

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 (1 week 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.

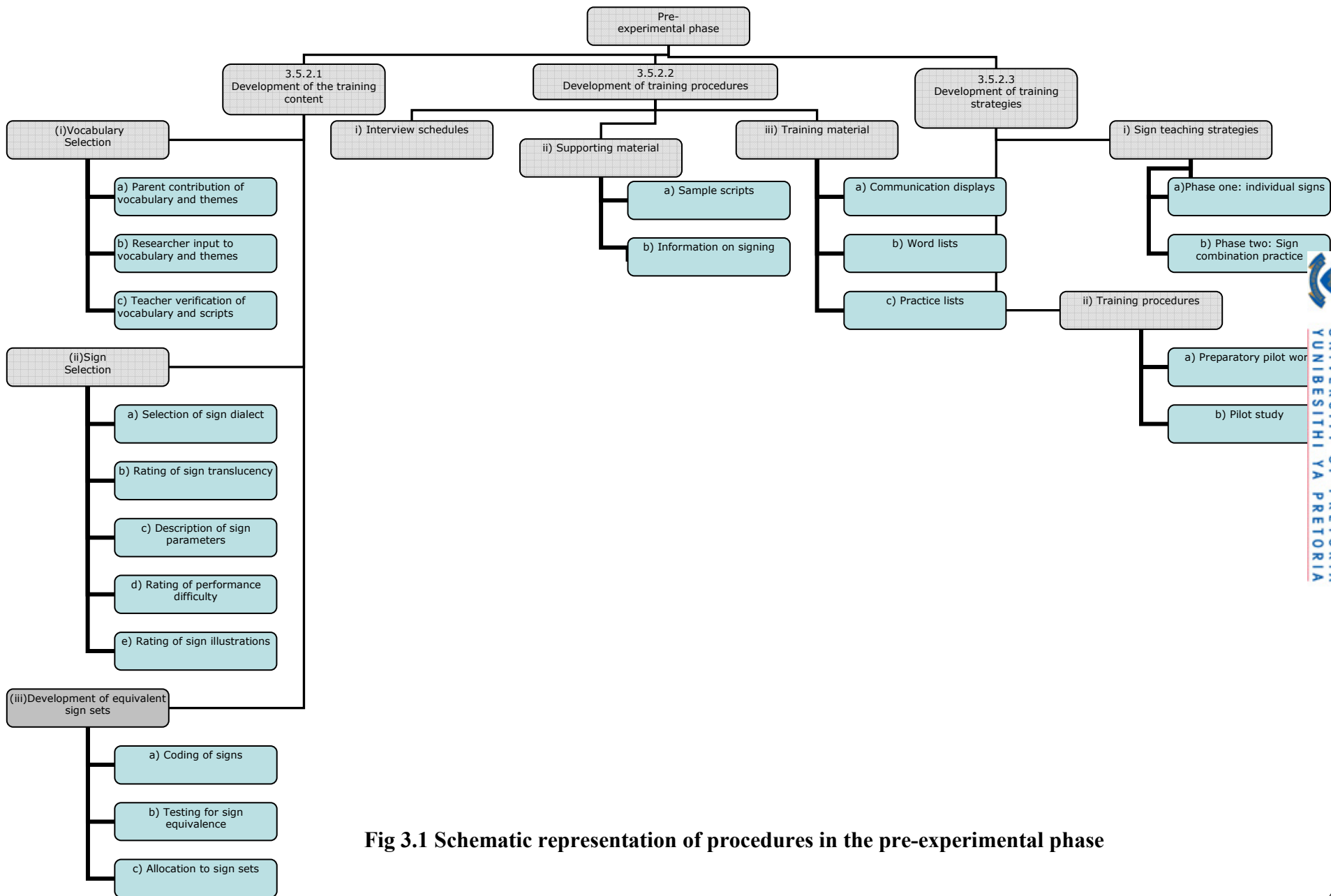


Fig 3.1 Schematic representation of procedures in the pre-experimental phase

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% *difficult* 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 chereemic 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	\bar{X}	Set	\bar{X}	Set	\bar{X}	Set	\bar{X}	Set	\bar{X}	Set	\bar{X}	Set	\bar{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 \bar{X}	G \bar{X}	Sign	PD \bar{X}	G \bar{X}	Sign	PD \bar{X}	G \bar{X}	Sign	PD \bar{X}	G \bar{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													
Miscellaneous	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 \bar{X}	G \bar{X}	Sign	PD \bar{X}	G \bar{X}	Sign	PD \bar{X}	G \bar{X}	Sign	PD \bar{X}	G \bar{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 chereemic 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 (Appendix 14). 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	<i>How signs are formed</i>	P0 & P1 of training set	Sample script read prior to training
Day Two	Strategy: A or B Theme: 1 or 2	<i>What is Sign Language</i>	P2 (previous set) P0 & P1 (of training set)	Sample script read prior to training
Day Three	Strategy: A or B Theme: 3 or 4	<i>Finger-spelling</i>	P2 (previous set) P0 & P1 (of training set)	Sample script read prior to training
Day Four	Strategy: A or B Theme: 1 or 2	<i>Sign Language users- Deaf culture</i>	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 (Section 3.6.4.3).
- 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):

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

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:				
<i>Translucency</i>				
- Low (73%)	11	11	11	11
- High (27%)	4	4	4	4
<i>Handedness</i>				
- one (47%)	7	7	7	7
- two asymmetrical (23%)	5	5	5	4
- two symmetrical (20%)	3	3	3	4
<i>Handshape</i>				
-easy (33%)	5	5	5	5
-difficult (67%)	10	10	10	10
<i>Visible (100%)</i>	15	15	15	15
<i>Contact (60%)</i>	9	8	9	8
Graphic characteristics of probes:				
<i>SASL(Text 1)</i>	14	14	14	13
<i>Signed English (Text 2)</i>	1	1	1	2
<i>Compound signs (13%)</i>	1	1	1	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.