study "**The impact of using theme based graphic communication displays on the learning of signs by mothers of deaf children"**

I understand:

- My participation is voluntary, and I can withdraw from the study if I so wish without any penalty
- My identity will not be disclosed, I will remain anonymous, and my contribution will be kept confidential.

Signature: _____

Appendix 5
Preliminary procedures for vocabulary selection: pilot studies

Objective	Procedure	Justification	Results	Recommendations
1) To assess methods of vocabulary selection using mothers and teachers	One mother of a deaf child, as well as two grade two teachers – one hearing and one Deaf, from the selected school participated. The child was a profoundly deaf 10-year old female with no intelligible speech, but "some" speech-reading ability. Both sets of informants were asked to: a) Generate as many words as they possibly could that would improve communication in the home-up to 110 words b) Name 3-4 themes that would be important to facilitate communication in the home. c) Words generated were compared to each other as well as to available vocabulary lists used to teach signs to communicative partners (Loeding, et al. 1990, Grove & Walker, 1990).	It was felt that teachers would know the language abilities of the child and therefore be able to supply useful vocabulary that would be known and needed by the children. This was to ensure that the language input in the home was in keeping with the child's language level as reported by teachers.	a) There were noticeable discrepancies between the words that were generated by the teachers and the mothers. Only approximately 10% of the words were common. The teachers appeared to focus more on language learning, while the mother was more focused on information sharing. In addition the mother tended to produce words, phrases and sentences in her submission, whereas the teachers produced mainly words in syntactical categories. b) Themes submitted by both sets of informants were more congruent (family/home, meals, school, and safety/behaviour). c) The vocabulary did not closely approximate the word lists chosen. This could be due to the context in which the existing lists were used, i.e. with teachers and hearing children, and focussing on initial lexicon for younger	a) Mothers should provide the primary input in selecting vocabulary to ensure that the selected vocabulary was functional in their context b) Vocabulary lists should be developed around items and themes submitted by parents. c) Existing lists in the field should be used to supplement vocabulary supplied by mothers.

Objective	Procedure	Justification	Results	Recommendations
			children.	
2) To assess strategies to elicit vocabulary from mothers/ care-givers	A group of 5 mothers, who were attending an orientation programme at the school for late diagnosed children just enrolled, were interviewed to assess the proposed strategy of selecting vocabulary. This was primarily to look at the current level of communication and assess the viability of using common themes. Participants were 4 mothers and an aunt who was a primary caregiver, who were all Zulu speaking. One of the participants served as interpreter. The class teacher was present during the group interview. In addition, 4 mothers from a second intake class were interviewed individually.	Open ended questions were used requesting mothers to describe how they communicate at home, and what is usually communicated. They were not asked to submit lists of vocabulary as it was felt this was not ethical as there would be no follow- up teaching with this group.	The mothers described themselves as communicating by using natural gestures and pointing, while using Zulu words and phrases. With regard to vocabulary used, individual words were not forthcoming – rather scenarios and related utterances were provided. These were however, very limited. Themes mentioned related to morning routine, meals, getting dressed, behaviour, and explanations about going out. Natural gestures were used predominantly.	Mothers selected for the study and pilot study would provide the vocabulary for the programme. The tasks would need to be very structured in order to elicit a wide enough vocabulary for the programme. Communication with non- signing parents was very impoverished and rating of signs may be difficult. It was recommended that these parents participate in a language stimulation programme, targeting functional sign vocabulary. Feedback was given to both the class teacher and student clinicians working with the children and their parents. Using common themes across all participants was feasible. One would however, need to look broadly for themes and common functional vocabulary. Input from the researcher would be required.

Appendix 6
Vocabulary selection procedure used in the main study

Steps in vocabulary selection	Procedure	Justification	Results	Recommendations
1. Participant contribution of vocabulary and themes	Interviews were conducted individually with participants selected for both the pilot study and the main study. The following methods were used to elicit vocabulary for the programme: a) Open-ended task: Mothers were asked to submit as many words or phrases and sentences as possible. In doing so they were asked to: 1)Reflect on daily routines, " Think about what you do daily at home and need to talk/communicate about" 2) Provide vocabulary that would be useful in the home context, i.e. allowing them to communicate about what they wanted to or would like to in the context of everyday life, " List all the words/phrases or sentences/expressions in signs that would be helpful to talk/communicate about these daily activities and interactions" 3) Provide items that would improve communication between themselves and their child, "List vocabulary that would improve communication with your child at home, include things that your child usually wants to communicate as well." They were told that they could submit up to 128 words. This was to encourage them to think broadly, and contribute as many functional items as possible. b)Directed task. This second step was used to somewhat prioritise targets in terms of settings	This was to ensure that the selected vocabulary was highly functional and would therefore be motivating in the learning of signs, encouraging commitment from the participants (Arvidson & Lloyd, 1997; Loeding et al, 1990). Semantically related signs taught together, as within themes, are considered to facilitate sign learning (Spragle & Micucci, 1990). The procedure outlined by Loeding,et al. (1990) and Spragle & Micucci (1990) were used with adaptations. Loeding et.al. (1990) had a teaching vocabulary of 122 signs in their programme, while the Makaton programme (Grove & Walker, 1990) has a core vocabulary of about 350 words with approximately 70 being	Four mothers contributed vocabulary, three from the main study and one from the pilot study as one participant was not available over a protracted period. However, prior to commencement of the study, this participant was taken through the same process, but did not contribute any new items. Her responses were minimal. a) Signs: A total of 289 words were generated by the four participants, of these 210 were new items and 79 were repeated items (45 twice, 15 thrice and 2 four times). Refer to Appendix G. Mothers found the open ended task difficult, there were periods of silence initially, and it appeared overwhelming, e.g. Participant SG stated "nothing comes at the moment". Responses were more forthcoming with themes. Also, submitted vocabulary was primarily what mothers felt they wanted to communicate, rather than from the child's perspective despite being asked to consider what the child may wish to communicate. b) Identified themes: Routines were considered important. Refer to Appendix H for parent submissions with regard to vocabulary within themes. Eight broad themes were mentioned, mainly in the context of routines within lesser themes.	Four themes should be selected, based on which were most common and the vocabulary should be arranged around the themes. This would require that themes be further condensed to ensure sufficient and equal numbers of words in the sign sets. Novel signs requested should be addressed in the debriefing interview. Researcher input would be required to ensure that the selected themes had the necessary spread of vocabulary to meet the requirements of a theme-based communication display. The 4 themes that

Steps in vocabulary selection	Procedure	Justification	Results	Recommendations
	and themes to be included in the training programme. Mothers were asked to specifically submit four topic areas in order of priority, together with the words, phrases and short sentences around the themes or topics identified. This could include vocabulary previously mentioned or include new topics or vocabulary. The four most frequently mentioned topics were to be included in the training programme.	taught in their introductory workshops. Topics were restricted in an effort to control vocabulary size. Loeding et.al., (1990) had initially generated a vocabulary of 1063 which was first reduced to 612, and finally 122 signs.	The following themes were identified and categorized from parent input: 1.Getting ready/ morning routine (waking up, bathing, getting dressed, packing bag, going to school) 2.Mealtimes (food/ in the kitchen, time issues, lunch, supper) 3.Family and people (family and others, visiting, behaviour) 4.Places (outings, out of the house, shopping, safety) 5.Evening routine (discussion of day, help with home work, watching TV, doing home –work, bed time, discipline) 6. Time issues (time, day of the week/weekend, early/late, wait, hurry, etc.) 7.School issues (getting ready for school, after school routine, homework) 8.Dressing up (buying clothes, wearing clothes, hygiene)	will be used are: Going out, Meal related, Behaviour related, and Evening routine.
2. Researcher input to vocabulary and development of themes.	1. The themes submitted by parents were condensed, smaller themes to fit into bigger. This was motivated by the concept that words do not exist in isolation (Ling&Ling, 1977). Thus, where vocabulary could be shared as influenced by context, they were put into a common theme. It was felt that greater carry-over may be possible if vocabulary was not restricted to a daily routine, but rather themes emerging from parent submissions, e.g. bathing in the morning or evening, time issues day /or night, getting ready any time of day etc.). Thus the vocabulary was reorganized to facilitate greater commonality of vocabulary	Sufficient words in some themes were lacking from parent input. A mixture of grammatical categories within themes for teaching language to school-aged hearing impaired children, as used by Ling and Ling (1977) lends itself to the concept of	A further 92 words were added, and four sets of words organised in themes were developed. The vocabulary within the themes was arranged such that there was a spread across the grammatical categories: miscellaneous, verbs, descriptors, and nouns. Analysis of parent vocabulary (as presented in Appendix G) revealed 47% nouns, 31% verbs, 18% descriptors and 4% of miscellaneous words. This reflected a high percentage of verbs and	Four themes were developed from a total of 283 words: 1. Going out (61) 2. Meal related (66) 3. Behaviour related (82), and 4. Evening routine (64) All vocabulary items were classified as belonging to one of the four syntactic categories, viz.

Steps in vocabulary selection	Procedure	Justification	Results	Recommendations
	within a theme- where this was applicable (e.g. with the After - school routine: "Did you eat your lunch?" was moved to Mealtime). The overall aim was to provide a set of highly functional vocabulary, rich in interactive content, loaded with verbs and functional vocabulary. 2. Lists of signs for initial lexicons by Fristoe and Lloyd (1980), and the Makaton programme stages 1 to 3 (Grove & Walker, 1990) were consulted, and signs appearing on both lists were included. In addition, the Ling and Ling (1977) programme for teaching language to school-age hearing impaired children within routines served to provide real utterances applicable to this population. Words were selected from the lists of vocabulary recommended for the first 500 words, the next 500 words, and words appropriate for children in grade 1, and the early reading programme in school. In addition, samples of utterances in context of phrases and sentences from Ling and Ling (1977) were scrutinized. This programme guided the choice of words, and assisted with supplementing vocabulary within the themes, across semantic categories (nouns, verbs, descriptors and miscellaneous). The word lists (first 500) used by Penn (1992) in the development of the *Dictionary of Southern African signs* using input from teachers and families in choosing signs in teaching young children, was also consulted. Lexical items were also selected in terms of knowledge of sign language rules (Penn,	communication displays. In keeping with the concept of the theme board, the numbers of words in the different categories was determined. Descriptions of ratios across syntactic categories by Owens (2001) influenced the ratio of words within the different syntactic categories. The following ratio, based on the developing child with a vocabulary of up to 400 words was used: nouns – 50%, verbs – 30%, descriptors -10%, and miscellaneous words-10%. Cognizance was taken of the ratio shift between nouns and verbs in the older child, with a decrease in nouns and increase in verbs (Owens, 2001).	descriptors, more so than Owens (2001). This would then translate into 15 nouns, 10 verbs, 6 descriptors and 1 miscellaneous word, for a total of 32 signs. The goal at this stage was to teach four sets of 32 signs	nouns, verbs, descriptors, or miscellaneous words. Scripts utilizing these words and other semantically related words were produced for all four themes.

Steps in vocabulary selection	Procedure	Justification	Results	Recommendations
	1992) such that English based words such as articles and auxillary verbs were excluded. The use of conceptually correct signs was considered (Vold, Kinsella- Meier & Hughes Hilley, 1990). Thus vocabulary was arranged within themes both from input from participants and from input from the researcher to allow for a range of vocabulary to ensure that the themes were cohesive and allowed for a wide choice from which to extract balanced sign sets. Sample scripts were used to group signs within themes from which the vocabulary was to be extracted for the theme-based sign sets.			
3. Teacher rating of vocabulary and comment on sample theme scripts	Four sets of theme- based vocabulary and sample theme scripts were presented for rating to three teachers (two Heads of Department of the junior primary phase – current and past, and a Deaf teacher responsible for sign language teaching in the school). The teachers needed to rate the vocabulary in terms of whether the sign would be known by a child in grade 3 (3-4 years at school). The categories were: Yes, No and Maybe. In addition, teachers commented on whether the sign should be included in the training programme, according to the following categories: 1= not at all, 2 = not really, 3 = maybe, 4 = recommended, 5 = highly recommended. Refer to Appendix 7 for the information presented to the teachers.	The rating of sign vocabulary for selecting signs has been used in sign programmes (Spragale & Micucci, 1990). The vocabulary was commented on by teachers to ensure that the vocabulary was within the children's experience and to also comment on the suitability of the selected vocabulary.	Scores ranged from between 3 and 5 for all items. Words were eliminated, and ratings influenced choice of vocabulary. Following the ratings, any words that were felt not to be in the child's vocabulary was omitted, with 2 exceptions as these words were requested by 2 parents. All participants felt that the scripts were very appropriate, providing functional vocabulary. A total vocabulary of 202 words was obtained.	The vocabulary would be equitably distributed among the four theme sets. This would require attention to sign characteristics known to influence sign learning: - Iconicity (translucency) - Semantic similarity - Cheremic similarity - Sign production characteristics

Appendix 7
Participant contribution of vocabulary

Words presented alphabetically, with number of times in parenthesis

age (1)
alone (1)
aunt (3)
bag (1)
bake (1)
bath (1)
belt (1)
beach (2)
beans (1)
bed (2)
behave (1)
big (2)
biscuit (2)
blanket (2)
book (1)
boy (1)
bridge (1)
bring (3)
brother (1)
brush (1)
burn (1)
bus-driver (1)
bus (1)
busy (2)
butter (2)
can't (2)
careful (1)
cereal (1)
cheese (1)
chair (1)
church (1)
clean (1)
clever (1)
close (1)
clothes (3)
come (2)
cover (1)
cook (3)
costume (1)
cousin (3)
crease (1)
day (2)
dholl (1)
different (1)
dinner (1)
do (3)
don't (3)

door (1)
drawer (1)
dress-up (2)
dreaming (1)
dry (2)
early (1)
ears (1)
egg (1)
face (1)
false (1) =not true
family (1)
far (1)
fast (1)
fasting (1)
find (1)
food (1)
forgot (1)
Friday (1)
friend (2)
gargle (1)
girl (1)
go (3)
good (1)
good night (1)
grow up (1)
grandfather (1)
hair (1)
hands (1)
have (4)
hearing aids(1)
home (1)
home-work (1)
hot (1)
house (1)
how (1)
hug (1)
I (1)
In (1)
jam (1)
kiss (1)
kitchen (1)
later (1)
late (2)
lip-ice (1)
library (1)
like (1)
lock (1)
long (2)
lost (1)
lotion (2)
love (1)
lunch (2)
make (3)

me (1)
meeting (1)
microwave (1)
milk (2)
milo (1)
mine (1)
Monday (1)
movies (1)
must (3)
mutton/meat (2)
naughty (2)
neighbours (2)
nephew (1)
next (1)
nice (2)
niece (1)
night (1)
not (2)
now (2)
obey (1)
o'clock (1)
off (1)
ok (1)
on (1)
only (1)
open (3)
finish (1)
pajamas (1)
pack (2)
pasta (1)
play (2)
2 people (2)
pillow (1)
polony (1)
porridge (2)
potatoes (1)
pour (1)
powder (1)
prayer (1)
put (4)
reading (1)
ready (2)
relax (1)
relatives=family(1)
rice (1)
road (1)
robot (1)
room (1)
Sandra (name) (1)
sentence (1)
tidy up (1)
service(prayer) (1)
shampoo (2)

share (1)
shirt (2)
shoes (1)
shopping (2)
sick (1)
sign board (1)
soap (2)
straight (1)
strangers (1)
stay (1)
stop (1)
supper (2)
Sunday 1)
sunny (1)
talk (1)
taxi (1)
that (1)
tired (1)
time (2)
to (1)
today (2)
together =with (1)
toilet paper (1)
toothpaste (3)
touch (2)
TV (1)
trouble (2)
truck (1)
uncle (2)
uniform (1)
us (1)
use (1)
wake-up (2)
vegetable (1)
visit (3)
viennas (1)
want (3)
wait (2)
wash (2)
wear (1)
we (1)
“weet-bix”
wedding (1)
weekend (1)
where (1)
what (3)
which (1)
who (1)
why (2)
with (2)
work (2)
you (1)
your (2)

yourself (1)

Total words= 289
Number of words repeated = 79 (45 words twice, 15 words thrice, two words four times)

Appendix 8
Participant contribution of themes

Words, phrases and sentences contributed

Categories	Participant D	Participant R	Participant P	Participant SG
Getting up	Wake up. It's late. Time is going.		Wake up and bath.	Let's go to bath. Need to bath. Need to brush your teeth.
Getting ready for school	Bring __. Tell sister. Brush your hair. Tuck shirt in. Shirt will crease. Dress up (change, clothes) Too much powder. Forgot to comb. Brush hair. Open belt. Pack your bag. Get ready. Walk fast. Bus is gonna come.		Put lotion. Bring your shoe. Open the drawer. shirt	Are you ready? Dress up. Is your bag, packed? Take your costume. Did you feed the fish? Did you rub lotion? Is your bag in the car? Is your hearing aid okay? Volume okay? Your lips are dry, put lip-ice.
After school			Do you want to eat? Must go bath. Keep your bath water (heat). Go put your clothes away- in the wash tub.	
Eating/ mealtimes	What do you want to have? Stop dreaming. Eat-porridge, jam, butter, milo, polony, viennas, cheese Don't put in microwave. Wait for me. Don't touch. You will be big. Certain foods not good for you. Today we are fasting. Cannot eat certain things. I am cooking now. Wait, the food is not ready. Eat first then, watch TV. Make porridge/cereal. Pour	I am cooking-meat, vegetables, potatoes, eggs.	What you want to eat? - jam, butter, cake, chicken	Did you have your lunch/sandwiches? Did you share your lunch with your friends?

