BSL Development

Final Report

J G Kyle

Centre for Deaf Studies

AUGUST 1990

University of Bristol
School of Education
22 Berkeley Square
Bristol BS8 1HP

Tel: (0272) 303030 ext M 377
Minicom: (0272) 251370

□

□

The Report in summary

Although we have seen a great upsurge in the popularity in sign methods in schools for the deaf in the UK, and although the legislation in 1981 actively promotes the assessment of the child's skills in his or her native language, we have as yet no means for assessing the performance of deaf children in sign language. This is partly the case because the priority of educators is to make progress in English and for this to be the most visible aspect of schooling. Nevertheless, it is of considerable importance to understand both the potential of the children and to be able to detect weaknesses in language use which relate to sign as well as to English.

In this short initial study a total of 77 children were filmed in 4 local authorities in England. All schools or Units used sign language with a varying relation to English. Our aim was to discover measures which would indicate the performance of deaf children in British Sign Language. We are not yet able to give objective judgements on the performance of deaf children in relation to any sort of norms (this may come from further studies). However, we can set out some of the considerations for test design and can also indicate relative performance on the tests which we constructed. We have as yet no reliability figures for these measures and so the results must be treated with caution.

The overall pattern of results is consistent with a view that most deaf children learn sign language rather late. Developments in linguistic competence which we could expect before schooling for hearing children learning speech, tend to occur in the beginnings of Infant and Junior schooling. Vocabulary development seems to proceed slowly though consistently over the age range from 4 to 11 years. This is apparent in both receptive and productive measures. However, spatial grammar, the use of classifiers, identification of sign components do not appear reliably until the latter part of junior schooling and then there is wide variability in the children's competence. Interaction and picture description also indicate some problems. Overall, it seems rather more attention to sign grammar and structure is required in teaching sign and teaching with sign for this group of children.

The measures we have used have a number of problems as they are attempting to break new ground but they do indicate the need to focus on grammatical developments in sign ordering, classifiers, modulation and even vocabulary.

The lack of a BSL curriculum is one of the problems; the lack of clarity about differences between BSL, SSE and English do not help. If we are to make a single recommendation from the study, it is to spend more time on the treatment of sign in school, with particular attention paid to the structure of the language and its usefulness in relation to English progress.

Acknowledgements

Any study of this sort is a team effort and in compiling the report I must make clear that all the data was collected by Bonnie Kirk and Jennifer Ackerman. Both carried out a great deal of the raw data analysis which was absolutely essential to the final analyses presented in this report. Description of Materials and Pilot Work in this report is taken from a paper by Kirk and Ackerman (1990).

Margaret Binnie was the co-ordinater who arranged the school visits and the accommodation and all the secretaries in the School of Education Research Unit were involved at some stage.

The main thanks of course are due to the schools themselves: their staff and their pupils, who gave of their time and effort. If this study can be a base for future development of sign language measurement in education then it is because of the work of this group of people in the schools where we tested. We have deliberately deleted the names of the schools to avoid identification but this should not disguise their contribution to the research work.

To all of these, many thanks.

Jim Kyle

Bristol

August 1990

Background

Language Development:

We have made major strides in our understanding of language development since child linguists first began to apply their expertise to the field in the wake of Chomsky's analysis of language in the 1960s. Put very simply we have progressed from simple word counts of the acquisition of speech, to the search for child grammars, into an area which acknowledges the importance of interaction as the main focus for study. In this latter form, we can see children constructing meaning through language, in communication with the others they encounter. This aspect, of course, brings us into the critical area for deaf children right away - how can deaf children succeed when the key part of language development is in the interaction and it is this interaction which is most affected by hearing loss?

Wells (1986) goes further in his views on the centrality of language in relation to all learning. All children develop ways of understanding what other people mean in their utterances. In doing so, they make progress in language. The task for us, as adults, is to ensure the complete involvement of children in this process and to encourage them to develop their own goal-setting in learning. Such an approach requires deaf children to be able to engage in free communication with those around. As we can see from research such as Wood et al (1986) this is seldom the case and many features of English teaching seem to work against the open-ended extension of language. It has therefore been a constant struggle to manage the learning of deaf children and we seem to have been trying to educate without answering one key question - how do deaf children function in their own language. This has been a subject which we have been studying in Bristol for the last seven years. It will take much longer before we have a definitive answer to the question but we are beginning to see the deaf child's potential for communication in this language situation.

Our work grew out of an ESRC research project (Kyle, Ackerman & Woll, 1985) which examined the interaction between deaf mothers and their hearing and deaf infants from a few months of age until three years. We found that deaf mothers communicated with their children in an adjusted register which differed from registers used in adult-adult interaction. This was similar to "motherese" or baby talk discovered in spoken language. However, interaction was rather different from mother-child interaction in spoken language, with deaf mothers emphasising visual attention and naming in the first two years of development. It was also observed that despite these differences from hearing dyads, young deaf children from deaf families had mastered and were using a great deal of BSL by the age of three or four years and functioned as effectively linguistically as hearing children did in spoken language. The following two transcripts exemplify this competence.

In the first transcript, this three year old deaf child is able to understand about past and future events and postponement of an action; specifically postponing the removal of her "Happy Birthday" chain from the mantelpiece. These negotiations form the basis of the interaction.

A second deaf child, four year old Ginny, is able to carry on an imaginary conversation in front of her mother. Ginny vocalises and signs but if we rely on her speech only, a great deal of the communication would be lost. Looking at her signing as well as her speech allows us to make a more complete appraisal of her language ability.

Transcript 1: Nancy (3 years 0 months)

Playing a game of pairs with cards face down. Nancy takes her turn then her attention is caught by the "Happy Birthday" chain hanging over the mantelpiece. She wants it removed because it's past her birthday by a few days.

	Mother	Child	Comments
1.	Turkey		Holds up a card
	Mother	Child	Comments
2.		*	
3.		You can have any of these	(pointing to cards)
		<Not me>, Wait, Wait	
4.		Take that, Take it off now	(pointing at chain on wall)
5.		Take it off, I want it off now.	
6.	Take what off?		
7.		I want those now.	(points to wall)
8.	You want those taken off?		
9.		Yes.	
10.	Wait until we finish the game.		

Then I will take it
off all right?

11. I can't reach it.

I can't. You reach

it and take it off.

12. I'll ask Daddy to

take it off. Wait

for Daddy to come

home and he'll take

it off.

13. Can't, Can't, I can't

reach it, I can't.

14. No you can't reach

it. Wait until Daddy

comes home and takes

it off.

15. OK, leave it. Leave it,

Leave it until later.

Transcript 2: Ginny (3 years 11 months)

Playing with plasticine. Ginny imagines it is custard. Her mother starts to discuss the colour.

	Mother	Child	Comments
1.		Pink, I saw pink custard*	
2.	Yours is pink, What colour is the custard in school?		
		Green	(spoken only)
3.	You're telling fibs, It's yellow		
4.		It's pink.	(pointing at dish)
5.	School...I'll ask tomorrow - no Friday - I'll ask at school if you have green custard. Then GM (teacher) will say "no".		
6.		(Turning aside)	

I'll ask GM (teacher)
"Have you had green custard?"
GM will say "yes"

7. When we ask GM if she

had green custard...,

perhaps she'll say
"yes",perhaps "no".

She'll say "yes".

* These are translations from BSL. Some signs are also vocalised. The sign GREEN is often made with exaggerated lip pattern. Here Ginny omits the manual element and vocalises.

These children are now beginning their school life in mainstream settings. Once there, the signing skills which they have developed are easily ignored because of the school's emphasis on hearing loss and the teaching of English-related skills. The language which they have mastered is not evaluated as part of their portfolio of abilities. However, despite this, they are still the lucky ones. The vast majority of deaf children are born to hearing families, and we do not know to what extent they have developed any "native" sign language at home. Often they have their initial exposure to signing at school, between the ages of 3 and 5 years. We do know that their spoken language will be poorly developed if they have a severe hearing loss. It would be a great step forward if we were able to understand the level of BSL competence in deaf children whether from deaf or hearing homes. It would be a great service if we were able to give them linguistic credit for their knowledge of BSL. Given the expectation that children develop language in an orderly manner, with increasing complexity of comprehension and expression, assessment of linguistic development in BSL should be possible and could inform teachers about the linguistic strengths and weaknesses of their pupils. It is critical that teachers know how much their students are understanding and whether any lack of comprehension or ability to express what has been learned is due to difficulty with the material or difficulty with the language.

