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Sue Livingston

CUNY La Guardia Community College

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LEVELS OF DEVELOPMENT IN THE LANGUAGE OF DEAF CHILDREN:

ASL Grammatical Processes

Signed English Structures

Semantic Features

Sue Livingston

Abstract. This study describes the spontaneous sign language of six deaf children (6 to 16 years old) of hearing parents, who were exposed to Signed English when after the age of six they first attended a school for the deaf. Samples of their language taken at three times over a 15-month period were searched for processes and structures representative or not representative of Signed English. The nature of their developing semantics was described as the systematic acquisition of features of meaning in signs from selected lexical categories (kinship terms, negation, time expression, wh-questions, descriptive terms, and prepositions/conjunctions).

Processes not representative of Signed English were found to conform with grammatical processes of American Sign Language (ASL) and were so described. Five levels of increasing complexity of these ASL processes and of the structures representative of Signed English were hypothesized. Levels of increasing complexity of

semantic feature acquisition of signs within the lexical categories named above were also hypothesized. The development of ASL grammatical processes was found to be orderly and characterized by the appearance of new processes and structures and by increases in utterance length and complexity resulting from the coordination and expansion of formerly used processes. By the end of Level 2, subjects displayed knowledge of most basic sentence forms, simultaneous processes, and some grammatical uses of repetition. A significant change appeared at Level 3, when processes that could express meaning simultaneously were used to portray communication between the signer and others as well as to express two different ideas simultaneously. These uses provided the foundation for Level 4 and Level 5 processes, which functioned to set up locations in space in increasingly complex ways. These processes decreased the need for total dependence on visual field content (i.e. immediate context), since persons and objects were first established, next assigned a position in front of the signers' bodies (i.e. set up in a particular location), and then commented about -- as opposed to the earlier process of first pointing out and then naming and describing elements of the visible "picture." Thus as the subjects became more linguistically mature, they developed "scene-setting" (typically ASL) ways of establishing who or what they were referring to, by making efficient use of signing space. This developmental change also revealed that the children were beginning to conceptualize events as wholes and to relate information about them in logical ways.

The development of structures representative of Signed English was likewise an orderly process,

characterized by the appearance of new relations and the coordination and expansion of formerly used relations. By the end of Level 2, most basic semantic and grammatical relations were expressed by signs in English order. Preposition-object, appositive, genitive, and disjunctive relations basic semantic and grammatical relations were expressed by signs in English order. Preposition-object, appositive, genitive, and disjunctive relations were later occurring relations (Levels 3 and 4), as were dative and indirect object relations (Level 5). There was some evidence to indicate that the consistent use of Signed English grammatical morphemes followed the order of acquisition of these morphemes by hearing children, presumably in both cases a function of the grammatical or semantic complexity of the morphemes themselves.

Learning the meanings for signs was, for the most part, a process in which labels (signs) for referents took on additional features and thereby became more specific. This process is compared with the general process of perception, in which initially single, usually broad or attribute features of meaning are perceived and labelled before more defining features are added to form "configurations" of features for a particular referent.

A brief contrast between the development of ASL grammatical processes and the development of structures representative of Signed English revealed both differences and similarities in development. Quite clearly, the contrast showed that the children were more linguistically competent using ASL grammatical processes -- processes be it noted for which they had no adult model.

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0. INTRODUCTION & METHOD

A first language, no matter what that language may be, is acquired by all children naturally and spontaneously through developmental processes starting at birth. Therefore just as the hearing child naturally acquires her auditory spoken language by internally processing the spoken language of her environment (Brown 1973, Bloom & Lahey 1978), so does the deaf child with ASL signing parents naturally acquire her visual gestural language by internally processing the sign language of her environment (Bellugi & Klima 1972, Collins-Ahlgren 1975, Ellenberger & Steyaert 1978, Hoffmeister 1978, Kantor 1980, 1982, Loew 1981). But what language does the deaf child of nonsigning hearing parents naturally acquire?