Categories	Participant D	Participant R	Participant P	Participant SG
	the milk. Must eat. Can't have.			
At home			Don't come late. Where go.	Set your room. Put your cars away. Where's you reading book? Bake biscuits together. Kitchen, decorate, milk, today, butter, cook, pasta
Home – evening		Did you have a good day? Did you do your home work? Did you clean the house? Did you go visiting? What did you eat for lunch? What did you eat for supper? Are you tired? You are a clever girl I am tired, busy Leave me alone for awhile. I want to relax for a little while		
Bath time	toothpaste, gargle, wash your face, ears, soap, hot water, burnt, stop playing, wasting water, don't use shampoo, stop wasting toilet roll, wash your hand	Toothpaste, shampoo, soap don't touch, hot water		
Bed time	Now its bed time, it is 8 o' clock, cover yourself (he kicks blanket off) wear your long pajamas, its a hot day, put head on pillow, good night, give us a hug, sleep straight in the center of the bed.	TV is finished (over), put the TV off, time for bed, time for homework, play time is over, its bed time.		

Categories	Participant D	Participant R	Participant P	Participant SG
Outside the home	Where's sister? What's that? Sister is on bridge/ library			
Safety issues		Don't talk to strangers. It is not nice, don't run across the road, be careful, close the door, lock the door, stay inside the house, you are alone, don't touch the switch.		
School issues			Do home-work. Make sentence. I sit on a chair sick, home- work	Bring your bag, lets do home-work, today was a sunny day
Going out	going to the beach, shopping, relatives house, today we are going to visit uncle Lenny, aunty Sandra, not going in car, with bus , taxi, bus, truck, boy, girl, sign boards, robots	weekend we go to the movies, beach, wedding, prayer meeting, shopping, clothing, can't buy same for you, age is different	I am going to my sisters where, far, home	Do you want to get into night clothes, put on something nice, we're going to dinner, which shoes do you want to wear?
Family (people in environment)	Communicating when going anywhere (people): aunt, grandfather, cousin, friend, niece, nephew, neighbours	Family, neighbours, bus driver, aunt, uncle, cousins	How are you? uncle, aunt, sister, grandma, mother	
Discipline/ behaviour/ safety issues	Don't put, wait for me, Don't touch	Not for you, we are talking (sister and I/ Dad and I), not you, go now, sister is naughty, be quiet, dad and I are talking, you are a good girl, no, not now, some other time, later,	You must behave, naughty	Were you a good boy?

Categories	Participant D	Participant R	Participant P	Participant SG
		wait, be a good girl, listen to grandma, be obedient, behave, sister is older, you can't go		
Time issues		It is _ o'clock, it's the weekend, school is over, no school today, youth meeting on Friday, only sister can go, you go to Sunday school, its night, I work night shift, programme will be on (day of the week)		Weekend: why did you get up so early?

Appendix 9
Teacher verification of vocabulary and sample scripts

Instructions

1. Please indicate whether the following words are in the vocabulary of a child who has been at school for approximately 3- 4 years (grade 3). Indicate with a Y (Yes) or N (No) or maybe (M).

2. Please indicate if the words would be suitable to teach to parents of a child who has been at school for 3 - 4 years. 1 = not at all, 2 = not highly recommended, 3 = maybe, 4 = recommended, and 5 = highly recommended.

Theme: Going Out

Miscellaneous	Verbs	Descriptors	Nouns
1. Where 2. Who 3. Not	1. Come 2. Go 3. Visit 4. Want 5. Ready 6. Change 7. Dress-up 8. Don't 9. Gonna 10. Hurry 11. Leave 12. Start	1. Many 2. Nice. 3. Old 4. New 5. Clean 6. Wear 7. Late 8. Dirty 9. Ready 10. Take 11. Cold 12. Warm 13. Maybe 13. Slow	1. Weekend. 2. Somewhere 3. Someone 4. Holiday 5. Next 6. Today 7. Tomorrow 8. I 9. My 10. Daddy 11. Family 12. Your 13. Cousins 14. Friends 15. Neighbours 16. Name of person 17. Uncle 18. Aunt 19. Movies 20. Shopping, 21. Town 22. Beach 23. Party 24. Wedding 25. Meeting 26. Funeral 27. Picnic 28. People 29. Clothes 30. Shoes 31. Jacket 32. o'clock 33. Minutes
Sample script	It's the weekend. Come, let's go out somewhere. Where shall we go? Let's go visit someone. It holidays next week. Who shall we visit today/ tomorrow? I want to visit: daddy's /my family, your cousins, friends, neighbours, name of person (uncle, aunt), someone. Let's go to the movies, shopping, town, beach, party, wedding,		

Theme 2: Food Related

Miscellaneous	Verbs	Descriptors	Nouns
1. What 2. Please 3. Thank you 4. Which	1. Want 2. Like 3. Eat 4. Cooking 5. Making 6. Baking 7. Bring 8. Boil 9. Put 10. Help 11. Fry 12. Throw 13. Set 14. Call 15. Look 16. Tastes	1. Hungry 2. Thirsty 3. Some 4. Dry 5. Clean 6. More 7. Enough 8. Nice 9. Wonderful 10. Enjoy	1. I'm 2. Lunch 3. Supper 4. Breakfast 5. Sandwiches 6. Cake 7. Biscuits 8. Salad 9. Dessert 10. Braai 11. Meat 12. Chicken 13. Sausages 14. Water 15. Rice 16. Eggs 17. Salt 18. Sugar 19. Milk 20. Tea 21. Coffee 22. Me 23. Pot 24. Bowl 25. Plate 26. Oven 27. Fridge 28. Stove 29. Dishes 30. Rubbish 31. Table 32. Chairs 33. Glasses 34. Everyone 35. Food 36. Cheese
Sample script	Are you hungry /thirsty? What do you want? Like to eat? I'm cooking lunch, supper, breakfast. Baking. I'm making sandwiches, cake, biscuit, salad, dessert. We'll have a braai. Bring meat, chicken, sausages. Boil water, rice, fry eggs. Put some salt, sugar, milk, tea, coffee. Please. Help me. Bring the pot, bowl, plate. Put this in the oven, fridge, stove. Wash the dishes, dry the dishes. Are they clean? Throw the rubbish out. Set the table. Bring more chairs/glasses. Let's call everyone to eat. Yes please. N**o** thank you. Which do you want? Thank you. That looks very nice. The salad tastes wonderful. Did you enjoy the food? Did you have you enough?		

	meeting, funeral, picnic. There'll be lots of people. Get ready. I'm gonna change my clothes. Dress-up nice. Don't wear your old shoes. Where's your new shoes. Wear a clean jacket. That one is not clean. It's dirty. Hurry. Don't be late. Let's leave at three o'clock. Be ready in 10 minutes. Take your jacket. It is cold, wear warm clothes. Maybe we'll go. Don't be slow. Start getting ready.

Theme 3: Behaviour related

Miscellaneous	Verbs	Descriptors	Nouns
1. Not 2. When	1. Must 2. Go 3. Come 4. Stay 5. Don't 6. Listen 7. Fight 8. Tease 9. Share 10. Can't 11. Wait 12. Have 13. Behave 14. Talk 15. Respect 16. Interrupt 17. Buy 18. Punish 19. Watch 20. Keep 21. Lose 22. Stop 23. Irritate 24. Bother 25. Worry	1. Inside 2. Outside 3. Dangerous 4. Alone 5. With 6. Naughty 7. Rude 8. Kind 9. Selfish 10. Greedy 11. Obedient 12. Careful 13. Now 14. Next 15. Patient 16. tidy-up (clean up) 17. first 18. then 19. after 20. Later 21. Nothing 22. Good 23. Quiet.	1. You 2. Home 3. Road 4. Traffic 5. Sister 6. Grandma 7. Sweets 8. Chips 9. Name of person 10. Yourself 11. Strangers 12. Your 13. Turn 14. Time 15. We 16. Room 17. TV 18. Me 19. Afternoon 20. Minute
Sample script	I must go. I'll come in the afternoon. You must stay at home. Stay inside. Don't go outside / road alone/ traffic. It is dangerous. Stay with your sister. Listen to grandma. Don't fight. Be naughty, rude, tease, mean. Be kind. Share your sweets, can't have chips. Give some to NAME. Don't be selfish, greedy. Behave yourself. Be obedient. Say sorry, excuse me, pardon. Why are you angry? Be careful. Don't talk to strangers. Have respect. Don't interrupt. Be quiet. Wait for your turn. It's not your turn now. I will buy that next time. Be patient. I will punish you when we get home. Tidy up, clean your room first, then, after that watch TV. Not now, later Keep it safe. Don't loose it. Stop irritating, bothering me. Wait a minute. I'm busy. Doesn't matter. Don't worry. Nothing. That's good. What happened? Don't touch/ be stubborn, jealous, lazy. That's funny, bad. Ask first.		

Theme 4: Evening routine

Miscellaneous	Verbs	Descriptors	Nouns
1. Where 2. Goodnight 3. In 4. Off 5. On	1. Stop 2. Playing 3. Do 4. Help 5. Make 6. Read 7. Try 8. Attend 9. Forget 10. Clever 11. Watch 12. Sleep 13. Must 14. Wake-up 15. Don't 16. Rest 17. Put 18. Use 19. Feel 20. Remember 21. Sleep 22. Come 23. Give	1. Dark 2. Correct 3. Wrong / not true/false 4. Again 5. Finished 6. Now 7. Early 8. Late 9. Tired 10. Cold 11. Hot 12. Close 13. Before 14. Difficult 15. Easy	1. Yourself 2. Home-work 3. Me 4. Sentences 5. TV 6. Programme 7. Time/bedtime 8. Room 9. You 10. School 11. Pajamas 12. Blanket 13. Pillow 14. Clothes 15. Cupboard 16. Curtains 17. Lights 18. Toilet 19. Hug 20. Kiss
Sample scripts	It's getting dark. Put the light on. Stop playing. Do your homework. Let me help you. Let's make sentences. Let's read. Is it correct? Is it wrong /false? Try again. Pay attention, that's difficult, easy. Did you forget? You are clever. Stop watching TV. Is the programme finished? How's the programme. It's funny, boring, frightening, scary, nice. It's time to sleep/ bedtime. Go to your room now. Tomorrow is school. You must wake- up early. Don't be late for school. You must rest. You are tired. Put on your pajamas. It's cold. Use a blanket. Where's your pillow? Are you feeling hot? Put your clothes in the cupboard. Close the curtains. Put the lights off. Remember to go to the toilet before you sleep. Come give me a hug. Give me a kiss. Goodnight.		

Appendix 10
Translucency rating form

Number:

Age:

Gender:

Status of vision: normal ____ , corrected (wears glasses)_____ , uncorrected(needs glasses) _____

Hearing status: normal:____, hearing problem(explain) : _____

Home language: _____
State other languages spoken, in order of proficiency: 1) 2)

Previous exposure to sign language: none ____, minimal:_____, moderate: _____, frequent:_____

Instructions:
You are about to see four sets of signs, approximately 55 per set, presented on video. The sign and its meaning will be presented. You are required to give the score a rating of between 1 and 7. The rating shows your opinion about the relationship between the sign and its meaning. A rating of 1 is the lowest score – showing very little relationship between the sign and its meaning. A rating of 7 is the highest rating – showing a very strong relationship between the sign and its meaning. We will first go through a practice round to familiarize you with the process.

Practice Signs
Relationship between the sign and its meaning

Rating	**Very little relationship** **1**	**Little** **2**	**Appears to be a little** **3**	**Uncertain** **4**	**Appears to be strong** **5**	**strong** **6**	**Very strong** **7**
BABY							
CRY							
WINDOW							
CUP							
PROBLEM							
STEAL							

Signs rated for translucency

Theme 1	Theme 2	Theme 3	Theme 4
WHERE	WHAT	NOT	GOODNIGHT
WHO	PLEASE	WHEN	IN
COME	THANK YOU	WHY	OFF
VISIT	NO	SORRY	ON
WANT	WHICH	HAPPEN	PLAY
GO	LIKE	MUST	DO
CHANGE	EAT	STAY	READ
DRESS –UP	COOK	LISTEN	TRY
DON'T	MAKE	FIGHT	FORGET
HURRY	BAKE	SHARE	SLEEP
START	BRING	CAN'T	MUST
MANY	HELP	HAVE	WAKE-UP
NICE	FRY	BEHAVE	USE
OLD	THROW	TALK	FEEL
CLEAN	CALL	RESPECT	REMEMBER
NEW	LOOK	BUY	DARK
LATE	GIVE	WATCH	CLEVER
DIRTY	WASH	KEEP	AGAIN
COLD	HUNGRY	LOSE	FINISH
WARM	SOME	STOP	NOW
MAYBE	MORE	WORRY	EARLY
SLOW	THIRSTY	ANGRY	TIRED
LONG	ENJOY	TOUCH	HOT
WEEK-END	OPEN	ASK	CLOSE
HOLIDAY	LUNCH	INSIDE	BEFORE
NEXT WEEK	SUPPER	ALONE	EASY
WE	BREAKFAST	OUTSIDE	UP
TODAY	SANDWICHES	WITH	YOU
I	CAKE	NAUGHTY	HOME – WORK
MY	BISCUITS	GREEDY	SENTENCES
FATHER	MEAT	CAREFUL	BEDTIME
YOUR	CHICKEN	NOW	SCHOOL
COUSIN	SAUSAGES	NEXT	BLANKET
FRIEND	WATER	FUTURE	CUPBOARD
NEIGHBOUR	EGG	FIRST	LIGHT
UNCLE	SALT	AFTER	TOILET
AUNT	SUGAR	GOOD	KISS
MOVIES	MILK	QUIET	NIGHT
SHOPPING	TEA	JEALOUS	O'CLOCK
TOWN	COFFEE	BAD	FORGET
BEACH	ME	BUSY	NOW
PARTY	POT	HAPPY	SCHOOL
WEDDING	PLATE	YOU	KISS
FUNERAL	FRIDGE	HOME	HOT
PEOPLE	STOVE	ROAD	