A search of the literature has revealed very few studies and no published instruments to measure deaf children's BSL skills. Only one published test, the Carolina Picture Vocabulary Test has been found which assesses vocabulary development in a sign language, American Sign Language (ASL) (Layton and Holmes, 1985). A survey of assessment instruments used in the United States to evaluate the language of deaf children found that English-based sign systems were used more frequently than ASL. Also reported by over half the respondents as major obstacles to speech and language assessment were "the lack of tests and the absence of norms for the hearing-impaired." (Abraham and Stoker, 1988).

In our study to be described below, we have taken some first steps towards creating measures of BSL competence in deaf children.

Aims

The primary aims of the study were to explore competence in BSL by deaf primary-school children and to develop some tentative measures of BSL achievement which would inform teachers and professionals on the level of performance of their deaf children.

In particular, the study planned to assess the value of pilot language material in receptive and productive vocabulary, sign order, turn-taking and interaction, sign decomposition and story-telling.

Expected outcomes were indicators of language performance which could be used experimentally by schools.

Methodology: The Schools and Children

The study involved the investigation of deaf children between four and eleven years of age. This age range was chosen as it is a period when expected growth in sign language is great and where it could be studied in primary school classes. Seventy-seven children from schools for the deaf or units which have a policy of sign use, in four regions of England took part to ensure that the assessment measures took into account regional variations in signs and the influence of a variety of teaching methods. This offered a basis for determining sign development and provided the data necessary to proceed with a full-scale evaluation of BSL levels of development.

The four settings differed on a number of key dimensions. Two of the schools were day schools, one was residential. The fourth location was a network of units attached to mainstream schools as the local authority policy does not include deaf school placement. The degree of mutual interaction amongst the deaf children varied from those in a large residential school where we can predict extensive, out-of-hours sign communication to units where children's only contact with other fluent signers was at school. Virtually all children were classed as being in Total Communication programmes or Sign and Speech programmes; two or three children in the residential setting had no formal sign language tuition or interaction with adults.

In all locations there was some contact with deaf adults though this seemed to be greatest in the Unit setting and least in the smaller of the two day schools and in the residential school. Teacher fluency in sign was not measured and this remains a difficult variable to quantify. It seems obvious that it has an effect though we cannot judge whether sign varieties which are closer to English are balanced by greater degrees of pupil contact which is BSL-based. It is also not clear whether sign used only in school leads to a narrow range of performance skills in sign. That is, if children only ever use sign in a school setting for classroom management, question-answering, and description of school-based topics, it is not clear that they will be able to express themselves adequately in open-ended fluent sign conversations.

The children in detail:

Seventy-seven children took part in the study. Thirty-four were girls (44%) and seven had deaf parents (9%). Table 1 shows the distribution of hearing loss.

Table 1: Better Ear Average Hearing Loss (n = 68)

-65dB	66-85dB	86-95db	96dB+

Nos	2	3	9	54
%	3	4	13	79

In nine cases no audiograms were available.

The average age range of the group was from 4 years 2 months to 11 years 7 months. The distribution is as shown in Table 2.

Table 2: Distribution of age

	Nos	%
4 years- 4:11	8	10
5 - 5:11	8	10
6 - 6:11	11	14
7 - 7:11	9	12
8 - 8:11	11	14
9 - 9:11	10	13
10 - 10:11	16	21
11 years +	4	5
	77	

This provides an evenly balanced sample by age. In each school we asked to see all children in the age range who were in the signing programme and who had no other severe handicaps.

We asked about the type of signing used in school. For most of the children (74%) the school claimed Sign Supported English was used or some combination of this with another form. Sixteen percent were said to use Total Communication. BSL was used for 5% of the children with a further 11% claiming BSL and SSE. This signing is carried over into the home for 43% of the children who have at least one parent signing at home. A further 22% are trying to sign. Twenty-one percent do not use sign at home and we had no information on 14% of the children.

Cause of hearing loss varied from `genetic' family history (16%), rubella (6%), meningitis (10%) to relatively infrequent causes such as viruses, otitis media, rare syndromes and illnesses (accounting for 12%). By far the largest category was unknown cause (55%).

There was some difficulty in obtaining accurate figures on onset with 61% being unreported or unknown. Twenty-two percent of hearing losses occurred at birth with virtually all the rest having an onset prior to three years (14%).

We collected a number of teachers' ratings of the pupils' language or speech, comprehension and signing. The following tables give the general result.

Table 3: Use of Speech (% of children)

	%

Uses only gesture	4
Uses less than 10 words	14
Uses less than 150 words	30
Uses speech within a limited range of situations	30
Uses speech almost normally but with a deaf voice	21

No data was reported for 7 children

Table 4: Comprehension of Other's Speech

	%
Has no understanding	15
Understands a little	47
Understands about half	19
Understands a lot	15
Understands most of what is said	5

No data was reported for 2 children.

Table 5: Intelligibility of Speech to Others Outside School

	%
Unintelligible	35
Possible to understand a little	35
Almost half intelligible	25
Most is intelligible	4
Clear speech	1

Data was not available for 2 children.

On a simple level it is clear that the school environment is a more sympathetic one for the child's speech than the outside world as this group has severe problems in conveying information through speech alone as seen in Table 5. Almost too-thirds have difficulty receiving information through speech.

Surprisingly, perhaps, teachers did not feel children used sign all the time but believed that gesture was used in combination rather more (Table 6).

This is similar to findings reported by Wickham and Kyle (1987) in relation to the definitions of BSL by educators which tended to downgrade the pupil achievements in favour of mime and gesture.

Table 6: The Nature of the Pupil's Signing

	%
Uses mostly gesture	1
Uses a few basic signs	14
Mixture of sign and gesture but clear	44
Uses a range of signs and combines them	33
Uses fluent sign	7

The rating implies only 7% of children are fluent in sign in this group. Of the 7 children who had deaf parents only 3 were rated as "uses fluent sign".

In terms of how clear the signing was to the teacher we find the vast majority of children were rated as having "mostly clear" signing. Only one of those from deaf families had a rating "all understandable".

Table 7: The ease with which teachers understand the child's signing

	%
Impossible to understand	0
Not very clear	7
Half understandable	33
Mostly clear	63
All understandable	6

Of the 4 children who had completely understandable sign, 3 were rated as effective speakers, though two were thought to be almost unintelligible to people outside of the school. In terms of the type of signing used with peers by the whole sample, 47% were rated as using BSL while 42% were considered to use SSE.

This section is purely descriptive of features of the sample and of the ratings provided by teachers. The latter are inevitably subjective but are likely to be consistent. This allows us to utilise them in later parts of the report to explore differences in sign performance. At this stage, we should not read too much into the scores.

Materials

There are seven receptive and expressive BSL assessment tools in the study:

1) Communication in an interview situation: This section was designed to put the child at ease in the setting and to encourage conversational, rather than short, responses. The child was asked a number of open-ended questions about herself, her family and school. Responses are analysed in terms of length of utterances, appropriateness of responses, and general conversational ability.

2) Sign Order Comprehension and Production: The tasks in this part were conceptually based on the "Word Order Comprehension Test" (Fenn, 1979) which was designed to look at deaf children's understanding of referents in written English. Simple action pictures with direct or indirect objects are used to examine whether children know BSL sign order. There were two parts to this section: the child first watched a deaf adult sign a sentence (e.g. GIRL (a), BOY (b), CHASE (ab)). [In this sentence the subscripts refer to location. The girl is placed at point (a) in space, the boy at point (b), the sign CHASE then moves through space from (a) to (b) implying the girl chases the boy.] The child was then shown pairs of the same base picture with the subject/direct object or direct/indirect object reversed. (So one picture has, "girl chases boy", and one has, "boy chases girl"). The child had to select the correct picture for the sentence signed by the examiner. Then the child had to sign a selection of pictures herself to indicate how well she could produce sign order.

3) Classifier use: The purpose of this section was to assess the ability to use classifiers in BSL and to manipulate spatial location. [Classifiers are base handshapes in BSL which refer to certain classes of objects, events or people, e.g. a flat hand palm-down can represent a car, a boat, a plane (if moved forwards) can represent a flat surface, (if moved sideways) e.g. a table. A curved hand may represent long cylindrical objects and so on.] Children were shown a set of the "What's Wrong Here?" pictures (LDA, 1976) and asked to describe the mistakes. Here we were looking for classifier manipulation such as man-classifier inverted to represent a man hanging from the ceiling. Comparable structures are not found in English and therefore this test provides a measure of language-specific skill. To describe adequately the locational and physical abnormalities in the pictures, deaf children have to use classifiers.

4) Sign decomposition/"rhyming": This task was designed to determine whether deaf children can decompose and compare signs in terms of handshape and movement just as hearing children learn to decompose words into component sounds and identify rhymes. The child was asked to identify the sign/picture from the four shown which had the same component (handshape or movement) as the one demonstrated by the researcher.

5) Picture description: This section elicited a text describing a picture. Using five pictures on a school theme the child was asked to describe what was happening. Measures extracted included length of utterance, and BSL use (modulation, placement). The test is also sensitive to preferences for Signed English or BSL structures.

6) Receptive Vocabulary Measure: This attempted to assess a child's comprehension of a signed example on videotape. The child was required to select the appropriate picture (from four) for the sign produced by the deaf model. Each response was coded for degree of correctness.

7) Expressive Vocabulary Measure: This measured productive vocabulary in BSL. The child was presented with a picture and asked to produce a single sign for the picture. Responses were video-recorded for analysis which could include scoring for use of classifiers, mime, and facial expression.

In the remainder of this section we will describe the construction and use of the vocabulary measures as these are the measures which we had expected to be most easily used in the classroom. Here we will deal with some of the issues for test construction when the language is BSL.

Procedure for and Preparation of Vocabulary Tests

Our goal was to develop a measure which could be used by teachers in the classroom to assess their deaf pupils' vocabulary, even if the teachers did not have a deep knowledge of BSL. Two published receptive language tests were found which could readily be adapted at least in theory: the British Picture Vocabulary Scale (BPVS) (Dunn, Dunn, and Whetton, 1982) and the Carolina Picture Vocabulary Test (CPVT) (Layton and Holmes, 1985). Both have a picture selection format. The former is a test of English vocabulary and the latter, of American Sign Language. The format is that the assessor asks the child "where is the ball", "show me the tree" or even "house", and the child has to point to the appropriate picture. In using this we made assumptions about the likely correspondence of conceptual development and appropriateness among the languages English, ASL and BSL. Such a decision does not tie us to either English or ASL but rather offers an initial baseline. Item analysis of collected data should determine the final items which could form the basis of a scale. We examined each test according to whether items from them could be "translated" into BSL. We examined 230 items in total and designated signs for each target picture. Several problems were immediately apparent when we examined these existing items:

1) Cultural inappropriateness: Some of the pictures in the American test were not applicable to British culture (e.g. baseball), or had visually inappropriate stimuli. These items were rejected.

2) Direct representation of body parts: Several of the BPVS plates depicted body parts (e.g. "neck", "ankle", "wrist"). Signing these would require merely pointing to or touching the body part. In a testing situation, a pupil would simply need to match the body part indicated, with items in the picture; knowledge of BSL would not be assessed. Therefore, these items were eliminated.

3) Lexical non-equivalence: It is obvious on a linguistic level that BSL and English are non-equivalent. What is less intuitively obvious is that pictures designated by a concept in one language may not be designated by the supposedly equivalent concept in the other language. English pictures which represent single English words may not represent signs in the same way. A concept which is represented by a single word in English can often be expressed in several different ways in BSL. Decisions had to be made for each test item as to which was the most appropriate sign for the picture. In some cases it is impossible to use a picture which can easily be represented by a single English word to represent an equivalent BSL concept at the same level of complexity. In conversation, fingerspelling might be used, but this is inappropriate when testing vocabulary. With pictures representing categories, another problem occurs. A single word (e.g. furniture) might be used in English, while a compound would be used in BSL (e.g. TABLE-CHAIRS). In a few cases, BSL disambiguation of manually identical signs depends on specific lip patterns.

What becomes clear is that the apparent simplicity of English word-concepts within a developmental framework, cannot be transferred to a BSL situation simply by translation. For almost all items, other than concrete objects, we have had to re-construct BSL stimuli for what should be conceptually simple pictures.

The following principles were used in constructing test items. If the test picture could be represented by a single sign, this was used, even when it seemed to be at an easier level of difficulty than its position in the test implied. If there was no single sign equivalent to the original

test item, a different concept which the picture could also represent and which could be signed was chosen. For example, one plate of four pictures depicted several animals, such as a puppy chewing on a slipper, a woodpecker pecking at a tree, and a seal balancing a ball on its nose. The original test concept was "stunt", which has no single sign translation in BSL in this context. Therefore the test item was changed to PRACTICE which uniquely identified one picture.

4) Iconicity: Some signs visually represent their referents, such as the signs BABY and DRINK. Although the sign in isolation may be opaque to a non-signer, when given a choice between four pictures, iconicity may be used as a clue. For example, the sign DIVE is formed by the hands in a praying pose moving upwards, then inverting and moving downwards. When shown the alternative picture choices, it was possible to exclude items such as children playing and swimming in the water, and to guess correctly the picture representing DIVE.

When there was a choice of how the original test item could be signed, the least iconic variant was chosen. Other changes in the test items were made as described above in order to ensure one signed test item per plate. A deaf researcher signed the sequence of test items and was videorecorded. All signs were tested for comprehension and correct identification of test items by another deaf adult.

Pilot Work

Further problems surrounded the need to determine and eliminate the signs which were too transparent to be used in a contextually controlled testing situation with children, since it is important that the test reveals what a child knows in BSL, rather than how well a child can guess. Therefore, twenty-one hearing children who did not know BSL and were aged between four and eleven years were given the pilot tests and asked to "try to guess which of the four pictures the lady on the tape is signing."

Wherever at least 80 percent of the hearing children correctly guessed a test item, it was considered highly iconic. Of the 129 items adapted from the Carolina test, thirty-six were found to be highly iconic, as were eighteen of the ninety-seven items adapted from the BPVS. Only twenty-one items of the former and twenty-four of the latter were correctly selected by the group at chance or lower than chance level (25% or less).

This must cast some doubt on the usefulness of the Carolina test as a measure of ASL competence, if we find hearing English children can guess correctly, large numbers of items in an American Sign Language Test!

After the pilot tests were administered to the hearing subjects, a single test was created by using the items which had been most difficult for the hearing children: those which were correctly selected by 25% or fewer of the subjects. This yielded forty-five items. Four easier practice signs were included from among the highly iconic items. Twenty items of mid range (scores of between 26 and 70% correct by hearing children) in terms of iconicity were added to the beginning of the test. The new sixty-five plate test was then video recorded in sequence with a deaf signer and a test booklet made of the practice and test plates (Appendix 1).

Expressive Vocabulary

Once the receptive vocabulary measure was designed, a reciprocal expressive vocabulary measure was created to elicit single signs from picture stimuli. The test items and pictures from the unedited pilot version of the signed receptive test were used as initial stimuli. This ensured pictures of consistent style yet distinct vocabulary. Any pictures which could not be signed with just one sign were then eliminated.

The possibility of correctly expressing sign by miming was then explored with two hearing adults who knew no BSL. They were asked to look at the expressive set of pictures and to use a single gesture to communicate the concept. Their responses were videorecorded. The pictures included representations of simple objects and actions as well as more abstract illustrations such as "dangerous".

A deaf researcher viewed the video-tape and items for which gestures matched BSL signs, were eliminated. A total of twenty eight items were discarded. Sixty items plus two practice items were then ordered in terms of generally predicted difficulty and a pilot test made.