Theme 1	Theme 2	Theme 3	Theme 4
CLOTHES	TABLE	TRAFFIC	
SHOES	CHAIR	SISTER	
JACKET	EVERYONE	GRANDMOTHER	
SHIRT	FOOD	SWEETS	
SATURDAY	CHEESE	YOURSELF	
SUNDAY	POTATOES	TIME	
CHANGE	SAUCE	ROOM	
MAYBE	WHICH	TV	
TODAY	BAKE	ROOM	
FAMILY	ENJOY	HAPPEN	
TOWN	CAKE	SHARE	
FUNERAL	SAUSAGES	WITH	
	RICE	SISTER	
	STOVE	TIME	
		AFTERNOON	
		LATER	
		PROGRAMME	
		HUG	
		CURTAIN	
		TOMORROW	
		REST	
		PUT	
		READY	
		HOUR	
		MINUTE	
		CUPBOARD	

Appendix 11
Composite list of sign ratings

(Note: -Grammatical categories: M = Miscellaneous, D = Descriptor, V = Verb, N=Noun
- Translucency ratings: L= Low translucency (1-3), H = High translucency (5-7)
- Performance difficulty scores and graphics (sign illustration) scores: Colour coding of scores used to facilitate equal distribution across theme probe sets: red = 1-2.9; blue = 3-3.9, purple = 4-4.9)

Sign	Grammatical category (Theme number)	Translucency $\overline{X}$ (L, H)	Performance difficulty $\overline{X}$	Graphics score $\overline{X}$
1. WHO	M1	2.466 (L)	5.954	5.277
2. WHAT	M2	2.866 (L)	6.136	6.000
3. WHICH	M2	2.466 (L)	5.652	5.350
4. WHEN	M3	2.482 (L)	5.826	5.050
5. WHY	M3	2.433 (L)	5.956	4.6667
6. SORRY	M3	2.933 (L)	5.782	5.833
7. NO	M2	5.966 (H)	6.652	5.500
8. IN	M4	6.000 (H)	5.913	6.222
9. VISIT	V1	2.266 (L)	4.217	4.833
10. WANT	V1	2.200 (L)	4.227	3.600
11. COME	V1	6.533 (H)	6.565	6.250
12. GO	V1	5.033 (H)	6.434	5.400
13. DON'T	V1	6.000 (H)	6.000	6.111
14. FRY	V2	2.600 (L)	4.608	3.555
15. EAT	V2	6.766 (H)	6.695	6.470
16. COOK	V2	5.900 (H)	6.043	4.333
17. THROW	V2	5.700 (H)	6.043	5.388
18. CALL	V2	5.733 (H)	5.304	5.500
19. LOOK	V2	6.300 (H)	5.636	5.500
20. GIVE	V2	5.866 (H)	5.695	5.944
21. WASH	V2	6.766 (H)	6.086	5.000
22. OPEN	V2	5.366 (H)	5.478	4.705
23. HAPPEN	V3	2.133 (L)	3.130	4.352
24. SHARE	V3	3.066 (L)	4.086	3.631
25. CAN'T	V3	2.066 (L)	2.956	2.187
26. HAVE	V3	2.966 (L)	5.869	4.411
27. BEHAVE	V3	2.366 (L)	3.652	4.352
28. BUY	V3	2.366 (L)	3.782	3.250
29. STAY	V3	5.566 (H)	6.217	5.500
30. LISTEN	V3	6.758 (H)	6.130	6.444
31. WATCH	V3	5.000 (H)	5.739	4.944
32. KEEP	V3	5.000 (H)	5.043	3.944
33. STOP	V3	5.166 (H)	5.826	5.055
34. TOUCH	V3	5.533 (H)	5.545	5.555
35. PLAY	V4	3.000 (L)	5.217	4.833
36. DO	V4	2.533 (L)	4.608	4.588
37. TRY	V4	2.300 (L)	3.869	4.611
38. USE	V4	2.400 (L)	4.782	3.500
39. SLEEP	V4	6.700 (H)	6.826	6.888
40. WAKE-UP	V4	5.633 (H)	5.727	5.350
41. CLOSE	V4	5.034 (H)	5.500	5.666

Sign	Grammatical category (Theme number)	Translucency $\overline{X}$ (L, H)	Performance difficulty $\overline{X}$	Graphics score $\overline{X}$
42. HUG	V4/N	6.433 (H)	6.347	6.277
43. NICE	D1	3.000 (L)	4.869	4.055
44. OLD	D1	2.600 (L)	5.521	5.500
45. CLEAN	D1/V	2.500 (L)	4.304	4.350
46. GOOD	D1	6.266 (H)	6.800	6.826
47. NEW	D1	1.566 (L)	3.590	2.500
48. LATE	D1	1.833 (L)	4.826	4.722
49. DIRTY	D1	1.466 (L)	4.347	4.277
50. WARM	D1	2.300 (L)	4.391	3.722
51. SLOW	D1	2.833 (L)	5.304	5.666
52. COLD	D1	5.233 (H)	6.000	5.333
53. ENJOY	D2//V	3.066 (L)	6.304	4.222
54. THIRSTY	D2	5.100 (H)	6.086	5.944
55. NAUGHTY	D3	2.566 (L)	5.869	4.944
56. GREEDY	D3	3.066 (L)	4.739	4.722
57. JEALOUS	D3	2.233 (L)	4.869	5.111
58. BAD	D3	2.966 (L)	5.173	**4.055**
59. INSIDE	D3	6.000 (H)	5.434	6.111
60. NOW	D3	6.300 (H)	6.347	6.421
61. .NEXT	D3	5.466 (H)	5.347	5.600
62. AFTER	D3	5.133 (H)	5.304	3.666
63. SLOW	D1	2.833 (L)	5.304	5.666
64. QUIET	D3	5.133 (H)	6.391	6.444
65. AGAIN	D4	3.033 (L)	5.043	4.333
66. EARLY	D4	2.275 (L)	3.909	4.055
67. TIRED	D4	2.620 (L)	5.391	4.900
68. EASY	D4	2.600 (L)	5.217	3.944
69. CLEVER	D5	5.266 (H)	6.260	6.294
70. UP	D4	6.633 (H)	6.304	6.444
71. WEEK-END	N1	2.333 (L)	4.260	3.555
72. HOLIDAY	N1	2.033 (L)	4.913	5.333
73. FATHER	N1	2.133 (L)	5.782	6.00
74. FRIEND	N1	2.733 (L)	5.739	4.833
75. NEIGHBOUR	N1	2.466 (L)	4.652	3.722
76. UNCLE	N1	1.600 (L)	5.217	5.388
77. AUNT	N1	1.666 (L)	5.086	5.500
78. MOVIES	N1	2.166 (L)	3.913	4.600
79. SHOPPING	N1	3.033 (L)	5.217	4.166
80. TOWN	N2	2.400 (L)	3.652	3.055
81. PARTY	N1	2.400 (L)	3.826	3.333
82. SHOES	N1	2.400 (L)	4.913	4.777
83. SATURDAY	N1	1.466 (L)	5.190	4.944
84. SUNDAY	N1	1.733 (L)	5.045	4.722
85. LUNCH	N2	2.275 (L)	5.043	4.722
86. SUPPER	N2	2.200 (L)	5.391	4.722
87. BREAKFAST	N2	2.233 (L)	5.652	4.250
88. CAKE	N2	2.900 (L)	5.521	5.222
89. BISCUITS	N2	2.266 (L)	5.391	5.555
90. CHICKEN	N2	2.333 (L)	4.347	4.277
91. SUGAR	N2	2.666 (L)	4.590	4.388
92. STOVE	N2	1.833 (L)	3.913	2.750
93. CHAIR	N2	2.333 (L)	5.043	5.00
94. POTATOES	N2	3.033 (L)	4.608	2.764

Sign	Grammatical category (Theme number)	Translucency $\overline{X}$ (L, H)	Performance difficulty $\overline{X}$	Graphics score $\overline{X}$
95. RICE	N2	3.066 (L)	5.217	4.300
96. SALT	N2	5.133 (H)	5.869	4.777
97. MILK	N2	6.100 (H)	5.565	5.000
98. TEA	N2	5.900 (H)	5.313	5.666
99. 1	N2	6.900 (H)	6.869	6.625
100. HOME	N3	6.900 (H)	4.913	5.555
101.TRAFFIC	N3	2.766 (L)	4.173	4.333
102. SISTER	N3	2.000 (L)	5.695	5.500
103.GRANDMOTHER	N3	2.433 (L)	4.863	5.333
104. SWEETS	N3	2.133 (L)	5.826	5.555
105. AFTERNOON	N3	3.000 (L)	4.260	4.833
106. YOU	N3	6.766 (H)	6.956	6.111
107. TIME	N3	6.900 (H)	6.782	6.125
108. TV	N3	5.033 (H)	5.521	3.142
109. WE	N3	5.466 (H)	5.608	4.333
110. TODAY	N3	5.633 (H)	6.347	6.176
111. MY	N3	6.466 (H)	6.695	6.555
112. CLOTHES	N3	5.166 (H)	5.565	5.250
113. JACKET	N3	5.551 (H)	5.636	5.333
114. HOME-WORK	N4	2.433 (L)	4.347	5.529
115. TOILET	N4	1.866 (L)	5.521	5.722
116. READY	D4	2.500 (L)	3.782	3.684
117. HOT	D4	5.333 (H)	5.652	6.058
118. HOUR	D4	5.100 (H)	4.521	4.500
119. BEDTIME	N4	6.533 (H)	5.478	6.000
120. LIGHT	N4	5.700 (H)	6.130	4.950
121. KISS	N4 /V4	5.433 (H)	5.391	5.555
122. O'CLOCK	N4	5.133 (H)	4.260	4.125
TOTALS		**L= 70 (57%) H= 52 (43%)**	**>5 (easy) = 83 (68%) 4 - 4.9 (average) = 27(22%) 1 - 3.9 (difficult) = 12(10%)**	**>5 (easy) = 62 (51%) 4 - 4.9 (average) = 40(33%) 1 - 3.9 (difficult) = 20 (16%)**

Appendix 12
Description of sign parameters

Instructions:

Please observe the signs in the video and note the features of the signs. Place a tick in the appropriate column for the following characteristics:

1) Number of hands:
   - 1 or 2
2) Symmetry (in two handed signs only):
   - Symmetrical = both hands have the same shape and perform the same movement (can be at different locations or different phases of the same type of movement.
   - Asymmetrical = the signs have different hand positions or different movements.
3) Contact (touch):
   - No contact = no body or hand contact during sign production
   - Contact: if the one hand touches the other hand or another part of the body during sign production
4) Visibility:
   - The sign is within the field of the visual signer, without the need for head or eye movements – even if just a part of the sign.
5) Movement: If there is movement in any part of the production of the sign. Placing a sign in the location is not considered movement.
6) Complexity: Meet one of the following criteria to be complex:
   a) Change of location
   b) Change in handshape
   c) Combination of two signs
7) Handshapes
   Easy: Stage I & Stage II handshapes): A, S, L, baby O, 5, C, G, B, F
   Medium: Stage III handshapes: I, D, Y, P, 3, V, H, W
   Hard: Stage IV& Stage V handshapes: 8, 7, X, T, R, M, N, E

Practice Signs

Sign	**No. of hands**		**Symmetry**			**Contact (C or Nc)**		**Visibility (V or Nv)**		**Movement (M or Nm)**		**Complexity (C-l, C-h)**				**Handshapes (easy, medium, hard)**		
HELLO	1	2	n/a	S	As	C	Nc	V	Nv	M	Nm	n/a	C-l	C-h	2 signs	Easy: ASL,baby O 5 C G; B, F	Medium: IDYP3WV H	Hard: EMN 87XTR
BABY	1	2	n/a	S	As	C	Nc	V	Nv	M	Nm	n/a	C-l	C-h	2 signs	Easy: ASL,baby O, 5 C G; B, F	Medium IDYP3WV H	Hard: EMN 87XTR
WINDOW	1	2	n/a	S	As	C	Nc	V	Nv	M	Nm	n/a	C-l	C-h	2 signs	Easy: ASL,baby O,C G; B, F	Medium IDYP3WV H	Hard: EMN 87XTR
CUP	1	2	n/a	S	As	C	Nc	V	Nv	M	Nm	n/a	C-l	C-h	2 signs	Easy: ASL,baby O,C G; B, F	Medium IDYP3WV H	Hard: EMN 87XTR
PROBLEM	1	2	n/a	S	As	C	Nc	V	NV	M	Nm	n/a	C-l	C-	2 signs	Easy: ASL,baby O,C G; B, F	Medium IDYP3WV H	Hard: EMN 87XTR
STEAL	1	2	n/a	S	As	C	Nc	V	NV	M	Nm	n/a	C-l	C-h	2 signs	Easy: ASL,baby O,C G; B, F	Medium IDYP3WV H	Hard: EMN 87XTR

Appendix 13
Coding of composite list of signs

Key: PD = Performance difficulty score, G= Graphics score, in italics; colour coding: purple = *average* scores 4.0-4.9; blue = *difficult scores* 3.0-3.9, red = *difficult scores* 1.0-2.9

	Theme 1: Going out			**Theme 2: Meal related**			**Theme 3:Behaviour related**			**Theme 4: Evening routine**		
Coding	**Sign**	**PD** $\overline{X}$	**G** $\overline{X}$	**Sign**	**PD** $\overline{X}$	**G** $\overline{X}$	**Sign**	**PD** $\overline{X}$	**G** $\overline{X}$	**Sign**	**PD** $\overline{X}$	**G** $\overline{X}$
H-1-E (High translucency- 1 handed - easy)	COME GO WE I MY NOW	**6.565** **6.434** **5.608** **6.869** **6.695** **6.347**	***6.250*** ***5.400*** ***4.333*** **6.625** **6.555** ***6.4.21***	NO EAT CALL GIVE LOOK THIRSTY	**6.652** **6.6.95** **5.304** **5.695** **5.636** **6.089**	***5.500*** ***6.470*** ***5.500*** ***5.944*** ***5.500*** ***5.944***	LISTEN GOOD QUIET YOU TIME	**6.130** **6.869** **6.391** **6.956** **6.782**	***6.444*** ***5.500*** ***6.444*** ***6.111*** ***6.125***	SLEEP CLEVER UP	**6.826** **6.260** **6.304**	***6.888*** ***6.294*** ***6.444***
H-1-D (High translucency- 1 handed - Difficult				THROW SALT	**6.043** **5.869**	***5.388*** ***4.777***	TV NEXT	**5.521** **5.347**	***3.142*** ***5.600***	WATCH LIGHT HOT	**5.739** **6.130** **5.652**	***4.944*** ***4.950*** ***6.058***
H-2-E (High translucency- 2 handed -easy)	DON'T COLD TODAY CLOTHES JACKET	**6.000** **6.000** **6.347** **5.565** **5.636**	***6.111*** ***5.333*** ***6.176*** ***5.250*** ***5.333***	WASH	**6.086**	***5.000***	STAY KEEP	**6.217** **5.043**	***5.500*** ***3.944***	HUG	**$6.347**	***6.277***
H-2-D (High translucency- 2 handed- difficult				COOK TEA MILK OPEN	**6.043** **5.313** **5.565** **5.478**	***4.333*** ***5.666*** ***5.000*** ***4.705***	STOP TOUCH INSIDE AFTER	**5.826** **5.545** **5.434** **5.304**	**5.055** **5.555** **6.111** **3.666**	KISS O/CLOCK HOUR IN BED-TIME WAKE-UP CLOSE AGAIN	**5.391** **4.260** **4.521** **5.913** **5.478** **5.727** **5.500** **5.043**	***5.555*** ***4.125*** ***4.500*** ***6.222*** ***6.000*** ***5.350*** ***5.666*** ***4.333***