Summary

By this somewhat circuitous route it becomes clear that English-Sign translation of test material is not simple. The issue of dealing with transparency in signs is a major one even in what would appear to be a simple test i.e. vocabulary. It is often supposed that tests of language can be used directly with deaf children e.g. the Reynell test, but it seems very likely that the transparency of test items and the ability of hearing children to guess signs or to create gesture, invalidates the test as an indicator of language development.

The study proceeded with these features in mind and the range of measures described were applied.

Procedures

Four LEA schools or services were approached with a view to their deaf children participating in the project. All agreed. One LEA had the children distributed in Units, two were day schools and the fourth was a residential school. All had a policy and practice of using sign in the classroom with this age group of children. We did not make any measurement of the levels of sign use by teachers and this was therefore a variable within the study. It was not possible within this study to take into account the child's school history in regard to signing as this would have been very complex (since it is very difficult to establish whether a previous teacher used sign and to what extent. Equally we could not accurately determine the home background in relation to signing and we had to be satisfied with a simple rating from the teachers who knew the situation best. Two researchers, one deaf and one hearing, travelled to each location for 3-4 days to complete the assessments.

No prior decisions were made in relation to the use by the children of Sign supported English as distinct from BSL. Our aim was therefore to determine the extent of sign knowledge of the children and the level of their productive skills in set piece situations.

Children were tested during normal school hours. The tests took in the region of one hour for each child but this was split between the vocabulary measures and the other measures to ensure that the children did not have sessions which were too long i.e. no longer than 30 minutes.

Analyses and Results

As is inevitably the case with video data it turns out to be rather more complex than expected. The analysis carried out in this project can therefore only be considered preliminary and as such does not provide neat solutions to the problems of how to assess BSL. We have no background material to turn to nor do we have an adequate model of BSL acquisition upon which we can draw. Although we can make predictions from the literature on ASL about likely developmental sequences in BSL, there is no easy way of linking them to the particular situation of deaf children in our British schools. The fact that most deaf children do not learn sign at home from their parents must make the pattern of development different. The fact that at school they meet, in their teachers, people for whom BSL is a second language at best or for whom at the worst, BSL is still a mystery alters the learning environment. The existence of policy which attempts to integrate deaf children as a first priority, is likely to affect the acquisition of sign. How critical such a situation is depends very much on language development as a whole and then on the corresponding degree of access to information offered in that education system.

There is no doubt that language is vital to early growth. Our task in this analysis is to consider levels of BSL development in the sample of deaf school children.

Results

In this initial examination of the data collected each measure will be considered on its own before attempting to combine the different measures.

1. Interview-Interaction

In this measure we have not analysed all the children recorded. We were concerned only to have an indication of performance and to attempt to develop a system for coding the degree of interaction. At a simple level, we were interested in appropriate turn-taking and the extent to which questions from the deaf assessor were understood in BSL. This could be examined by describing the interaction in terms of correct answers given, the amount of repetition required, and the length of utterances produced.

Our purpose was also to provide an easy entry point for children. The interview asked them about themselves, their homes and family and their class at school. It was designed to avoid putting them under too much test pressure but inevitably for some this was an unusual situation and it may not provide a full measure of their achievement in sign language. Taking the data as a whole we were surprised at how many children seem to have difficulty in this situation and how little dialogue ensued in many cases. We chose in the end to analyse only a small sample of the whole as a way of indicating the type of problems associated with this type of setting.

Transcripts were made of the interactions of 13 of the children ranging from 4 year-olds to 11 year-olds. We examined the number of questions asked by the adult and compared it to the frequency of repetitions or clarifications occurring because the child did not understand. Not surprisingly there is a relation with age in these variables. More questions are used with older children (the dialogue is longer) and there are fewer clarifications and repetitions as the child gets older. For the four and five year-old children, 35% of questions were repetitions or clarifications while around 18% were in the case of 11 year-olds.

In the same way, as the child gets older, the length of utterance becomes greater (Table 7). There is therefore evidence of considerable growth in this period but the utterance length figures are well behind what would be the comparable figures for length in words for hearing children - even taking account of the fact that hearing people tend to use more individual words in conveying the same meaning.

Table 7: Utterance length in sign increases with age - sub sample of children

Age (months)	Total no. of sentences	Length of longest sentence	Average Length
54	1	2	-
59	16	4	0.6
80	21	9	0.6
84	31	7	0.9
87	19	6	0.5
90	12	3	0.3
99	46	6	1.1
109	59	5	1.4
110	15	4	0.4
122	23	8	1.2
131	53	5	1.4
131	79	4	3.0
139	37	8	1.9

As can be seen we do not reach an average of more than single sign utterances until we have children over 8 years old. This seems quite late though we have to be careful in placing too much weight on this as we have analysed only a small subset of our own data. Nevertheless, for deaf children in conversation with a deaf adult using BSL, this is a somewhat disappointing figure.

In looking at the child figures further, we see a decrease with age in the number of wrong answers given (where the answer does not relate to the question asked) and a decline in no responses. Among the younger children there is also a tendency to give a nod as a general answer as if they are trying to cause least offence i.e. where the child may be unsure of the answer the easiest response is to nod and smile. This type of reaction can be noted in many deaf children in any communication situation. Three examples of the range of interaction appear in Tables 8, 9 and 10. In each extract the interviewer asks, "What's your Name?", "How old are you?", "Tell me about your house", "Tell me about your family".

Table 8: Interaction/Interview with child (87 months)
Teachers ratings: speech: most intelligible; sign: most intelligible

{BSL Glosses are used here}

Adult	Child	Comment

NAME?
	k.	fingerspells "K"
HOW OLD?
	7
HOUSE HAVE?
	[NOD]

HAVE HOUSE HAVE?	repeats question
	HOUSE
WHERE?
	OVER THERE[POINT]
BIG/SMALL?	"what size is it?"
	BIG
GOOD, FAMILY?
	PUT j.
WHAT?	"what do you mean?"
	?
EH?
	HOUSE? HOUSE HOUSE
FAMILY HAVE?
	WHAT?
FAMILY HAVE?
	[NOD]

********** this does improve later ********

There are clearly some difficulties in this interaction and the utterance length is never very extensive in this extract (it does extend later).

Table 9: Interview/Interaction with a child (90 months)
Teacher's rating: speech: half intelligible, sign: most intelligible

{Further into the interview}

WHY LIKE SCHOOL?
	[DON'T KNOW - shrug]
SCHOOL, WORK LIKE?
	[NOD]
WORK LIKE?
	[NOD] FARM THERE [point]
SCHOOL COME HOW?
	[SHAKE]
WALK?
	NO, CAR
LIVE LONG WAY?
	{no reply}
ALL DAY WHAT DO	?
	[DON'T KNOW]

WAKE-UP WHAT?
SLEEP

In this interview the deaf interviewer has great difficulty in creating a dialogue and when the child makes spontaneous utterances it seems to be off the point.

In contrast the 11 year-old child (Table 10), the oldest in the sample, is much more confident and handles this situation at a level to be expected for her age.

Table 10: Interview/interaction with child (139 months)
Teacher's ratings: Speech: unintelligible; sign: mostly clear

MY NAME j.o.a.n.n.e
GOOD, HOW OLD?
FILMING ME? 11
BIG GIRL
YOU DEAF YOU?
DEAF ME
[NOD]
SHE (point) HEARING indicating other researcher
MY MUMMY SAID,
AND HEARING
HOUSE HAVE?
HAVE
WHAT LIKE?
58 s.a. SORRY mistake in
s.a.n.d. STREET, fingerspelling
LONDON NW3
NW ALL NW3 GOOD
[NOD]
FAMILY HAVE
YES, HAVE
HAVE MUMMY, HAVE DADDY
MUMMY ONE. DADDY BAD
DADDY NAUGHTY. WORK WORK WORK

Here we can see much greater command of sign but there are still a number of occasions later in the transcript where she does not understand the question and goes off on a different line of thinking.

Taken together these give us an initial picture of sign use by deaf children. It appears to be less developed than hearing children's speech would be in this situation, with greater need for repair in the conversation. We have not examined the whole sample, but children from deaf families appear to be much more effective in this situation.

2. Sign Order Test

In the sign order measure for comprehension, the child was presented with two comparable pictures except that subject and object were reversed in them. The child was allowed to examine them briefly before the deaf assessor signed a particular sign ordering, indicating agent and object by the use of spatial location and by the ordering of the signs. Children indicated which was the appropriate picture. There were nine sequences. A chance score would be 4.5 items correct.

In the production part of the measure which followed the comprehension task, children were shown a single picture with an agent and object and possibly indirect object (BOX(a) GIRL(b) CAKE GIVES) their task was to sign the picture in a way which reflected the arrangement of

participants. They had to provide the grammatically correct spatially related utterance. Children were scored for correct elements in their production, subject, object and verb.

Stimulus sentences in the receptive part required the interpretation of spatial grammar and the understanding of directional verbs in BSL.

Table 11 shows the average performance by age.

Table 11: Older children are better in understanding the spatial grammar (maximum score 9) (n = 77)

Age(yrs)	4	5	6	7	8	9	10	11
Average correct	2.0	3.6	4.3	6.5	6.4	6.6	6.9	6.5
Standard Deviation	1.9	2.0	2.8	1.3	1.9	2.1	1.9	1.7

The finding looks fairly clear cut here. Children up to the age of six years are unlikely to understand the spatial grammar reliably, though there is a considerable variation. By the age of eight years the main features of the grammar in respect of location and directional verbs are understood in sign communication. However, even at 11 years we have one child in the sample performing at less than a chance level.

There seems to be a slight difference in favour of girls and a slightly better performance from those with the greatest hearing losses (>100dB). Neither difference reaches statistical significance.

When asked to sign themselves i.e.to produce the same structures in response to similar pictures, the pattern is not as simple. In order to sign the item completely correctly the child has to identify and produce the vocabulary items, choose the appropriate verb, arrange the items in the correct spatial arrangement and use the correctly inflected form of the verb. There were very few completely correct items (approximately 4%). The major problems were the grammatical features which the test was designed to highlight. Children tended to name elements of the picture but to choose the wrong verb or omit it altogether. In addition placement was rarely correct. Two factors in the task itself may have combined to make this more difficult. Firstly, it appears to be a task similar to one with which the children are familiar, i.e. name the object, and secondly, the children may not have felt the need to disambiguate the relationships of the objects and people in the pictures. Nevertheless, it is consistent with previous American research that deaf children may come to spatial grammar rather later than one might expect. It is also consistent with observations of teachers that it is often difficult to establish referents clearly in deaf children's stories; it is sometimes impossible to determine who did what to whom.

Perhaps the most obvious argument as to why this spatial grammar is not developing is the lack of a role model for it. If deaf children are using a signed English system then spatial grammar will be impossible to use in those utterances. When we examine those children from deaf families we find that 35% of the completely correct items (subject, verb, object and location) come from those from deaf families even though they constitute only 9% of the sample. This can be linked

to the finding in the comprehension part above, where all those from deaf families over the age of 7 years had maximum scores on the test and of the three aged 6 years and under, one was scoring above chance.

The production results are shown in Table 12. In this we can see the extent of the problem where the children become relatively good at naming as they get older but where the verb inflections and the placement are mostly absent.

Table 12: Producing sign order from picture cards

Age	Vocabulary items max=23	Verbs max=9	Placement max=9	n
11 yrs	23.8(3.9)	1.5(1.3)	0.0(0)	4
10 yrs	26.1(3.6)	3.9(1.5)	0.6(1.8)	16
9 yrs	24.0(4.4)	3.6(1.6)	1.5(1.9)	10
8 yrs	17.1(8.8)	2.0(1.7)	0.7(2.4)	11
7 yrs	14.3(8.2)	2.1(1.5)	0.0(0)	8
6 yrs	19.4(8.7)	2.1(2.1)	0.4(0.5)	9
5 yrs	9.4(6.6)	1.0(0.8)	0.0(0)	8
4 yrs	8.2(4.4)	1.2(0.8)	0.0(0)	5

There is no obvious reason for the relatively good performance of the group of 6 year-olds but the general trend of the figures is unmistakable. Performance at the 4 and 5 year-old level is single sign naming. By the age of 6 years the responses are more complex involving two-sign constructions. It appears that the standard response of identifying elements of a picture does not naturally lead to fully grammatical utterances with appropriate verb inflection within this age range. This is a rather worrying finding.

The sign-order task does not support the notion that these deaf children have mastery over the spatial grammar for production and suggests that their comprehension of it is not available until 7 years of age on average.

3. Classifier Use

Classifiers in BSL are particular handshapes which act as "roots" of sign meaning. They designate particular types of object and action and are rule-governed. Objects such as "thin, long" items (e.g. a sheet of paper, or piece of wire) or "long, cylindrical" items, (e.g. tubing or a handrail), are typically described with classifiers. It had been expected that children presented with the task of identifying features of the pictures which were wrong would be prepared to describe the anomalies.

As in measure 1, we were more concerned here with whether classifiers could be elicited in the task we chose. Children examined pictures with lively detail of people engaged in activities improbable in the depicted location. To explain these activities deaf adult signers would often use classifiers to indicate that activity was opposite to that expected.

As it turned out the task produced fewer classifiers from the children than expected and our video-recordings showed pointing accompanied by amusement or simple description. Even the anomalies were not described.

Table 13 shows a good example of these, mainly pointing responses in the children.

Table 13: Classifier Analysis
Response to What's wrong picture of a gym (see Appendix 1) by an 8 year-old

Adult	Child
	P. WRONG
WHAT WRONG P.	P. WRONG
	P.P.P.P. BECAUSE NO INSIDE
	USE OUTSIDE
	P. IN HOUSE
OH	
	P.P. WITH STICK NOT
	MORE P./P. BOY
	MAKE LEG HAT
NOD	
	P. PARK/SCHOOL
	NOT IN THAT USE
	IN SWIMMING
OH	
	P. HAVE PUT ROLL P.
	? ROLL/ P. NOT IN
	BLACK IN THE WATER
NOD	
	P. NOT INSIDE WATER
	OUTSIDE
WHAT P.	
	BICYCLE
	THAT OVER STAND
	OH DEAR
OH	
	P. NOT IN USE
	OUTSIDE
OH	
	P. NOT IN USE OUTSIDE
	OUTSIDE BUT P. ONLY
	OUTSIDE IN WATER

P. = point

In a sub-sample of children aged from 5 years to 11 years we find an average of only 2 classifiers used in the description of each of the three pictures used. In contrast, children pointed to the anomalies on average 15 times per picture without describing the actions or objects in detail. This indicates quite simply that a different form of task is required to elicit classifiers from deaf

children. This might be done by simply modelling the events or objects either live or on video. The use of picture cards which are designed for speech therapy work, in order to encourage and develop spoken language in children, do not produce the same type of performance in BSL.

4. Sign Decomposition

In this task children had to find the picture from four, where the sign shared the same handshape or movement with a target sign presented by the deaf assessor. Examples would be where the sign was "BOOK" - two flat hands opening out and the target picture among the four would be BOAT (signed like the prow of a boat with two flat hands). The task turned out to be extremely difficult for all the children and for some deaf adults but the results are still informative.

This task rests on the underlying assumption that it is possible to decompose signs in the same way we can with words. The comparable task is to decide which word from a set of pictures rhymes with "sand", or "if you take away the letter `t' from stand, which word do you get?" Linguists have analysed sign language in terms of handshape, location and movement and there has been an attempt to use these features of sign parameters in tasks for adult deaf people in the USA. Success or failure in the task can tell us something about the signer's familiarity with sign and his/her ability to analyse sign. Equally it informs us of the validity of this component analysis. (As a parallel in written English we might ask people to match syllable sounds in differently spelled words which would be a task which would fit with our perceptions of words; however, if the task asked people to match components such as the number of ascenders (h,k) and descenders (g,y) in words we would have much greater difficulty as it is not a usual form of analysis.)

The task given to the children proved to be difficult and it is not easy to determine whether this is a reflection on the analysis problem or whether the task is not a valid test of sign knowledge.