	Theme 1: Going out			Theme 2: Meal related			Theme 3:Behaviour related			Theme 4: Evening routine		
Coding	**Sign**	**PD** $\overline{X}$	**G** $\overline{X}$	**Sign**	**PD** $\overline{X}$	**G** $\overline{X}$	**Sign**	**PD** $\overline{X}$	**G** $\overline{X}$	**Sign**	**PD** $\overline{X}$	**G** $\overline{X}$
L-1-E (Low Translucency- 1 handed -easy)	WHO FATHER AUNT	**5.954** **5.782** **5.086**	***5.277*** ***6.000*** ***5.500***	WHAT BREAKFAST LUNCH WANT	**6.136** **5.391** **5.043** **4.227**	***6.000*** ***4.250*** ***4.722*** ***3.600***	WHY SORRY SWEET NAUGHTY	**5.956** **5.782** **5.826** **5.869**	***4.666*** ***5.833*** ***5.555*** ***4.944***	WHEN SUPPER	**5.826** **5.391**	***5.050*** ***4.722***
L-1-D (Low translucency, 1 handed , difficult)	OLD UNCLE SATURDAY WANT DIRTY WARM NEIGHBOUR NICE	**5.521** **5.217** **5.190** **4.227** **4.826** **4.391** **4.652** **4.869**	***5.500*** ***5.388*** ***4.944*** ***3.600*** ***4.277*** ***3.722*** ***3.722*** ***4.055***	WHICH SUGAR STOVE	**5.652** **4.590** **3.913**	***5.350*** ***4.388*** ***2.700***	BAD SISTER JEALOUS HAVE BEHAVE	**5.173** **5.695** **4.869** **5.869** **3.652**	***3.666*** ***5.500*** ***5.111*** ***4.411*** ***4.352***	EASY AFTERNOON	**5.217** **4.260**	***3.944*** ***4.833***
L-2-E (Low translucency, 2 handed , easy)	SUNDAY SHOPPING FRIEND	**5.045** **5.217** **5.739**	***4.722*** ***4.166*** ***4.833***							PLAY TIRED TOILET	**5.217** **5.391** **5.521**	**4.833** **4.900** **5.700**
L-2-D (Low translucency, 2 handed , difficult)	CLEAN LATE SLOW WEEK-END HOLIDAY MOVIES SHOES PARTY NEW TOWN VISIT	**4.304** **4.826** **5.304** **4.260** **4.913** **3.913** **4.913** **3.826** **3.590** **3.652** **4.217**	***4.350*** ***4.722*** ***5.666*** ***3.555*** ***5.333*** ***4.600*** ***4.777*** ***3.333*** ***2.500*** ***3.055*** ***4.833***	ENJOY CAKE BISCUITS CHICKEN CHAIR POTATOES RICE FRY GREEDY	**6.304** **5.521** **5.391** **4.347** **5.043** **4.608** **5.217** **4.608** **4.739**	***4.222*** ***5.222*** ***5.555*** ***4.227*** ***5.000*** ***2.764*** ***4.300*** ***3.555*** ***4.722***	HAPPEN SHARE BUY HOME GRAND- MOTHER CAN'T TRAFFIC	**3.130** **4.086** **3.782** **4.913** **4.863** **2.956** **4.173**	***4.352*** ***3.631*** ***3.250*** ***5.555*** ***5.333*** ***2.187*** ***4.333***	USE EARLY HOME- WORK READY DO TRY	**4.782** **3.909** **4.347** **3.782** **4.608** **3.869**	***3.000*** ***4.055*** ***5.529*** ***3.684*** ***4.588*** ***4.611***
Totals (122)	31			31			32			28		

Note: Cheremically similar signs: THROW & LIGHT; LATE & SLOW, PARTY & NEW

Appendix 14
Development of interview schedules

Objectives	Procedures	Results	Recommendations
Pre-training questionnaire			
1. To test the pre- test questionnaire for time taken for administration and method. 2. To assess the content and organisation of the schedule	Presented face to face to the participant selected for the pilot study. An informal style was used to encourage the participant to relax (Alpiner & McCarthy, 2000).	The questionnaire took 25 minutes to administer. All questions were answered without hesitation. Two questions could be added to section B, as they appeared to be omissions. These related to information on mothers' level of communication and their sign learning experience.	The length of the schedule was acceptable, and an informal interview style would be adopted. Two questions be added to section B, with regard to mothers' communication generally with the child, and experiences thus far in learning to sign
Post-training questionnaire			
1. To assess the scope of the questions used to assess the sign learning experience	Two opportunities were used to assess these aspects – one during a pre-pilot study using two students then in the pilot study using a mother of a deaf child, described in Section 3.5.1.4. Issues raised in the pre- pilot were addressed prior to the pilot study.	Following the pre- pilot study, the questions needed to be rephrased in order to describe perceived signing ability. The actual comparison of the treatments needed to be worded more explicitly.	A third section prompting views on the comparison of treatments needed to be added.
Debriefing interview			
1. To address individual questions that arose prior to, and during the training specific to the signing programme and vocabulary covered in terms of earlier parent input.	This procedure was conducted both during the pre-pilot on the two students, and the pilot study participant. Issues raised in the pre- pilot	1. The pre-pilot participants had questions and comments pertaining to actual signs taught. The length of the interview was approximately 20 minutes.	The debriefing interview was a valuable aspect of the programme, and must be included. The researcher must be prepared to address issues with

Objectives	Procedures	Results	Recommendations
2. To address parents concerns following the training in terms of the way forward. 3. To provide closing comments on the study	study were addressed prior to the pilot study.	2. The pilot study participant contributed valuable information with regard to the information content of the programme by raising pertinent issues in signing, e.g. nonverbal behaviour and facial expression. The style of the interview was acceptable and it flowed smoothly.	regard to sign language issues (e.g. the role of non-manual features) and resources on sign learning. The purpose and outcome of the study must be put in context i.e. research, with sensitivity to participants future signing needs.

Appendix 15
Description of the interview schedules

Pre-training interview (Please refer to Appendix 16 for the schedule used)			
Structure (structured interview: open and close ended questions, rating scales)	**Content**	**Reason for inclusion**	**Additional information**
A. Biographical Information	PARTICIPANT - age - home language - educational level - status of hearing and vision CHILD - age of child - gender of child - number of years at school	These are standard questions that facilitate an understanding of the context of the participants	
B. Diagnosis and Intervention Aspects	1) Age at diagnosis , and description of hearing loss 2) Description of intervention following diagnosis. 3) Description of child's communication 4)Description of parents communication with child	To gain an understanding around the issues of the late intervention. To obtain information about the process of intervention from the parent's perspective. To examine parent perceptions of the child's communication abilities. To allow parents to freely state their abilities such that questions following will allow them to more fully explore this.	Probes were used for questions 1 and 2 to more fully explore these open –ended questions Questions pertaining to acceptance of hearing loss and experiences in learning to sign were included as these were considered important to compliance with intervention
C. Signing ability	Aspects of both skill level and knowledge of signing was probed. A 5 point Likert scale was used to	Parents needed to describe their signing skill as they perceived it at both receptive and expressive levels	This was used to assist with a descriptive measure for comparison post training.

	describe signing ability (Joseph, 1998). Scale: 1= no skills, 2= poor, 3=fair, 4= good, 5= excellent.		
D. Attitude towards signing	Perceptions about sign language were probed in terms of a general feeling about it and perceptions with regard to learning. 5 –point Likert scales were used. Learning difficulty rating scale: 1= very difficult, 2= a little difficult, 3= average, 4= easy, 5=very easy. Interest rating scale: 1= don't really want to learn, 2= not interested, 3= doesn't really matter, 4=a little interested, 5= very interested.	Interest in learning to sign and the perceived difficulty of the task are considered contributing factors in sign learning (Loeding et al., 1990).	The scales used by Loeding et al. (1990) were used to assess this aspect.
E. Other	Additional information was requested	This was an opportunity for parents to contribute any aspect they felt was relevant	It was felt that allowing the parent to contribute would facilitate the process of participation in the programme
Post- training interview (Please refer to Appendix 17 for the schedule used)			
Structure (structured interview: open and close ended questions, rating scales)	**Content**	**Reason for inclusion**	**Additional information**
A. Attitude towards signing	Perceptions of the sign learning experience The rating scales used in the pre-training schedule were used.	To assess the participants perceptions about the learning of signs following the training	
B. Description of signing ability	Both open- ended and closed ended questions were used. The rating scale used in the pre-training schedule was used to assess signing ability.	To obtain the participants subjective impression of their signing skills following training.	
C. Evaluation of the training	Open ended questions were used to obtain comments on the methods	It was considered important to obtain the participants perceptions of the	

	used, as well as the vocabulary covered.	training to more fully understand the strategies used.	
Debriefing interview guide (Please refer to Appendix 18 for the schedule)			
Structure (semi – structured)	**Content**	**Reason for inclusion**	**Additional information**
A. Aspects relating to sign learning	A general guide was used	This was to ensure that issues that arose during the training – relating to information given, as well as the signs covered were dealt with in terms of researcher identified issues or parent questions.	
B. Specific comments relating to pre- training	This was very individualized – based on both the vocabulary selection phase and the pre-interview	It was considered important to address unique issues that become evident with regard to sign learning from the parent's perspective prior to the training, e.g. specific vocabulary needs.	This addressed the issue of the lack of individualized vocabulary, usually covered in intervention, viz. supplementary vocabulary (Goossens', 1995)
C. Closing comments	Researcher input was covered in terms of the scope and limits of study.	As this was a research study, not solely a training programme – it was felt that the context needed to be clarified again, with parents seeing the value of their contribution as well.	

Appendix 16
Pre-training interview schedule

Section A: Biographical information:

Mother:
Reference Number:
Age:
Highest educational level:
Home language:
Child:
Age:
Grade:
Gender:

Section B: Diagnosis and intervention aspects

1) When did you find out about (child's) hearing loss?

   a. When did you notice the problem?

   b. When and where was the hearing testing done?

2) What happened after you were told about the hearing loss?

   a. What was done for you and the child by the doctors/ audiologist?

   b. What were you told?

   c. What has been done by the school?

   d. Have you attended any programmes to help you communicate with (child)?

   e. How do you feel about (child's) hearing loss?

   f. How has it been to learn sign language so far? (barriers/ facilitators)

3) Describe (child's) communication.

   a. Describe (child's) hearing ability.

   b. Describe (child's) speech ability.

   c. Describe (child's) signing ability.

   d. Describe your communication with (child's name).

Section C: Signing skills

1) Describe your ability to sign :

   a. Understanding signs: 1 = No skills, 2 = poor, 3 = fair, 4= good, 5= excellent

   b. Producing signs: 1= No skills, 2= poor, 3= fair, 4= good, 5= excellent

   c. How many words can you sign?

   d. What words can you sign?

   e. Can you sign phrases/ sentences?

   f. Can you sign the alphabet?

2) How much do you know about sign language?

   1=Nothing, 2= very little, 3= some things, 4= a lot, 5= most things

---

Section D: Attitude towards signing

1) How do you feel about sign language?

2) How do you feel about learning to sign?

   a. Would it be easy/ difficult to learn to sign?

   Rating scale: 1= very difficult, 2= a little difficult, 3= no problem, 4= easy, 5= very easy

   b. How interested are you in learning to sign?

   Rating Scale: 1 = don't really want to learn, 2= not interested 3= doesn't really matter, 4= a little interested, 5= very interested.

Section E

Is there anything else you would like to add?

END

Appendix 17
Post-training interview schedule

Reference Number: _____

SECTION A: **Attitude towards sign learning**

1) How would you describe your experience learning to sign?

2) On a scale of 1- 5, with 1 = very difficult, 2 = a little difficult, 3= no problem,

   4= easy, and 5= very easy, how would you describe your sign learning?

SECTION B: Description of signing ability

1) Describe your ability to sign now.

2) How would you rate your signing ability now, on a scale from 1-5 with 1= no skills, 2= poor, 3= average, 4=good, 5= excellent?

SECTION C: Evaluation of the training programme

1) Was there a difference in learning between the two methods? Explain

2. How was it learning with:-
   a) Word lists?
   b) Sign pictures/graphics?

3) What do you think about:-
   a) Information given?
   b) Number of signs taught?
   c) Kind of signs taught?

Appendix 18
Debriefing interview guide

Reference number: _____

Section A: Aspects relating to sign learning:

1. Non- manual features of signing (facial expression; signing intensity; speed of signing)
2. Dialect issues
3. Home – signs
4. Other

Section B: Specific comments relating to pre- training

1. Vocabulary requested
2. Other

Section C: Closing comments

1. Summary of purpose of study, current status, future access to findings
2. Parents :Way- forward – Plans for future
3. Presentation of available resources for learning South African Sign Language
4. Parent's input: suggestions for teaching parents sign language
5. Other: "Is there anything you would like to add?"
6. Researcher's expression of gratitude for participation in the study (letter)

Appendix 19
Theme sample scripts

Introduction	**Theme1: Going Out**	**Theme 2: Meal Related**	**Theme 3: Behaviour related**	**Theme 4: Evening Routine**
The topic we are covering today is _____. These are some of the things one can say. We will learn signs relating to this theme today. (read script)	It's a holiday. Let's go somewhere. Where shall we go? Let's go visit someone. Let's go today /tomorrow. I want to visit daddy's /my family, your cousins, friends, neighbours, name of person, uncle, and aunt. Hug, kiss, call. Let's go to the movies, shopping, town, beach, the wedding. Get ready. I'm gonna change my clothes. Dress-up nice. Don't wear your old shoes. Where are your new shoes? Wear a clean jacket. It's dirty. Hurry. Do you have your jacket? It is cold, use warm clothes. Get ready.	Are you hungry / thirsty? What do you want? Like to eat? I'm cooking rice, lunch, supper, breakfast. I'm making sandwiches, cake, biscuits. I am frying meat, chicken, sausages, and eggs. Put some salt/sugar. Have milk, tea, coffee. Please help me. Bring the pot, bowl, plate. Put this in the oven, fridge, stove. Wash the dishes. That looks very nice. Did you enjoy the food?	You must stay at home. Stay inside at night. Don't go outside / road alone/ traffic. It is dangerous. Stay with your sister. Listen to grandma. Don't fight, be mean, naughty, rude, tease. Say sorry. Share your sweets. Can't have chips. Behave yourself. Be obedient. Be careful. I will buy that next time, on Saturday. Not now, later.	Its night. Put the light on. Stop playing. Do your homework. Let me help you. Let's read. Is it correct? Is it wrong /false? Try again. You are clever. Stop watching TV. Is the programme finished? Its time to sleep/ bedtime. Go to your room now. Tomorrow is school. You must wake- up early. Don't be late for school. You must rest. You are tired. Put on you pajamas. It's cold. Use a blanket. Put your clothes in the cupboard. Put the lights off. Come give me a hug. Give me a kiss. Goodnight.

Appendix 20
Information on signing

Session 1: How are signs formed?

Signs are the words in sign language. Single signs are like the vocabulary of sign language. All signs have four aspects that make up the sign. These four aspects are:

1) The shape of the hand/s, open or closed. E.g. V or A
2) The place on /near the body where the sign is formed, face, head, body or hands.
3) The movement of the hands, towards or away from the body, straight or curved movement, wriggly or alternating.
4) The orientation of the hand/ direction the hand is facing, towards or away from the body. Upwards or downwards.

Changes in any of these components can change the meaning of the sign.
Facial expression is also very important. It helps the person better understand what is signed.
Signs can be made with either one or two hands. With two – handed signs, the hands can both make the same shape and movement or the hands may perform different movements and have different shapes.
If you are right – handed, then one- handed signs should be made with the right hand. If the sign requires two hands, then the main movements should be made with the right hand.
The place where the sign is formed must be observed carefully, e.g., the right or left side of the face. The direction of the hand movement must also be made carefully – it can be towards the body or away from the body, or move from the right side to the left side of the face or body.
These aspects are important to note when learning to sign.

Session 2: What is sign language?

- Sign language is the language used by Deaf people to communicate. It was made up by deaf people, as spoken languages were made up by hearing people.
- Sign language uses the hands, head and body to form signs which are words or sentences, and is understood by watching the signing person. With spoken language words and sentences are formed by the mouth and understood by listening.
- There are many different sign languages in the world, just as there are many different spoken languages in the world. People from different countries cannot understand each others sign languages. In SA we mostly use SASL.
- The meaning of only some signs can be guessed by watching, most signs do not look like what they mean.
- Sign language grammar is complex. The order of signs is not the same as in speaking. It takes many years to learn this language, like it takes to learn any new language. One would need to associate with Deaf signing people to learn it well.
- Deaf people are happy when hearing people try to learn sign language. Hearing people generally use signs in spoken word order, and this is understood by Deaf people. As people learn sign language better, they sign more like Deaf people. Facial expression is very important to clarify what certain signs mean.
- Deaf children learn sign language easily as they use their eyes instead of their ears to learn language.
- Parents of deaf children often experience difficulty in learning to sign for many reasons, but they too can learn basic signs quickly.
- There is no sign for every spoken word. Some signs need many words to convey the meaning or many words can be replaced by one sign. This also happens when translating in spoken language as well.
- Signs can be arranged in the order of spoken words with only the main words signed – method also called Pidgin Sign Language. Many hearing people use this method; it is also called Signed English or Key Word Signing.