Table 14 shows the average performance by age for the children tested. It can be seen that there is no clear relation between chronological age and the ability to decompose signs correctly in this group. In the case of the younger children the scores produced are very close to chance performances (5.0 would be the score expected it the child guessed on each trial). There is some trend toward better scores with the older children but no real evidence that they are aware of the principles of sign decomposition.

The confounding variable in all these analyses is the one of sign experience. However, it is not possible to measure this adequately. The reasons for this are that we do not usually have access to any accurate historical record on sign use in school and also that we have no way of knowing the extent of sign use outside of school hours (nor indeed the amount of contact with other deaf children or adults). All we can do is to examine the performance of the small number of children from deaf families. When we do this on this measure, we find that the average performance of the 4 children with deaf parents aged 8 years and over is 9.0 (SD:1.4) which is better than any of the age group averages. However, the number of children involved is so small as to make the finding intriguing but not statistically viable.

Table 14: Sign Decomposition has little relation to age (means and standard deviations).

Age	Sign Decomposition (max 20)
4	5.0(1.4)
5	6.8(1.3)
6	5.9(2.6)
7	7.8(2.8)
8	7.0(1.6)
9	8.6(2.7)
10	7.8(1.9)
11	7.8(1.0)

Sign decomposition, therefore, remains an interesting possibility as a task for experienced signers but it is not clear that this is a naturally developing feature of sign language use which can be tapped in young children.

5. Picture Description

In this analysis, we were concerned to measure the production of the child (insofar as it was BSL- or English-based), the length of utterance, whether facial expression was appropriate to the sign, the extent of inflection in the sign and the overall quality of the child's production. This is a much more complex area where we spent a great deal of time classifying the children's utterances.

In this section children were asked to describe picture cards which depicted a series of school situations. The aim was to elicit signed utterances from the children and then to analyse the extent of the production and determine its level of BSL. Of course this turns out to be a rather difficult task since we are still unsure of the developmental stages of BSL and in reality it is rather difficult to classify utterances as BSL, manually coded English or even English with signs.

Children produced varying amounts of data and we chose, in the end, to work with the first 20 utterances of each child. Some of the younger children were unable to produce 20 utterances and we included the maximum number produced in that case. A full transcription of the 20 utterances was made to allow further analysis. Tables 15 and 16 show two typical interactions between a child and the deaf assessor in conjunction with the pictures (Appendix 1).

Table 15: Picture Description by deaf child aged 10 years 11 months

	Deaf Assessor	Child	Comment
1.	P. TEACHER PICTURE SHOW CHILDREN SURPRISE LOOK SURPRISED		explains card 1
		CHILDREN LOOK HAPPY LIKE P.	

shows card
P. SIX

LOTS

2. in hall

shows next card
P. TV
DEAF P.
P. SH

P. SH TALK ALLOW
WATCH NOW
CHILDREN WITH P.
CHILDREN WITH P.
TALK (repeats)
THINK WHAT TV P.?
P. BUT AND WELL
LONG PICK PARTY?

3. listening with headphones

shows next card
P. HEAR HEADPHONE

HEAR PUT (repeat)
MONEY PUT TOUCH
HOLD LOOK WHAT P.
TWO PUT-DOWN THERE

YOU HAVE HEADPHONE
YOU?
P.
YOU HAVE YOU?
YES
HEADPHONE
P.
LIKE YOU HEADPHONE?
NO
nod NOW
BEFORE

4. breaktime

shows next card
P. PLAYTIME PLAY
MILK DRINK
nod LIKE YOU MILK?

DRINK
I HAVE P.
P. DIFFERENT CARTON
straw P. pick-up P.
pick-out rubbish P.
P. drink finish
PUT-BACK
nod
BACK
BACK PUT WHERE?
P. MAN CARRY

Table 16: Picture Description by child aged 6 years 8 months.

	Deaf Assessor	Child	Comment
1.			show picture A
	ALL WATCH TV P.		
		THERE	
		P.P. (over) DIFFERENT	
	nod LOTS CHILDREN		
2.			listen with headphones
	WHAT P. WHAT?		
		PUT ON	
		HEADPHONE (repeat)	
	PLAY WHAT P.?		
		?	
	YOU SAME HEADPHONE?		
		NO	
	YOU SAME?		
		BUTTON TRAIN	
		BUTTON	
3.			breaktime
			shows next card
		DRINK (repeat)	
	WHAT P.?		
		P. MILK (repeat)	
	P. LIKE MILK P. LIKE		
		ME HOME	
	YOU HOME DRINK?		
	SAME P.?		
		YES	
	WHO BRING MILK WHO P.?		
		YES	

YOU STRONG CARRY?
STRONG CARRY P.

4. playtime

shows next card
P.
P.
P.
WHAT?
P.
P.
YES, WHAT MANY?
TEN
OH
P.
YES JUMP (repeats)
PLAY P.
ME HOME P. HOME
nod, HOME
NOT CHILDREN
YES

5. classroom
changing

shows next card
CLOTHES
WHAT CLOTHES WHAT?
TOP SHORT DRESS-UP
WHY OFF WHY OFF (repeat)?
YES
WHY?
OFF (top) OFF (shorts)

6. in hall - p.e.

shows next card
P. WALK
HANDSTAND
P. WHAT P.?
BOY
YOU SAME P. YOU PE?
ME NOTHING
NOTHING SHAME

7. dinnertime

shows next card

EAT DINNER
WHAT P.?
TRAY HOME

It is quite difficult without some considerable knowledge of BSL to extract the full nature of the description from these BSL glosses. There is a temptation to see the production as simply telegraphic speech. However, these are meaningful BSL utterances by the children, which relate to the picture as seen. What does seem to be the case is that they are rather less fluent than hearing children are in speech. Mean length of utterance of hearing children in this situation should be quite considerably longer but there is a tendency for the deaf children to name only and never to evaluate. We have not had the resources to examine the transcripts much further in terms of the semantic nature of the language produced. As a result the comments here have to be seen as preliminary. Nevertheless there is strong indication that deaf children have difficulty in this task in demonstrating complexity in their BSL.

When we considered the extent of modulation in verb production, we found very few examples (these would be seen as changes to the internal structure of the sign (e.g WATCH) so that it takes on a new meaning (e.g. STARE, or GAZE-AROUND)). In a previous study which was never published, Wickham (1986) studied examples of verb modulation in deaf children using sign but these were more likely to occur after the age of 7 years - relatively late for the acquisition of one of the most powerful features of BSL. In these transcripts we find very few examples of this verb modulation. When coupled with the lack of classifier use discovered in one of the earlier tasks, there are some grounds for concern at the relatively slower rate of development which seems to be occurring in BSL.

Table 17 shows data on mean length of utterance (MLU) in sign for the children arranged by age. There are some problems about the use of MLU (the number of signs used in a related sequence (corresponding to a sentence in BSL) as it may depend on situational and motivational factors. It is also the case that the MLU is likely to be more extended in spontaneous speech to peers than in the confines of a test situation such as this. Nevertheless it gives us an indicator of performance and this should be related to age. Because of the nature of the task, utterances were accompanied by pointing to elements in the picture. Where this occurred we did not include the point as a sign.

Table 17: MLU in this task has a weak relation to age

Age	Mean Length of Utterance
11 years	2.5 (0.9)
10	2.6 (0.7)
9	2.8 (0.8)
8	2.0 (0.5)
7	1.9 (0.5)
6	2.1 (0.9)
5	2.1 (0.7)
4	1.5 (0.4)

In Wells (1985) data for hearing children these MLU's would be reached in words by children aged 3 or 4 years. This would be consistent with a view that linked production to extent of exposure to that language. These deaf children have had relatively little exposure to BSL prior to schooling and may be at a stage of development consistent with their degree of language contact.

We can see that older children are likely to give longer comments on the pictures than the younger children. The variation in extent of utterance seems greater in the middle of the age group because of the fact that we chose to use only 20 utterances. Children from deaf families produce longer utterances than the average, though the values generated are within the range for their particular age group. It is also noticeable that one school's children produces longer utterances at each age indicating that there may be an educational and situational effect (Table 18).

Table 18: Differences between schools - One school seems to produce rather longer MLU's

age	School X	Average for others
11	3.2	2.2
10	2.4	2.7
9	3.6	2.6
8	2.4	1.9
7	2.5	1.7
6	2.1	2.1
5	3.0	1.6
4	1.7	1.5

This table reflects the general age trends but indicates that MLU may vary according to the environment. One would expect that the extent of the child's language would vary according to the language models available and according to the teaching style. However, we do not wish to read too much into this apparent school difference as a range of other factors might impinge on it, such as parental involvement or local authority policies on placement of children.

When we examine the proportion of utterances which were "one sign" there is a much clearer relation to age (Table 19).

Table 19: Percentage of utterances which contained only one sign

Age	Single Sign Utterances %
11	36
10	33
9	30
8	46
7	51
6	45

5	50
4	67

Here we see that the youngest children produce mostly single signs which name elements of the picture and do not elaborate or comment on the picture at all.

We classified utterances according to whether they followed BSL structure - the main factors were the use of BSL sign ordering and appropriate non-manual grammar (facial expression, body posture, placement and so on). Since a key aspect was the BSL order of the signs we did not include single-sign utterances in this analysis. Utterances could then be classified as being BSL, where the typical sentence construction in BSL was observed, as being English, where the order was predominantly English, where English words were mouthed or vocalised and where, relatively speaking, there was much less non-manual grammar. A third category was Mixed, where it was apparent that there was considerable influence of English, but this was mixed with features which we would expect in a BSL dialogue. As the task was set up in BSL by the deaf assessor, it is not surprising to find the most common classification to be BSL (Table 20). Figures shown are the predominant pattern for that child. Based on at least 20 utterances we consider the relative frequency of each type. Where BSL is the classification of the majority of the child's utterances (over 50%) the child is considered to be a BSL user, where the utterances have been classified in over 50% of the cases as English then the child is reckoned to be an English Signer. In all other cases we have a mixed situation.

Table 20: Percentage of children in each group classed as BSL, English signer or mixed.

Age	BSL	Mixed	English
11	75	0	25
10	69	18	13
9	70	20	10
8	91	9	0
7	86	14	0
6	100	0	0
5	86	14	0
4	100	0	0

One might interpret the table as the gradual development of English as the child becomes older and therefore a greater presence of it in the signing. One might also point to the greater likelihood of signed English exposure as the child gets older and also the greater emphasis on literacy. There is no way of testing these ideas, given the data we have, as it was not possible to collect reliable information on the amount of signing experienced by the child, nor on the performance levels of the teachers.

In examining the children whose signing is predominantly English-like, there is no obvious relation to other variables such as hearing loss (all have losses over 90dB), to speech intelligibility or to rating of sign performance. Three of the four English-sign children do however have ratings from their teachers that they "use speech almost normally but with a deaf voice", perhaps giving support to the notion of them being more experienced in the use of English. On the other hand, they were not considered as having better speech intelligibility (the extent to which others could understand the child).

The final comments on this measure have to be that rather more work is required on what is exceedingly complex language data on the children. We lack a comprehensive framework for BSL analysis in adults and it is not surprising that this pilot study does not produce clear-cut differences and findings on the children's BSL. We can explore this data further at a later stage when an analysis of language use can be based on a fully developed coding system.

6. Receptive Vocabulary:

The receptive measure was designed to be relatively easy to score being simply the sum of items correctly chosen in response to the video recorded target sign. The expressive side is more complex since there are regional variations in sign which affect the correctness of the child's production. We attempted to allow for this by collecting adult performances from that area. Analysis can be taken further in terms of examining the degree of correctness of each item since children's signing is often misarticulated and this can be evaluated on a number of dimensions. We have begun to do this but it will be reported in a later publication.

The receptive test is perhaps the simplest measure used, yet it has been one of the most difficult to set up. We have already described some of the problems which were encountered in designing the measure of receptive sign vocabulary. Because of the inclusion of the easy iconic items at the beginning of the test it was envisaged that the scores would be relatively higher. This is what happened (Table 21).

Table 21: Receptive Sign Vocabulary scores for each group.

Age	Receptive vocabulary (max=65)
11	45 (13.3)
10	46 (7.5)
9	41 (7.1)
8	38 (8.5)
7	31 (6.3)
6	29 (9.3)
5	12 (3.4)
4	11 (1.5) (completed 20 items)

The values in Table 21 follow the expected age pattern and suggest that the test may be a useful indicator of sign comprehension. When we correlated the scores with the measures of Mean Length of Utterance the coefficient was 0.25, which is statistically significant, indicating a relation between the two measures. Children from deaf families perform much better on average. Those aged eight years and over had a mean score of 56.8, in comparison to the age mean of around 42. Children using more English in their sign utterances also did marginally better (46.2) than the age average for those over 8 years old.

A good deal remains to be done with this measure before it is suitable for widespread use. In particular, a full-scale item analysis is required to ensure that the items are consistent and valid.

However, it offers the best hope for a simple test which teachers could use in school to give an indication of children's performance.

7. Sign Vocabulary - Production

This measure proved to be considerably more difficult to manage. On the one hand children when faced with a picture which had to be interpreted and signed would tend to utilise the same strategy which has been apparent throughout - the naming of individual elements of the picture rather than trying to extract a central concept. In addition they tended to use local variants of signs or even family signs and this could prove very difficult to score. Further, the degree to which a sign is wrong in its articulation can be difficult to determine. Errors can be seen in each parameter of the sign - location, movement, handshape.

For this analysis, we adopted a largely qualitative approach where recognisable signs displayed in location would be accepted, as would signs with incomplete motion. Where alternative concepts were offered for the picture these were treated as incorrect. The overall results turn out to be rather inconclusive although a similar age effect is detectable as in most of the measures to date (Table 22).

Table 22: Sign Vocabulary Production arranged by age

Age	Production (max=60)
11	33 (2.2)
10	30 (9.6)
9	26 (7.9)
8	30 (4.0)
7	26 (6.5)
6	27 (5.4)
5	23 (4.5)
4	21 (8.8)

Inter-rater reliability was not as high as is needed in such a test, indicating the critical problem of carrying out BSL production assessment without a set of clear guidelines for acceptable responses to be used by raters who are not completely fluent in BSL. To make the test viable, more work will be needed on the range of responses which can be accepted and on a differentiated system of scoring.

The correlation between receptive and productive measures was low ($r=0.15$) indicating little relation between the measures as they are used at present.

In these last two measures a good deal of work is still required to make them viable in an ordinary school setting, but they do offer a simple way of obtaining an estimate of sign performance.

Discussion and Implications

Inevitably in this type of study we are likely to find the need to carry out more research. The study started life as a simple pilot to discover the feasibility of measuring the sign competence of deaf children. In practice it grew into an attempt to estimate the sign competence of deaf children in school. In the end, it has fallen somewhere between the two in its outcome.

It seems absolutely essential at this time to have measures of sign competence which schools can use to indicate the progress of their children in signing programmes. It is important to know whether lack of progress in English or other subject areas is related to a difficulty with all language forms, signed and spoken, rather than to soldier on with inappropriate subject teaching. It is not outside the realms of possibility that some children will have difficulties in sign and will need what amounts to remedial help in sign acquisition. It is likely also, in that circumstance, that parents would wish counselling and then support to ensure the development of their child.

It can also be the case that the opposite happens - that a child's ability in language is under-estimated simply because we have no adequate way of assessing performance. With a national situation which is rather confused in terms of sign assessment and tuition, we have no easy way of knowing whether teaching performance in sign is adequate or not. We do know, however, that children do acquire language in the most unfavourable circumstances in the absence of good language models. We may be able to minimise some of the pain involved, and ensure that we are aware of the problems as they arise rather than having children pushed into circumstances which greatly undervalue their skills or place them in inappropriate remedial groups on their performance in English.

The rationale is therefore clear-cut. The solution is rather more complex. What the study has indicated is that it is not a matter of translating the English tests available, into BSL and then estimating performance. As well as cultural differences in the type of setting used, it is often the case that the picture/object methods used are too iconic and transparent for the deaf child in sign. As a result, we have anomalous scores where our English hearing children can score adequately in a test of American Sign Language. The simplest type of test, which involves choice from a set of pictures, is therefore more complex than at first thought. Nevertheless it offers the greatest potential for immediate development and use in schools.