Session 3: Fingerspelling

Fingerspelling is the spelling of words using the manual alphabet. The manual alphabet refers to forming letters with the fingers. The number of letters in the alphabet depends on the language being used. In English there are 26 letters. English also has two types of manual alphabets – the one – handed alphabet (American - developed from Spanish) and the two – handed alphabet (British), e.g. the letter A can be formed with one hand or with two hands. Most schools in SA use the one handed alphabet.

Fingerspelling is a very old way of communicating and can be traced back to the 1600s and earlier. It was used by early traders and religious groups such as monks. It was developed by hearing people as a way of communicating. Deaf education adopted fingerspelling also, to teach Deaf people to read and write. Fingerspelling has become associated with sign language. It is not a sign language. Fingerspelling is used when a sign does not exist for a word in sign language (e.g. a place Victoria Falls) or someone's name, e.g. Trevor Manual.

Fingerspelling is also used in communication between Deaf people and people who do not know sign or have limited signing. It is slower than sign language – and therefore only serves as a bridge to communication. It has also been used widely in some forms of signing, e.g. Signed English – where new signs are created by signing the initial letters of the word, e.g. "office" and "room".
Initials are widely used among deaf people when developing name signs for people, e.g. for a person whose name in Bongi, the name sign created would contain the handshape for the letter B. In addition, some characteristic of the person would also be reflected. For example if the person has curly hair the B would be made moving down the head, or if the person has a scar on the cheek the B would be made at or near the cheek with the scar.

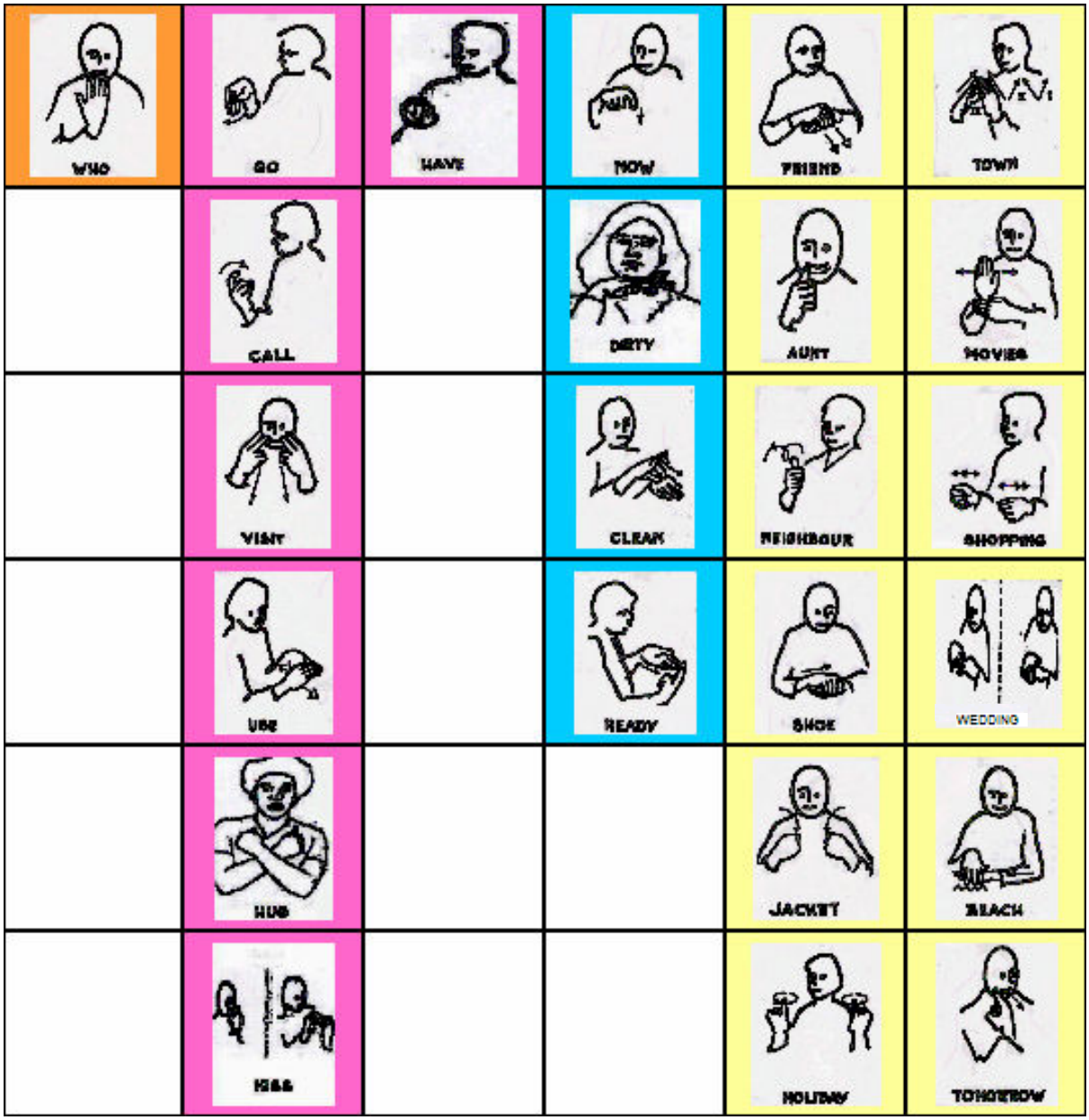
All deaf children learning sign language learn the manual alphabet at school. It is only useful once a child starts reading and writing. The use of initials in signs however can be used as soon as the child starts signing, for example with names of people and for made up signs for things which have no known sign.

Session 4: Users of sign language

People who use natural sign language are usually born with a severe to profound hearing loss or may have developed a hearing loss very early in life and have learned to sign at school. Some deaf adults may learn sign language later in life, having gone to schools that used the oral method. The users of sign language generally belong to the Deaf community and see themselves as a minority group having their own language and culture, called Deaf Culture. They spell deaf with a capital "D". They participate a lot in activities that involve other Deaf people, e.g. Deaf clubs, Deaf theatre. Deaf people see it as their human rights to be allowed to communicate in sign language. They also believe that deaf children should learn natural sign language as early as possible, at home and at school, as well as English or whatever language their parents speak. Natural sign language is best learned from a Deaf signing person. Interested people can find out more about the Deaf community by reading books and watching videos about the Deaf culture, by visiting the local Deaf club and visiting websites of the Deaf community, e.g. in South Africa, the Deaf Federation of South Africa (DEAFSA). This training course has not taught you natural sign language, but rather signs from South African Sign Language as a bridge to communicate using basic signs.

Appendix 21
Theme-based graphic displays

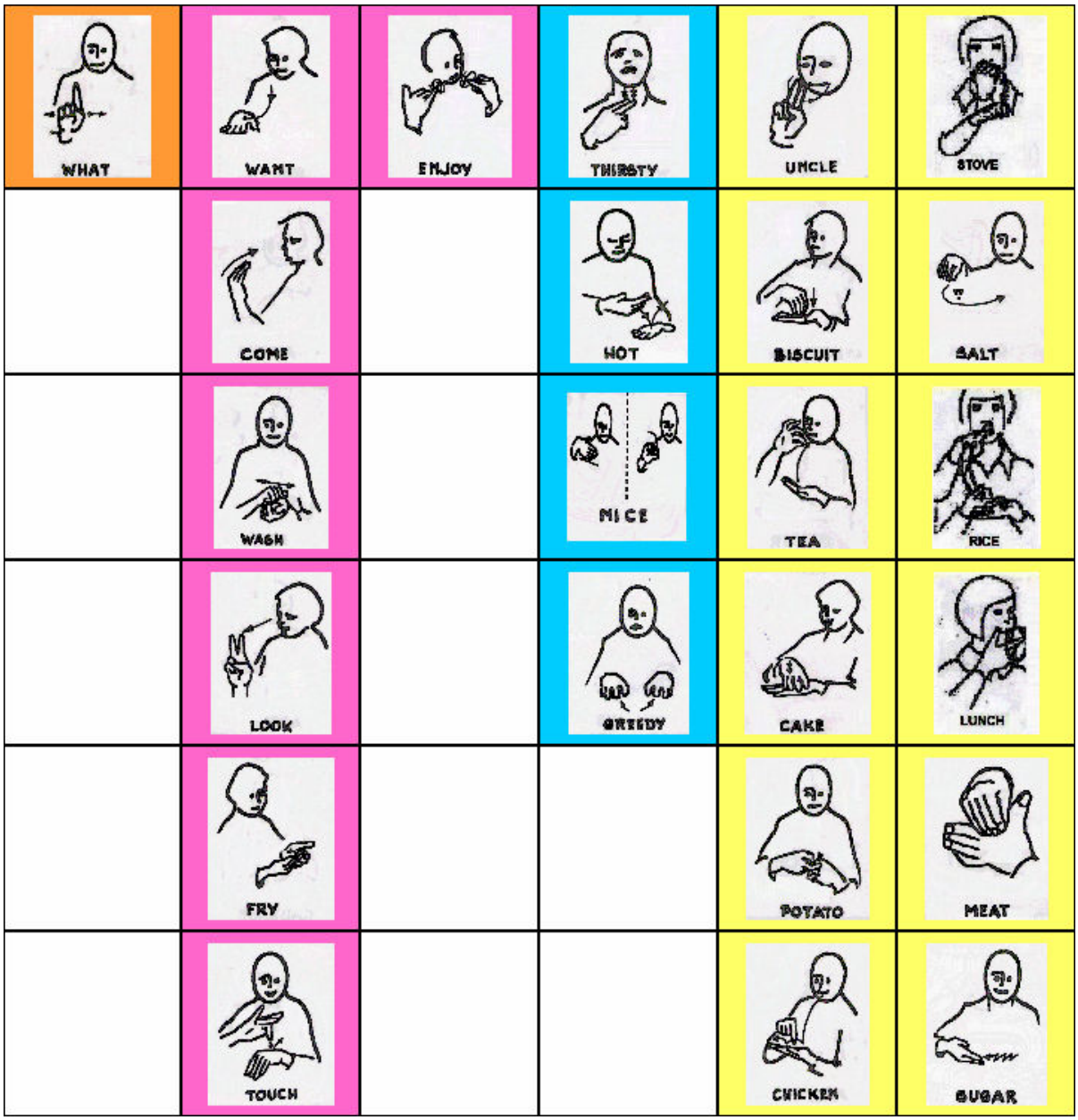
Theme 1: Going out



Miscellaneous Verbs Descriptors Nouns

Theme: Going out

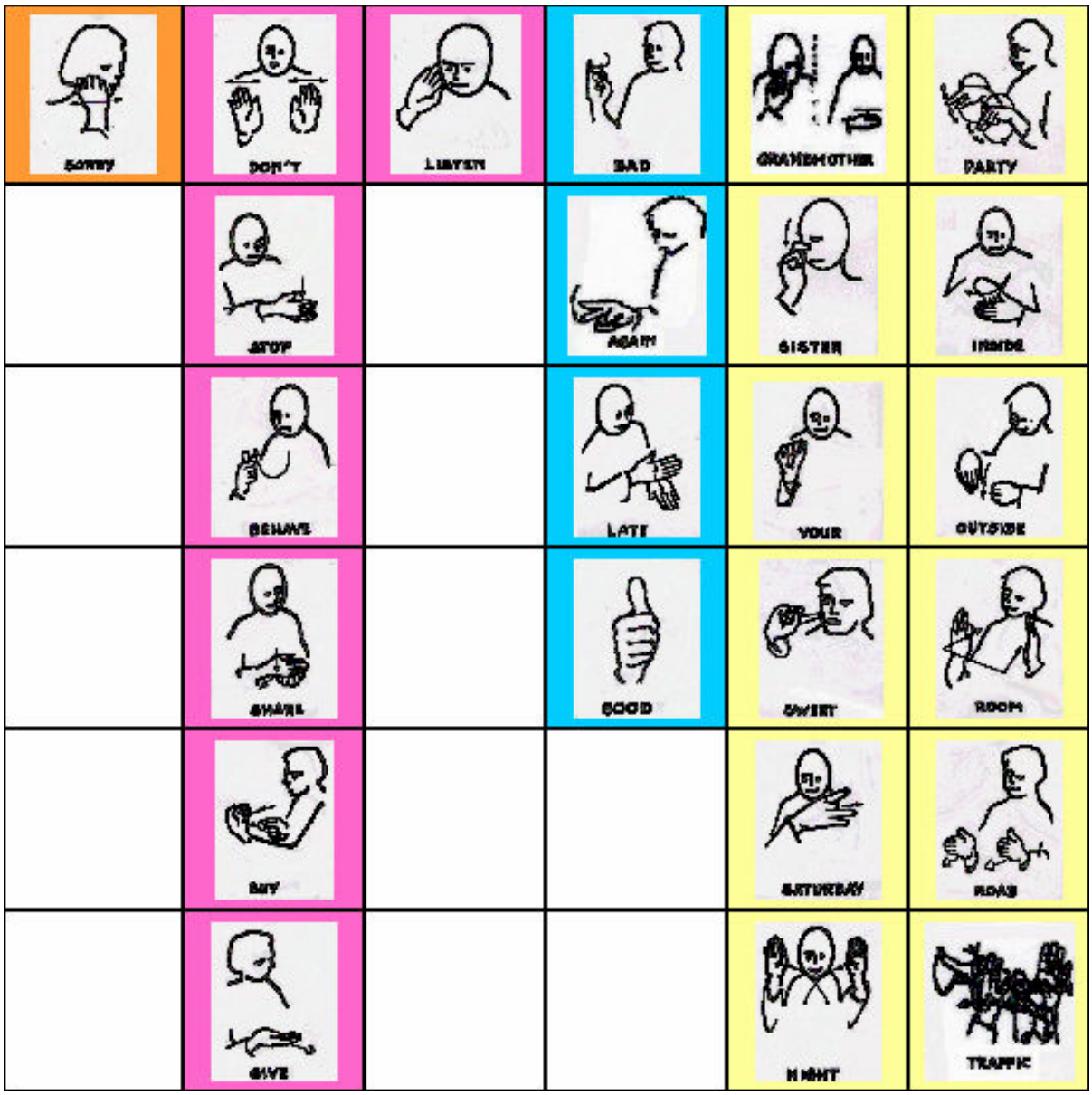
Theme 2: Meal related



Miscellaneous Verbs Descriptors Nouns

Theme: Meal related

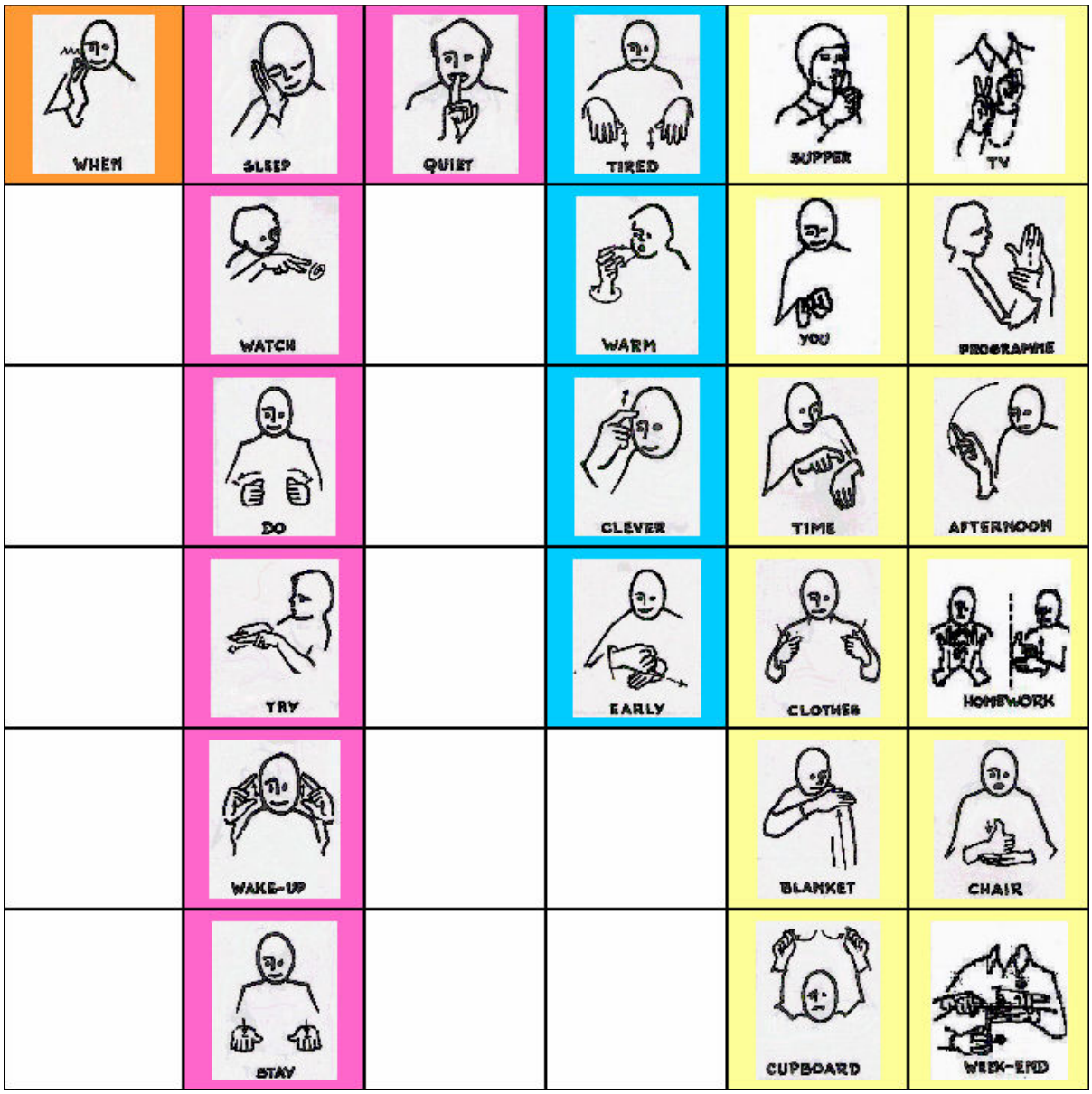
Theme 3: Behaviour related



Miscellaneous Verbs Descriptors Nouns

Theme: Behaviour related

Theme 4: Evening routine



Miscellaneous Verbs Descriptors Nouns

Theme: Evening routine

Appendix 22
Lists of colour coded sign glosses

Theme 1: Going out

Miscellaneous

WHO

Verbs

GO
CALL
VISIT
USE
HUG
KISS
HAVE

Descriptors

NOW
DIRTY
CLEAN
READY

Nouns

FRIEND
AUNTY
NEIGHBOUR
SHOES
JACKET
HOLIDAY
TOWN
MOVIES
SHOPPING
WEDDING
BEACH
TOMORROW

Theme 2: Meal related

Miscellaneous

WHAT

Verbs

WANT
COME
WASH
LOOK
FRY
TOUCH
ENJOY

Descriptors

THIRSTY
HOT
NICE
GREEDY

Nouns

UNCLE
BISCUIT
TEA
CAKE
POTATO
CHICKEN
STOVE
SALT
RICE
LUNCH
MEAT
SUGAR

Theme 3: Behaviour related

Miscellaneous

SORRY

Verbs

DON'T
STOP
BEHAVE
SHARE
BUY
GIVE
LISTEN

Descriptors

BAD
AGAIN
LATE
GOOD

Nouns

GRANDMOTHER
SISTER
YOURSELF
SWEET
SATURDAY
NIGHT
PARTY
INSIDE
OUTSIDE
ROOM
ROAD
TRAFFIC

Theme 4: Evening routine

Miscellaneous

WHEN

Verbs

SLEEP
WATCH
DO
TRY
WAKE-UP
STAY
QUIET

Descriptors

TIRED
WARM
CLEVER
EARLY

Nouns

SUPPER
YOU
TIME
CLOTHES
BLANKET
CUPBOARD
TV
PROGRAMME
AFTERNOON
HOME-WORK
CHAIR
WEEK-END

Appendix 23
Practice scripts

Theme 1: Going out

TOMORROW is a **HOLIDAY**
WHO to **VISIT?**

CALL AUNTY
HUG and **KISS** her

GO to **TOWN**
SHOPPING and **MOVIES**
HAVE a **FRIEND**

Get **READY NOW**
The **SHOES** are **DIRTY**
USE a **JACKET**

The **NEIGHBOUR'S WEDDING**
The **BEACH** is **CLEAN**

Theme 2: Meal Related

WHAT do you **WANT**?
COME get **CAKE**

UNCLE is **THIRSTY**
Put **SUGAR** in the **TEA**

Mustn't **TOUCH** the **BISCUITS**
LOOK that's **GREEDY**

WASH the **POTATOES**
I'll **FRY MEAT**
The **CHICKEN** is **NICE**
The **STOVE** is **HOT**
Put **SALT** in the **RICE**
Did you **ENJOY LUNCH?**

Theme 3: Behaviour Related

SHARE with **SISTER**
GIVE her **SWEETS**
We'll **BUY AGAIN**

Say **SORRY** to **GRANDMOTHER**
BEHAVE YOURSELF
STOP that's **BAD**
Be **GOOD** and **LISTEN**

TRAFFIC on the **ROAD**

LATE in the **NIGHT**
DON'T go **OUTSIDE**
INSIDE your **ROOM**
PARTY on **SATURDAY**

Theme 4: Evening Routine

It's **TIME** for **SUPPER**

WHEN is the **PROGRAMME**?
Be **QUIET** and **WATCH**
STAY in that **CHAIR**
TIRED in the **AFTERNOON**

DO your H**OMEWORK**
YOU are **CLEVER**
TV in the **WEEKEND**

The **BLANKET** is in the **CUPBOARD**
Get **WARM CLOTHES**
TRY to **SLEEP**
WAKE-UP EARLY

Appendix 24
Training instructions

Introduction to the programme This research study involves looking at two methods to learning to sign – one uses sign pictures (graphics/sign illustrations) in a graphic display, and the other uses written words. Sign will be demonstrated for both methods. The aim is to test the two methods and to see how good they are in teaching signs to parents with children who are deaf. You will learn four sets of signs over the next four days, using the different methods. You may be familiar with some of the signs. That is okay. You may also learn a different way of signing the word. These signs are used in the school as well. For the purposes of the study we request that you learn the signs in the programme for now. Do you have any questions? If you have any questions as we go along- we will talk about them at the end of the session.

Condition A – Graphic display Method :Present graphic display Instructions: "We are going to learn this set of signs by using the graphic display".
PHASE I : Learning individual signs
INSTRUCTIONS "These are the signs that we will cover in this session. They are in grammatical categories. The sign from different categories can be combined to form phrases or short sentences. There are signs for question words, doing words - called verbs, describing words called adjectives and naming words- called nouns. First we will learn how to make individual signs. I will show you how these signs are made".
Demonstration "Watch me I will demonstrate the sign twice – once without voice and once with voice. Then you can do the same. We will go through all the signs in this way".
Imitation Participant imitates the sign twice. Correct sign formation if necessary. Feedback: "Okay"……or ….. "Do it like this"?
Practice Use graphic display as reference. Associate the sign with labelled sign illustration. "Now point to the picture and then practice the sign:–first without saying the word (two times). Then sign and say the word (two times). Ask me for help if you need it".
Each of the 24 signs are taught in this manner.
PHASE II: Sign combinations Present the list of sign combinations.
Demonstration "Watch me. I will sign two signs in a phrase or short sentence, signing only the words you have learned. I will read the phrases/sentences and then point to the sign illustrations before signing the words, once without voice and once with voice. Then you can try the same".
Imitation Participant imitates the sign combination. Correct sign production if necessary. Feedback: "Okay"……or ….. "Do it like this".
Practice 1. "Now look at the phrases / sentences and then practice the signs, first without saying the words (two times). Then sign and say the words (two times). Ask me for help if you need it". 2. "Then go through the list again, signing all phrases twice with voice".

Condition B – Word lists Method: Present written list of signs. Instructions:“ We are going to learn this list of signs”
PHASE I : Learning individual signs
INSTRUCTIONS “These are the signs that we will cover in this session. They are in grammatical categories. The sign from different categories can be combined to form phrases or short sentences. There are signs for question words, doing words - called verbs, describing words called adjectives and naming words, called nouns. First we will learn how to make individual signs. I will show you how these signs are made”.
Demonstration “Watch me I will demonstrate the sign twice, once without voice and once with voice. Then you can do the same. We will go through all the signs in this way”.
Imitation Participant imitates the sign twice. Correct sign formation if necessary. Feedback: “Okay”……or ….. “Do it like this”.
Practice Use word list as reference. Associate the sign with the written word. “Now point to the word and then practice the sign, first without saying the word (two times). Then sign and saying the word (two times). Ask me for help if you need it”.
Each of the 24 signs are taught in this manner.
PHASE II: Sign combinations Present the list of sign combinations.
Demonstration “Watch me. I will sign two signs in a phrase or short sentence, signing only the words you have learned. I will read the phrases/sentences and then point to the signs, before signing the words, once without voice and once with voice. Then you can try the same”.
Imitation Participant imitates sign combination. Correct sign production if necessary. Feedback: “Okay”……or ….. “Do it like this”.
Practice 1. “Now look at the phrases / sentences and then practice the signs, first without saying the words (two times). Then sign and say the words, two times. Ask me for help if you need it. 2. “Then go through the list again, signing all phrases, twice with voice”.

Appendix 25
Pilot studies

Aim	Procedure	Results	Recommendations
Pilot study One			
To determine very broadly an adults response to learning to sign the manual alphabet, signs and the use of graphic representations of signs.	A novice adult signer, female, aged 40 years, who was familiar to the researcher was approached to participate. The aspects that were presented were: 1. The one-handed manual alphabet 2. A set of 10 signs within context 3. A set of 5 sign illustrations unrelated to the signs in (2) above, A video recording was made.	Pre-training, the participant showed a willingness to learn to sign. However, the procedure itself seemed daunting, as the participant struggled to get the orientation of the hands correct. The learning of the alphabet, and the difficulty in acquiring it within the session appeared stressful. 2. The signs were imitated fairly easily – but the hand orientation was problematic, the participant turned her hand towards herself to monitor and match the production of the researcher. 3. Sign illustrations: The participant was taught to associate the illustration with the sign, but seemed to link it rather to the demonstration than to "reading" the sign. The participant felt that that task was "hard". Having the camera set up in close proximity resulted in the participant demonstrating a constant awareness of it.	1. The use of the video equipment needs to be more discreet. 2. The learning of the alphabet should not be considered in this introductory programme. This is also recommended in other instructional programmes (Fant, 1979) 3. Visual feedback may need to be considered, perhaps via a mirror. 4. The illustration would have to be associated with a demonstration of the sign, rather than a strategy to read the sign using text or an explanation of the sign formation. 5. A context for the sign learning, and its relevance had to be established.

Aim	Procedure	Results	Recommendations
Pilot study Two			
To assess the use of a graphic display in learning to sign	An undergraduate student-volunteer, took part in this procedure. The training took place in the video studio of the disciplines of Speech Language Pathology and Audiology clinic of the University of KwaZulu Natal (UKZN), Westville Campus - used specifically for student training. A set of 36 signs were presented to the student on a graphic display using signs arranged in word categories (miscellaneous, verbs, descriptors, and nouns). The display size was A4. The procedure involved producing the signs on imitation and then practicing the signs within a short phrase	The participant felt that a bigger display such as in an A3 format would be easier to follow. She felt that a demonstration by the researcher was easier to follow than the graphic symbols. She felt it was intimidating not knowing all the signs initially, and also felt that it was too many signs to learn. Pre- training scores were 2/ 36 i.e. 5% of signs were known. On immediate recall, 47% were acquired, 19% were approximations and 27%) were incorrect.	1. The board size should be A3. 2. Fewer signs should be taught in the session. 3. Not all signs on the display should be probed. 4. Attention should be given to the issue of practice of signing following acquisition through imitation.
Pilot study Three			
To practise and test both teaching strategies within the AATD for all four themes.	Two student volunteers, female, aged 19, participated in the pre-pilot study	Various aspects were specifically evaluated as enumerated in the table below	Recommendations on these aspects are presented below
1. To assess the environment with regard to the video recording	Participants were trained in the video studio at the UKZN clinic. Two cameras were used, one to focus on the participant and one on the trainer.	The set- up worked well. It did not appear to be intrusive. The split screen used in the analysis of the data will be useful to monitor both the participant and trainer performance.	The screen should be split in a 45: 55 ratio, as the right hand of the trainer was sometimes not captured with signs made away from the body. The table on which the graphics was placed needed to be lower, as it got on the way of some signs being produced.
2. To assess the use of visual feedback provided by a mirror	A large mirror (76 cm x 58 cm) was placed against a wall, 2 meters away and directly in front on the participant	The participants' attention had to be drawn to the mirror during the programme. They did not readily use it.	The mirror would introduce a new variable into the study and therefore should not be utilized.

Aim	Procedure	Results	Recommendations
3. To assess the format used in the session with regard to the flow of training components in terms of order	The order of the session included: introduction to the session; administering of theme probe sets, information on signing, teaching of the sign set (word level and phrase level) then administration of the post test probes.	The context did not seem very clear prior to the training despite the topic being given. The theme script was misplaced when it appeared later in the session. The introduction of information on signing should be presented before the teaching of the signs as it acknowledged the lack of skills and knowledge on signing – serving to perhaps help the participant relax. The participants appeared very interested in the topics and did not ask for any clarity or raise questions.	1. The sample script should be read prior to the pre- test probe. 2. The information on signing should be given prior to the teaching of signs. 3. The order of the information topics be altered such that more information be given on sign formation, including hand dominance be included as participants needed to be reminded of this many times during the training. Order of topics should be: 1) sign formation, 2) description of sign language, 3) fingerspelling, 4) Users of sign language. Format: 1) reading of script, 2) pre-training probes, 3) Sign information, 4) imitation of sign, 5) practice of sign, 6) practice of sign combinations in Key Word Signing (KWS), 7) post training probe.
4. To assess instructions given	The instructions were read for both imitation and practice together.	This was confusing, and needed to be separated. Participants requested verbal feedback during the imitation task.	The instructions be shorter and be given separately for the imitation task and the practice task. Participants will also be given non- specific feedback during the training period.
5. To assess the practice of sign combinations	During both the teaching strategies, KWS was used with sign combinations.	The participants experienced difficulties with longer utterances.	Short phrases should be used when sign combinations were used for practice. There was difficulty signing and speaking longer utterances. The utterances had to be such that the amount of practice of all probes was constant.