In the receptive measure, which we used with 77 children, we can see clear relations to age and to sign performance in picture description. A full-scale item analysis is required to make the test consistent, but since it is administered by presenting a video tape to the children with the hearing assessor only having to note the position of that picture designated by the child, then it can be quickly and easily administered and scored. Most importantly, the scoring can be fairly accurate, even in circumstances where the assessor is not fluent in BSL.

Unfortunately, of course, vocabulary knowledge is only a small part of linguistic development and it does not take into account our research knowledge which implies that interaction and the construction of language by the child are the more important parts of development. Even where we reverse the vocabulary comprehension test to record the child's sign production we run into major problems. Firstly, deaf children's signing is less predictable and accurate than adults - it will require a native deaf signer to rate the closeness of the signing to the model provided to the assessor. One could help with this by providing a videotape of correct answers, but this will not

take into account all the regional variations of the signs for common objects. In addition school signs and family signs may need to be assessed. This is all manageable and it will be possible in the future to make a production version of this test.

Where we have tested more than vocabulary we have more difficulty in estimating performance reliably. Of the other measures used, the most promising for administration is the sign order test. This test, which works best in its receptive version, can be varied in content of both vocabulary and of grammar. The spatial grammar and sign ordering which was chosen as most important here can be extended to include a range of features of sign construction and use. To that extent it can be used in the same way as the receptive vocabulary test. The fact that we have some clear-cut differences between children at the age of 7 years in the ability to understand spatial grammar suggests a developmental and conceptual growth. At the moment these cannot be separated - we do not know whether it is the grammatical complexity with which the child struggles up to the age of 7 years or whether it is the concept of "who does what to whom and with what" which is the main problem. It is likely to be an interaction of the two and some control studies with hearing children are required. There are confusions in hearing children's language which relate to communication breakdown and it may not be surprising to find that deaf children have problems at a similar age. The difficulty may not rest wholly in the language.

Neither sign decomposition nor classifier elicitation worked in the way we had expected. Both can be dealt with differently, though before repeating the study it is perhaps more important to try to establish what would be a typical order of acquisition. Studies which elicit stories from children would indicate a greater range of their performance and it could be more effective to attempt to elicit much greater sections of monologue.

Adult-child interaction produced a mixed range of findings. We are somewhat surprised at the lower than expected level of interactional skill in the deaf children. We found a great many problems in direct questioning when apparently simple questions were misunderstood where answers seem to bear little relation to the question. It is possible that there is somewhat greater tolerance of this lack of relation of questions and answers in early sign development, though it seems more likely that the lack of access to sufficient role modelling and correcting adults makes the lack of accuracy in the child's responses greater than one would expect in hearing children mastering their own spoken language. Deaf children may not have enough access to adults whose first language is sign to be sure of the appropriate interactional rules.

We know from our studies of early mother-child interaction from a few months of age that the deaf mothers engage in very different styles of attention-getting. The payoff for this early focus on attention is that by 12 months the child is more able to determine where the information is coming from and it is noticeable how smoothly the child's and the mother's gaze come together and separate. This allows the easy transfer of information in context and allows the child to explore the accuracy of their utterances. It is in precisely these areas of interaction where we find the greatest qualitative differences between those deaf children in our sample who come from deaf families and the others. Those who have had sign language interaction from an early age are simply better at interaction and able to participate in conversation much better.

The disadvantage is that teachers and other adults whom they meet may be second language learners in sign and as a result are likely to be using spoken language rules for interaction even though attempting to sign. It is not simply the content of the hearing adult's utterance which is

important but the way in which this is delivered and the way in which it takes into account the unique interactional style necessary in a visual world.

The two tasks of picture description and interview/interaction produce mixed results. We can see the development in sophistication from the youngest 4-year-old to the 10-year-olds, but the task of assessing the true nature of their performance is very complex. The simple systems of classification which we have used so far will not suffice in the long run. Mean length of utterance is not an adequate measure of performance in language as has been discovered in the child language field. Nevertheless it does give us an immediate yardstick. In picture description and in the interview, mean lengths of utterances are much less than we would have expected for hearing children in words. There are major differences between the expressiveness of signs as compared to words and one can deal more flexibly with event description in sign than in words (i.e. one needs more words to do the same). However, the performance of the deaf children on average seems to be less than one would have hoped for.

The solutions on the one hand are very simple - give more access to experienced signers from an early age if we want to ensure the adequate development of a language. However, this is much too simplistic as the deaf role model will not be the parent and may not be the teacher. In realistic scenarios it will be hearing people most likely to bring up the child. What we can do is to bring the different groups into closer cooperation - hearing educators and care-givers and deaf experts in language. The form it has to take in order to ensure smooth development in language is not yet clear, but we will need to give much greater consideration to it in future years, if we are to see earlier development of sign and through this, adequate development of other languages.

We can speculate on the likely effects of later development of sign and indeed there are some research findings on the cognitive implications of deaf children learning sign later than languages are normally learned. Abilities to use sign are affected and there is no evidence that they eventually recover. It is certainly true that deaf children and young people may lack any confidence in their language skills throughout life. However, the speculation on effects will not help us to overcome the major problems of how to ensure language development in the deaf child, whether it is in English or sign or in both.

This study has not found panaceas for this problem, but what it has aimed to do is to take the first steps towards assessing the nature of the problem and has tried to set down some of the requirements for the measuring instruments necessary to make the progress in language visible. There are no simple recommendations from the study, not are there research results showing whether one method or curriculum is superior. It has been an attempt to carry our a pilot study on the feasibility of measuring deaf children's competence in sign. We believe this is possible and that a simple measure of vocabulary can be refined quickly from the work already done. Measures of the full complexity of interaction will have to wait a little longer until we know the order of development of sign grammar in the child. When we can indicate the relation of conceptual development to the sign grammar then we will be in a better position to usefully evaluate the performance of deaf children in sign.

References:

Abraham, S. and Stoker, R. (1988). Language Assessment of Hearing-Impaired Children and Youth: Patterns of Test Use. Language, Speech, and Hearing Services in Schools, 19, 160-74.

Dunn, L.M., Dunn, L.M. and Whetton, C. (1982). British Picture Vocabulary Scale. Berkshire: The NFER-NELSON Publishing Company Ltd.

Fenn, G. (1979). Word Order Comprehension Test. Slough: The NFER-Nelson.

Kirk, B., Kyle, J.G., Ackerman, J. and Woll, B. (1990) Measuring British Lnguage Development in Deaf Schoolchildren, in J.G. Kyle (ed) Deafness and Sign Language into the 1990s, Bristol: Deaf Studies Trust.

Kyle, J. G., Woll, B. and Ackerman, J. (1989) From Gesture to Sign and Speech, Final Report to ESRC. Bristol: School of Education.

Layton, T. and Holmes, D. (1985). The Carolina Picture Vocabulary Test. Tulsa, OK: Modern Education Corp.

Wells, C.G. (1985) Language Development in the Pre-school Years. Cambridge: Cambridge University Press.

Wells, C.G. (1986) The Meaning Makers, Portsmouth NH: Heineman.

Appendix 1

Measures and materials used

Sample items

1. Interview/Interaction - the interviewer used a series of simple questions to elicit comments on school and home.

e.g. What's your name?

How old are you?

Tell me about your house?

What's your family like?

Do you like school?

2. Sign Order and Comprehension.

Assessor signs

Boya Girlb bChasea

Child selects picture "girl chases boy".

3. Classifier Use

"Tell me what's wrong in the picture."

4. Sign Decomposition

Find the picture whose sign has the same handshape as BOOK.

(answer BOAT)

5. Picture Description

(a) What's the teacher saying?

Why is the girl laughing?

(b) What are they doing?

What do you like for dinner?

6. Receptive Vocabulary

Assessor plays videotape with individual signs from the list in the order shown. Child chooses from 4 pictures the one to match the sign.

Item 10 - LAUGH

7. Sign Vocabulary - Production

What's this?

Show the picture and the child signs.

The answers can be scored according to whether a sign is used, a mime, whether facial expression is correct, whether a baby sign or home sign is used, or even if a classifier is used.