Aim	Procedure	Results	Recommendations
6. To assess the theme-based graphic displays	The displays were referred to by pointing to sign illustrations when learning the individual signs and also when signing combinations.	The size of the pictures was considered acceptable, i.e. same as the original size in the book *Talking to the Deaf* (Neider-heitman, 1980). Some drawings were lighter than others. Locating the signs on the displays took time.	The final display should be darker when photocopied onto the A3 format. Colour coding should be used to highlight the semantic categories (Goossens', 1995)
7. To assess written material – cues to signing	Word lists and phrase/sentence lists were presented during the signing only condition.	The words were not easily distinguishable from each other	The word classes should be separated and written in larger font, and all signs should be in bold, and colour – coded for grammatical categories as the graphic displays -for ease of identification.
8. To assess analysis methods	The number of probes per session and within the ATD was assessed.	There were two sets of probes assessed within a session. This seemed acceptable to the participants. No signs were known on pre- training probes. All 64 signs were probed on the last session.	The data presentation method will need to also consider day seven when retention will be assessed.
9. To assess the design overall.	The design included time slots for the treatments to be adhered to.	This was not practical as participants had commitments that prevented them being seen as anticipated	Time slots in the design would have to be adjusted such that the order in which participants are seen rather than the actual time is considered in the alternation. Difference between strategies was not readily noticeable on scores. The prominent difference was evident in the participant request for assistance from the trainer when graphics were not available (e.g. 14 items had to be repeated by the trainer when only words were used). This aspect should perhaps

Aim	Procedure	Results	Recommendations
			be evaluated in terms of efficiency of the methods in terms of resources and self learning.
10. To assess time frames	Each aspect of the programme was timed.	Approximately 25 minutes was required to administer the programme.	Time frame was adequate for a half hour session.
11. To allow the trainer opportunity to practice the teaching strategies.	The researcher made notes during the training and observed the videos to critique performance.	Some signs were found to be inaccurate e.g. CLEAN – the movement was not repeated. The order of voice versus voiceless production was not consistent for the signs.	1. The trainer must be vigilant with regard to production of all signs. 2 The instructions should be on hand and read out for each aspect of the training to maintain consistency. This should be confirmed by an independent rater.
12. Preliminary general comparison of strategies		**Graphics**: Coped well, did not ask about arrows Comments from participant: -good to do voiceless practice, it helped "think differently" and/focus when signing. -Number of signs was okay for the time allocated, i.e. 24. **Signing only:** Many errors with orientation, participants asked for assistance frequently.	**Graphics**: 1. Two demonstrations need to be done consistently, participants were eager to imitate without careful observation. 2. No need to teach reading of arrows. Graphics triggered accurate recall. **Signing only:** 1.Imitated correctly after one demonstration, therefore need to be consistent 2. Phrases should be clearly typed, signs in bold. 3. The phrases and signs should be practiced twice: with voice, then without voice.

Appendix 26
Sample score sheet

Score Sheet Two
Participant Number: ____
Training strategy: ____
Probe number: P0/P1/ P2/P3

Expression	**Response**			
Carrier phrase: "Sign _____":	**Correct sign**	**Approximation**	**Different sign - note**	**No response**
1. NICE				
2. BISCUIT				
3. COME				
4. UNCLE				
5. GREEDY				
6. FRY				
7. TOUCH				
8. ENJOY				
9. CHICKEN				
10. WHAT				
11. LOOK				
12. WASH				
13. WANT				
14. SUGAR				
15. RICE				
16. THIRSTY				

Reception	**Response**		
Carrier phrase "What is this?"	**Correct**	**Different sign-note**	**No response**
1. BISCUIT			
2. WHAT			
3. COME			
4. TOUCH			
5. GREEDY			
6. FRY			
7. THIRSTY			
8. RICE			
9. CHICKEN			
10. NICE			
11. SUGAR			
12. WASH			
13. WANT			
14. LOOK			
15. ENJOY			
16. UNCLE			

Appendix 27
Sample session format

Session Two

(So, how are you doing?)

1. Administer Probe (P2- Theme 1)
   - Expression
   - Reception

2. Presentation of Information on signing
   - What is sign language?

3. Introduce theme and read sample script

5. Probe (P0)
   - Expression
   - Reception

6. Sign teaching (Theme 2)

(So, how did you find that?)

7. Administer Probe (P1)
   - Expression
   - Reception

Appendix 28
Treatment integrity and inter-rater reliability measures

Aspect	Rater	Procedure	Justification
Treatment integrity of the teaching procedures			
1. Treatment integrity of the training sessions	An audiologist (Inter-rater 1) who had done a basic course in SASL 2 years prior as part of her undergraduate training was recruited.	Six of the sixteen video-recorded training sessions, 37.5% of the data was randomly selected by the inter-rater. In addition 50% of the post interviews and the debriefing sessions were observed. This resulted in 10 of a possible 24 sessions (42%) of the programme overall being observed for treatment integrity. Refer to Appendix AD for the schedule of sessions randomly selected by the inter-rater. The observer was guided by a schedule containing the aspects to be covered. Refer to Appendix AE for the schedule used.	Schlosser (2003) suggests a range of 20 to 40% be used as a guide when selecting data for the purpose of treatment integrity and inter- observer reliability. It addition, it was ensured that each set and participant was represented and that there were equal numbers of the two training conditions as recommended in the literature (Schlosser, 2003).
2. Treatment integrity of the training procedure	Inter-rater One	Video- recordings of the six treatment sessions (37.5% of the data) described earlier and referred to in Appendix AD were observed. Refer to Appendix AF for a sample of the recording form used by the inter-rater.	To determine if the training itself was conducted as specified in terms of the teaching (instructions, demonstrations, imitation and practice.
Inter-rater reliability for sign acquisition and assistance scores			
1. Inter-rating of individual probe signs measured by pre-training and post-training probes in the expressive and receptive modes.	A SASL signer (Inter-rater 2), who had completed a level three SASL course through the KZN Sign Language Academy was recruited.	On completion of the training programme, the researcher viewed all the signs measured on probes P0 to P3 captured on video- recordings. Signs were evaluated in terms of being either correct on incorrect on the specified criteria. A brief training period and discussion of the task occurred prior to the inter-rating. A video recording was made available to the inter-rater specifying the sign dialect that was used in the study. Discussion occurred around the factors that would be considered in terms of the scoring, viz. the parameters of handshape, location, movement and orientation. In addition the inter-rater felt that signs that could be	100% of the data was inter-rated. Thus 960 signs (60 signs X 4 sets X 4) for expression and reception respectively were inter-rated. This was considered critical as the scores would be the primary data to differentiate the two conditions being evaluated. This is above the criteria recommended by authors (Schlosser et al., 2001, Richards et al., 1996). Video-recordings were used as this was a more feasible method

Aspect	Rater	Procedure	Justification
		confused with other signs on the basis of the changes in sign parameters was critical, and considered sign location to be critical in terms of contributing to the accuracy of the signs. Once the inter-rater completed the scoring by observing all videos, the researcher captured the data and compared the scoring, looking at discrepancies. Inappropriate sign dialect that was accepted by the Inter-rater was rejected; however, the inter-rater's judgment for the parameter of movement was favoured where the researcher had noted a score to be "uncertain" due to this parameter.	because of the time demands of live inter-rating within the AATD in terms of the availability of personnel to suit the schedule. In addition, the video also allowed for verification in the case of uncertainty of the scorers due to the transient nature of the signs.
2. Inter-rating of scores for trainer assistance during training.	Inter-rater 1	Six of the 16 training sessions, i.e. 37.5% of the data, were randomly selected for inter-rating as described above and presented in Appendix AD. All signs covered in the theme set (24) were inter-rated because of the difficulty of separating them. However, only the results for probes (15) are given in the results. These signs were inter-rated during three phases of sign practice, viz. word level, and two sessions at phrase level. This resulted in 15 x 3 (45) opportunities for probe signs within a set. Signs were rated in terms of three categories: a) assistance not required; b) correction for a sign approximation, and c) demonstration for a non response or incorrect sign.	The decision to reflect only the probe signs in the inter-rating was influenced by the comparisons of the training strategies which will be more meaningful if ratings did not include signs not balanced for the purpose of the AATD.

Appendix 29
Random selection of material for inter-rater reliability

Material selected randomly (by Inter-rater 1) for inter-rater agreement of assistance received during training and for calculation of treatment integrity - denoted by X.
(S= Signing-only strategy, G=Graphics strategy)

	Day 1 (training)	**Day 2 (training)**	**Day 3 (training)**	**Day 4 (training)**	**Day 5 (P2 and post-training interview)**	**Day 12 (P3 and debriefing interview)**
Participant SG	SET 1 - G	***X*** ***SET 2 - S***	***X*** ***SET 3- G***	SET 4 - S		
Participant D	SET 2 -S	SET 1 -G	***X*** ***SET 4 – S***	***X*** ***SET 3 –G***		***X***
Participant R	***X*** ***SET 1-S***	SET2-G	SET 3 -S	SET4-G	***X***	***X***
Participant SA	***X*** ***SET -2 G***	SET 1- S	SET 4-G	SET 3-S	***X***	

Appendix 30
Treatment integrity- session format

Treatment integrity: session format form

Participant:

Teaching strategy:

Theme number:

Please indicate if the trainer conducted the following:

	Yes	**No**
1. Asked the participant how she was doing.		
2. Probed signs learned from previous session (except on day one).		
3. Presented information on an aspect of Sign Language/		
4. Provided instructions on the teaching strategy.		
5. Introduced the theme, with a sample script.		
6. Probed signs related to the theme.		
7. Conducted the training.		
8. Asked the participant how they felt about the completed task.		
9. Probed the signs learned in the session.		
10. Conducted a post interview, raised issues for discussion in debriefing session.		
11. Conducted a debriefing session.		

Appendix 31
Treatment integrity form: training criteria (sample)

Instructions: Please note whether the following aspects were covered in the training session.
((V= with voice, VL = without voice, C = Correction, D = Demonstration, - = No assistance provided)

Participant number: _____ Teaching strategy: _____
Theme 1: Going Out (Individual signs)

	Word Demonstration			**Word imitation**		**Word practice**			
	Instruct ions	**VLx1**	**V1x1**	**VL x1**	**VLx1**	**Instructions**	**VLx2**	**Vx2**	**Assistance C/D/-**
1. WHO									
2. GO									
3. CALL									
4. VISIT									
5. USE									
6. HUG									
7. KISS									
8. HAVE									
9. NOW									
10. DIRTY									
11. CLEAN									
12. READY									
13. FRIEND									
14. AUNTY									
15. NEIGHBOUR									
16. SHOES									
17. JACKET									
18. HOLIDAY									
19. TOWN									
20. MOVIES									
21. SHOPPING									
22. WEDDING									
23. BEACH									
24. TOMORROW									

Theme 1: Going out (sign combinations)

Signs	Phrase Demonstration			Phrase imitation		Phrase practice 1				Phrase practice 2		
	Instructions	VL x1	V x1	VL x1	V x1	Instructions	VLx2	Vx2	Assistance C/D/-	Instructions	Vx2	Assistance C/D/-
1. TOMORROW												
2. HOLIDAY												
3. WHO												
4. VISIT												
5. CALL												
6. AUNTY												
7. HUG												
8. KISS												
9. GO												
10. TOWN												
11. SHOPPING												
12. MOVIES												
13. HAVE												
14. FRIEND												
15. READY												
16. NOW												
17. SHOES												
18. DIRTY												
19. USE												
20. JACKET												
21. NEIGH-BOUR												
22. WEDDING												
23. BEACH												
24. CLEAN												

Appendix 32
Treatment integrity of programme: results

Note: Inter-rater agreement for treatment integrity of the training sessions was conducted by Inter-rater 1. Six sessions, 37.5% of the sessions, were observed to determine whether all components in a session were conducted.

	Yes	**No**
1. Asked the participant about how she was doing	*5/6*	*1/6*
2. Probed signs learned from previous session	*5/5*	
3. Presented information on an aspect of sign language/signing.	*6/6*	
4. Introduced the training programme, with instructions (Day one only).	*2/1*	
5. Introduced the theme, with a sample script.	6/6	
6. Probed signs related to the theme.	6/6	
7. Conducted the training	6/6	
8. Asked the participant how they felt about the completed task.	6/6	
9. Probed the signs learned in the session.	6/6	
10. Conducted a post-training interview.	*2/2*	
11. Conducted a debriefing session.	*2/2*	
Inter-rater agreement	***50/52 = 96%***	

Appendix 33
Treatment integrity of teaching criteria: results

Inter-rater agreement for treatment integrity of training sessions observed by Inter-rater 1
(37.5% of randomly selected sessions: 6 of 16 sessions). In each of the themes, the 15 probe signs were observed for adherence to the teaching criteria, and instructions given.

(Key: Observations relate to participants: SG, D, SA, R, and Themes: 1-4
VL= voiceless signing, and V= voicing during signing)

a) Individual signs

Observations (Participant – theme)	**Demonstration**			**Imitation**		**Practice**		
	Instructions	**VLx1**	**Vx1**	**VL x1**	**Vx1**	**Instructions**	**VLx2**	**Vx2**
1. (SG-2)	1	15	15	15	15	1	30	30
2. (SG-3)	1	15	15	15	15	1	30	30
3. (D-3)	1	15	15	15	15	1	30	30
4. (D- 4)	1	15	15	15	15	1	30	30
5. (SA-2)	1	14	14	14	14	1	30	30
6. (R-1)	1	15	15	14	15	1	30	20
Inter-rater Agreement	**6/6 (100%)**	**89/90 (99%)**	**89/90 (99%)**	**88/90 (98%)**	**89/90 (99%)**	**6/6 (100%)**	**180/180 (100%)**	**180/180 (100%)**

b) Sign combinations

Observations	**Phrase Demonstration**			**Phrase imitation**		**Phrase practice 1**			**Phrase practice 2**	
	Instructions	**VLX1**	**VX1**	**VLX1**	**VX1**	**Instructions**	**VLx2**	**VX2**	**Instructions**	**Vx2**
1 (SG-2)	1	15	15	15	15	1	29	30	1	30
2 (SG-3)	1	15	15	15	15	1	30	30	1	30
3 (D-3)	1	15	15	15	15	1	30	30	1	30
4 (D-4)	1	15	15	15	15	1	30	30	1	30
5 (SA-2)	1	15	15	14	15	1	30	30	1	30
6 (R-1)	1	15	15	14	15	1	30	30	1	30
Inter-rater agreement	**6/6 (100%)**	**90/90 (100%)**	**90/90 (100%)**	**88/90 (98%)**	**90/90 (100%)**	**6/6 (100%)**	**179/180 (99%)**	**180/180 (100%)**	**6/6 (100%)**	**180/180 (100%)**

Summary (Inter-rater agreement) :

Total instructions = 30/30 = 100%
Total demonstrations = 359/360 = 99%
Total imitations = 355/360 = 98%
Total practice = 939/900 = 99%

Appendix 34
Inter-rater agreement scores for probe signs

(Note: 4 x 15 probes per set, PO-P3, were considered, 100% of the data)

	Theme 1	**Theme 2**	**Theme 3**	**Theme 4**	**Total**	**Percentage**
Participant SG						
Expression	59/60	53/60	59/60	56/60	227/240	95%
Reception	58/60	59/60	59/60	59/60	235/240	98%
Participant D						
Expression	57/60	56/60	57/60	56/60	226/240	94%
Reception	59/60	59/60	59/60	59/60	236/240	98%
Participant SA						
Expression	59/60	56/40	57/60	56/60	228/240	95%
Reception	59/60	57/60	58/60	60/60	234/240	98
Participant R						
Expression	56/60	60/60	59/60	59/60	234/240	98
Reception	59/60	60/60	58/60	60/60	237/240	99%
SUMMARY						
Inter-rater agreement			**Expression**		**915/960**	**95%**
			Reception		**942/960**	**98%**

Appendix 35
Inter-rater agreement for assistance scores

(Note: Six sessions, 37.5% of the sessions, were observed during 3 practice phases. There were 15 probes signs in each phase.

Strategy		**Signing-only**	**Graphics**	**Graphics**	**Signing-only**	**Graphics**	**Signing-only**
Theme (Participant)		2 (SG)	3(SG)	3 (D)	4 (D)	2 (SA)	1 (R)
Practice level	Practice 1	13/15	11/15	13/15	14/15	14/15	11/15
	Practice 2	12/15	12/15	12/15	14/15	15/15	14/15
	Practice 3	13/15	15/15	15/15	13/15	15/15	11/15
Total scores		**38/45**	**39/45**	**40/45**	**41/45**	**44/45**	**36/45**
Inter-rater agreement		**238/270 = 88%**					

Appendix 36
Summary of participant perspectives on sign teaching

Note: A summary of the main findings is given here. The details from the pre- and post training interviews are presented in Appendix 37 and Appendix 38.

A. Signing ability and views on learning to sign

It must be noted that participants were recruited on the basis of a lack of signing ability and a motivation to learn to sign. Participants had responded in accordance with having a sign vocabulary of less than 15 signs. With regard to pre-training signing ability, participants unanimously described their signing as inadequate with descriptions such as *"pathetic", "very bad"* and *"basic"*. Post-training all participants felt their signing had "*definitely"* improved. Refer to Appendix 37 for details on participant perceptions of skills pre- and post-training.

B. Interest in sign learning

All participants appeared highly motivated to sign prior to the training. This was not unexpected, given their voluntary participation. Post-training they were still very motivated to improve their signing skills, expressing a desire to continue with lessons. Comments included regret at not having learned to sign earlier, as well as viewing sign language from a broader linguistic perspective with wider application to the hearing population. This perhaps reflects a change in their own view of themselves as signing hearing individuals. This can therefore be seen as a positive step in intervention, as it may have implications for transformational learning (Broder- Johnson (2001). This is of particular importance given that pre-training participants perceived that the training would be "a little difficult", and post training, did not generally view it as "easy". Appendix 37 presents detailed information on the level of interest in sign learning pre- and post training.

C. General aspects

Participants' feedback from the post training interviews provided the data by which the responses to the training were noted, and is available in Appendix 38. It became evident from participant responses that the training in general, including both strategies, was viewed positively by all participants. The vocabulary, in terms of size and scope were seen as highly appropriate with immediate practical application. Comments included "*It is something I would use on a daily basis with R"; "All these words are important- These are the words you use everyday"*. Participants also appeared to retain and apply the general information on signing provided during the training, described in Section 3.5.1.3 and noted in Appendix 38. Examples included "*I remember you saying sign in a box, in a particular area- I wasn't aware of it"* and "*Things I didn't know- there are different signs and facial expression"*.

D. Training strategies

All participants commented on the benefit of the graphics. Refer to Appendix 38. Three participants actually felt it was more useful than the word lists. The following comments were made by the participants - R: "*The pictures were more helpful- show you the sign"*; SG: "*From where I started, I needed illustrations- show me how to grasp it. I am not really that good at knowing how the sign is positioned as such;* D: "*Only words, was a little hard";* R*: "Seeing the pictures helped me a lot. Because even if don't know anything about sign language by seeing the picture- gives you as idea about how to go about it... I found it a very big help looking at the pictures"*. One participant, SA, stated that she relied on the signing

that accompanied the graphics, only *"peeking*" at the sign illustrations. This could mean that the graphics did assist with recall, but the sign demonstrations were relied on.

Participant S was also the only one who commented on the bimodal method (signing with and without voice), and felt it to be beneficial: *"It helped especially when you made us repeat it twice. Saying it twice for ourselves, twice silent and twice with words actually drums it into our heads".* Word lists accompanying the signing-only condition were seen as beneficial as well, as commented on by R who stated they did add to the signing demonstration, which could also refer to the structuring of the learning task to keep the targets in mind*: "It was good. It was different from if someone just signs to you. Here you are also seeing the word".*

In summary, the training was viewed by the participants as beneficial as they considered their signing to have improved to some extent. Further, they felt that the use of the communication displays facilitated their learning of the signs, with three participants clearly stating that it was more beneficial than the signing only condition.

Appendix 37
Participants' perceptions of signing

1) Participant perception of signing ability

Aspect	**Participants**							
	SG		**D**		**SA**		**R**	
	Pre-training	**Post-Training**	**Pre-training**	**Post-training**	**Pre-training**	**Post-training**	**Pre-training**	**Post-training**
1. Description of signing ability	*Pathetic. My sign language sucks. I need to learn sign language.*	*I don't think I am good in any way. I've got a lot to learn. From what I learned it's actually okay… definitely improved. I am confident to a certain extent.*	*Not very good. Basic, am learning*	*I'm able to sign a lot better than I used to. I had very little knowledge of it. I think I will be able to sign better now.*	*Very bad*	*Much better. Definitely improved. Because I knew about 5 or 6. Now a lot. Now I can make a sentence. Talk to M now- "Do your homework".*	*Know basics. Half the time I am lost. I need to learn. I think we should learn proper signs.*	*Definitely improved... definitely improved. I know now I can communicate better, been a big help for me. I actually can put sentences together and stuff like that. Something I didn't know before. It even helps me when she does home –work.*
2. Self rating of signing ability	2- poor	3-fair	2-poor	3- fair *I am a little more confident now.*	2- poor	3- fair *I only know key words. Can't say good, because I don't know everything.*	2-poor	4- good. *I'll say from poor, now to good. I'll give myself good" (laughed)*

2) Participant perception of the sign learning experience

Aspect	**Participants**							
	SG		**D**		**SA**		**R**	
	Pre training	**Post – training**	**Pre-training**	**Post –training**	**Pre-training**	**Post – training**	**Pre-training**	**Post - training**
1. Description of sign learning experience.	*If I had put effort would have learned. Have been putting it off. Very oral, because daughter didn't need it.*	*Look I don't think I have been utterly good at it, but I have picked up. But relatively I have made a difference. You described Pidgin – I have made attempts to learn signs and use it. When I am by myself during the day, I practice. Look it's really been good.*	*Haven't had lessons*	*For one I benefited quite a lot. I learned many signs. It was interesting.*	*Haven't learned more since being to parent guidance class, and observing.*	*It was actually a good experience. It wasn't that difficult as I thought it would be.*	*A little difficult. I don't spend time because of working nights. Need time – I have no time*	*Um! Fascinating. What can I say? So many signs. Never thought like the words I learned so far- are everyday words. – have signs for them, Enlightening. Because good to know sign language. Not only because have a child who signs – just to communicate*
2. Attitude towards sign learning 2.1 Feelings about sign language	*Now I am older, would really, really like to do it. Such a good language to learn.*		*Is a very interesting language to learn.*		*Haven't really thought about it. I don't have a problem with it. It's good.*		*Interesting, a good thing to know*	

Aspect	**Participants**							
	SG		**D**		**SA**		**R**	
	Pre training	**Post – training**	**Pre-training**	**Post –training**	**Pre-training**	**Post – training**	**Pre-training**	**Post - training**
2.2 Interest in sign learning 2.21. Description of interest in sign learning	*It's becoming an issue at school for me to learn and help R. Therefore, I have been so eager to come and learn.*	*Oh I am very very pleased. Doing this is a complete turning point for me now. Why didn't I do it many years back? But my approach was different I wanted R to be oral, but he's not like T(his sister)as such. I wish I could continue. Find somewhere I*	*Love to learn*	*I enjoyed it for one. Two it was very very beneficial to me. I hope I will now be able to l earn more signs. There was a little of confusion before – unable to communicate. Now from what little I learned- I can communicate.*	*I would love to sign, would be excellent. Can communicate more. Can understand him better. My family can learn.*	*I would like to go and learn it on my own. Maybe I can end up teaching.*	*Very eager*	*It is interesting and I will like to learn more, definitely. I think everyone should learn, whether they have a deaf child or whatever. Maybe helps you in other countries- people will pick up – not only if you have a child I want to go find out about*
2.2.2 Rating scale of interest level (5-point)	*1- very interested*	*can go on the weekends and become fully fledged.*	*1- very interested*		*1- very interested*		*1- very interested*	*classes for the entire family, because will be useful throughout our life. E should be given a fair chance to communicate freely with us and everyone else.*
3. Perceived sign learning difficulty	*2- a little difficult*	*3 – no problem*	*2- a little difficult*	*2- was a little difficult*	*3- no problem*	*4- easy*	*2- a little difficult*	*3 – no problem..*

Appendix 38
Participant perception of sign teaching strategies

Aspect	**Participants**			
	SG	**D**	**SA**	**R**
1. Perception of the different teaching strategies.	*Good way to learn… see the words and use the illustrations. From where I started, I needed illustrations. Show me how to grasp it. I am not really that good at knowing how that sign is positioned as such. Looking at the illustration showed me what I should be doing.*	*It was a very good method. It simplified from my point of view.*	*I think it was good. It helped especially when you made us repeat it twice. Saying it twice for ourselves twice silent and twice with words actually drums it into our heads.*	*The pictures were more helpful. Show you the sign. The word also, because if put words and pictures together, actually know what you are doing.*
2. Comments on specific aspects of the training: 2.1 word lists 2.2 graphics 2.3 sign information 2.4 sign selection (number of signs/ kind of signs)	**Word lists***: Okay because you were also aiding me. Would have been difficult.* **Graphics:** *For a beginner like me, was excellent looking at the illustration. But even then you needed to guide me.* **Sign Information***: I remember you saying sign in a "box, in a*	**Word lists**: *Only words, was a little hard.* **Graphics**: *The pictures were there, were able to see it...was better. You can look at picture and….(*gestured). **Sign Information:** *I did benefit. Things I didn't know there are different*	**Word lists**: T*he word lists was very helpful because I really don't look at the pictures*. **Graphics**: *The pictures as well helped, because mostly you showed us. The pictures don't actually show you. You showing helped a lot. Easier. The pictures also helped. If you peek at it quickly, you remember how the sign goes. It was very good.* **Sign Information**: W*hen you told me about the monks, used it many years ago, I was*	**Word lists**: *It was good. It was different from if someone just signs to you. Here you are also seeing the word.* **Graphics**: *Seeing the pictures helped me a lot. Because even if don't know anything about SL, by seeing the picture, gives you as idea about how to go about it. I found it a very big help looking at the pictures.* **Sign Information**: I*t was good. Maybe some people don't know about DEAFSA,*

Aspect	Participants			
	SG	**D**	**SA**	**R**
	particular area- I wasn't aware of it.	*signs and facial expression. I was not aware of it.*	*learning a little bit of history. Helped to understand about Deaf society.*	*and about ASL- Different forms of sign language. Names- associate something about person- made me understand when E talks about friends at school- uses characteristics, also family – uncle with silver car. Good way for child to remember people - it helps.*
	Sign selection No of signs*: For now I would say it was adequate. Off- hand I don't remember everything. If more, would have been worse.*	**Sign selection** No of signs: *Was okay, - manageable.*	**Sign selection** No of signs*: You told me how many words we had to learn- something like 80- 90 or something. To me I thought "wow" but it didn't prove to be that hard at the end of the day. It was a good thing.*	**Sign selection** No of signs: *Number of signs, were okay. In fact, I am very happy that I did this. Because it made me learn a lot of signs, I won't know.*
	Kind of signs*: Familiar and useful. It is something I would use on a daily basis with R. Common things, use everyday with a hearing impaired child.*	Kind of signs: *I have benefited. I did not know them. I am pleased to learn them.*	Kind of signs*: All these words are important- These are the words you use everyday.*	Kind of signs: *lot of signs one used often at home. . but you don't know how to sign it. Because of this programme, I have learned a lot of things. It will be easier for me to communicate with E. Most of the signs we learned are common words- words we always use. It's a good feeling because you learned something to use.*

Appendix 39
Individual signing scores: sign production

Note: Scores were obtained for four participants (SG, D, SA and R), across four probes (P0-P3), and four themes (1-4).

SG

Teaching strategy (theme)	Probe			
	P0	**P1**	**P2**	**P3**
Graphics (1)	2	9	9	6
Graphic (3)	1	8	7	6
Graphics Total	***3***	***17***	***16***	***12***
Signing-only(2)	2	10	11	8
Signing-only (4)	2	10	7	6
Signing-only Total	***4***	***20***	***18***	***14***

D

	P0	**P1**	**P2**	**P3**
Graphics (1)	1	12	11	8
Graphics (3)	0	12	13	7
Graphics Total	***1***	***24***	***24***	***15***
Signing-only (2)	2	11	9	8
Signing-only (4)	1	9	10	6
Signing-only Total	***3***	***20***	***19***	***14***

SA

	P0	**P1**	**P2**	**P3**
Graphics (2)	4	14	12	10
Graphics (4)	2	13	11	12
Graphics Total	***5***	***27***	***23***	***22***
Signing-only (1)	4	15	13	9
Signing-only (3)	4	13	13	11
Signing-only Total	***8***	***28***	***26***	***20***

R

	P0	**P1**	**P2**	**P3**
Graphics (2)	3	14	14	10
Graphics (4)	1	13	12	12
Graphics Total	***4***	***27***	***26***	***22***
Signing-only (1)	1	13	14	10
Signing-only (3)	2	14	13	9
Signing-only Total	***3***	***27***	***27***	***19***

Appendix 40
Individual signing scores: sign understanding

Note: Scores were obtained for four participants (SG, D, SA and R), across four probes (P0-P3), and four themes (1-4).

SG

Teaching strategy (Theme)	P0	P1	P2	P3
Graphics (1)	4	12	11	9
Graphics (3)	5	10	11	9
Graphics Total	***9***	***22***	***22***	***18***
Signing-only (2)	5	12	13	14
Signing-only (4)	3	11	9	8
Signing-only Total	***8***	***23***	***22***	***22***

D

	P0	P1	P2	P3
Graphics (1)	2	14	13	9
Graphics (3)	0	13	11	10
Graphics Total	***2***	***27***	***24***	***19***
Signing-only (2)	4	11	11	8
Signing-only (4)	2	12	12	9
Signing-only Total	***6***	***23***	***23***	***17***

SA

	P0	P1	P2	P3
Graphics (2)	4	15	15	14
Graphics (4)	3	13	14	13
Graphics Total	***7***	***28***	***29***	***27***
Signing-only (1)	3	15	15	11
Signing-only (3)	2	15	14	14
Signing-only Total	***5***	***30***	***29***	***25***

R

	P0	P1	P2	P3
Graphics (2)	4	15	14	14
Graphics (4)	1	12	13	13
Graphics Total	***5***	***27***	***27***	***27***
Signing-only (1)	0	14	15$	14
Signing-only (3)	5	15	15	14
Signing-only Total	***5***	***29***	***30***	***28***

Appendix 41
Assistance required during training

Participant	Strategy					
	Graphics			Signing-only		
	Theme- Day	N=15	Percentage	Theme- Day	N=15	Percentage
SG	1-1	10	67	2-2	12	80
	3-2	8	53	4-4	13	87
D	1-2	9	60	2-1	11	73
	3-4	10	67	4-3	8	53
SA	2-1	10	67	1-2	12	80
	4-3	10	67	4-3	12	80
R	2-2	12	80	1-1	11	73
	4-4	9	60	3-3	9	60

Appendix 42
Nature of assistance

Participant	Type of assistance	Strategy											
		Graphics						Signing-only					
		Day-set	Practice 1 (n=15)	Practice 2 (n=15)	Practice 3 (n=15)	Total N=45		Set-Day	Practice 1 (n=15)	Practice 2 (n=15)	Practice 3 (n=15)	Total N=45	
						No	%					No	%
SG	Demonstration	1-1	0	0	0	0	0	2-2	10	2	0	12	27
	Correction		8	6	5	19	42		1	5	7	13	29
	Demonstration	3-2	0	0	0	0	0	4-4	9	3	3	15	33
	Correction		7	5	1	13	29		4	4	5	13	29
D	Demonstration	1-2	4	1	0	5	11	2-1	6	2	1	9	20
	Correction		3	3	1	7	16		6	4	0	10	22
	Demonstration	3-4	2	1	0	3	7	4-3	8	6	4	18	40
	Correction		8	3	3	14	31		1	1	2	4	9
SA	Demonstration	2-1	0	0	0	0	0	1-2	6	2	2	10	22
	Correction		10	0	1	11	24		4	2	2	8	18
	Demonstration	4-3	3	0	0	3	7	4-3	7	3	2	12	27
	Correction		5	6	2	13	29		3	1	1	5	11
R	Demonstration	2-2	4	1	0	5	11	1-1	7	2	2	11	24
	Correction		7	5	2	14	31		2	2	3	7	16
	Demonstration	4-4	0	1	0	1	2	3-3	5	1	2	8	18
	Correction		8	2	1	11	24		3	3	2	8	18