Typically this is a child who arrives at a school for deaf children at about the age of 4 or 5 and is there exposed to some form of manually coded English (MCE). One would expect, then, that such a child would naturally acquire this MCE system by internally processing the MCE of her environment. But is this necessarily so? Is this what happens?

It appears that even after four years exposure to one of the MCE systems, specifically Signed English, competence is limited and improvement thereafter only slight (Bornstein, Saulnier & Hamilton 1980, 1981). However, as one would expect, deaf children do not stand linguistically idle, waiting for their Signed English structures to develop in order to communicate. Recent findings are that deaf children use complex linguistic devices that do not resemble Signed English structures to express their equally complex intentions (Sutty &

Friel-Patti 1982). Although the research is limited, it does thus far point to the interesting finding that such deaf children create and use grammatical processes that are not part of the adult Signed English model to which they are exposed.

Just a few of the questions generated by this finding are:

What is the nature of these grammatical processes? How can they be characterized?

How can Signed English structures, limited though they may be in the child's output, be described?

What is the nature of such children's developing semantic system? Are the features of meaning inherent in the signs they use like or unlike the features of meaning in the signs they are exposed to?

What is the progression of development in mastery of these grammatical features, Signed English structures, and semantic features? In short how does their linguistic system become more complex over time?

In order to answer these questions, I sampled the spontaneous sign language output of six deaf children. They were all children of hearing parents and their first exposure to Signed English occurred some time after they were six years old and in a school using this form of MCE. To find what these deaf children, and by extension others like them, of hearing, nonsigning parents unknowingly know about language, I analyzed their language samples, determined which features belonged to MCE or to another language system, and arranged their development into levels of increasing complexity.

Method. The six subjects of this study were students in a large public day school in New York City exclusively for deaf children. At the time of the study all teachers on staff were hearing and none other than the researcher and the two Deaf paraprofessionals possessed near-native ASL competence. Of the approximately 600 students only four or five had Deaf parents. [Note that the word Deaf denotes members of a minority group whose culture or subculture is informed by a sign language; the word deaf refers to the condition of not being able to hear speech even with maximal amplification.]

For approximately 200 of the school's students a Total Communication program was begun in September of 1974. Selected staff members were required to attend after-school workshops for a period of two years in order to learn the Signed English form of MCE. Prior to 1974 all instruction was carried on either orally or in reading and writing and students were forbidden to sign.

My study began in June of 1975, one school year after the students were first introduced to Signed English. I asked teachers in the Total Communication program to select one student at each of the following ages: 6, 8, 9, 10, 13, and 15. These ages reflected a representative cross-section of age levels in the school. Subjects were selected by the following criteria: (a) they were deaf from birth; (b) they had no additional impairment; (c) they had hearing parents who knew no sign language at the time the children were acquiring language and confessed an inability to express complete thought in either ASL or Signed English; and (d) their spontaneous signing abilities were typical of the school population except for fluency, i.e. they expressed themselves easily through sign language as

judged by the quantity of their signed expression.

Most of the subjects were videotaped as they communicated naturally either with the researcher or with a peer. The taping was done at five different times over a fifteen month period (Table 1). As Table 1 shows, although there were five taping sessions, there were only three real times, tapings II and III and tapings IV and V being made within a few days of each other.

To encourage spontaneous production the subjects' communication partners were placed in the position of not knowing something that the subjects knew; e.g. the subject explained the contents of photographs they brought from home of family activities or of photographs showing them in classroom activities. In addition, the subjects' teachers were asked to tell stories to them so that they could tell the same stories to the researcher or other communication partner in a tape session. This use of photographs also provided readily accessible context information and so reduced transcription tasks. All videotaping was done by the researcher, a member of the school staff familiar to the children, during school hours in a room within the school building.

A Deaf consultant, the researcher, the subjects' teachers, and at times the subjects themselves transcribed and interpreted all the approximately eight hours of videotaped data. In order to ensure that no grammatical processes were overlooked, all pointing, facial, body, and manual activity was conscientiously noted. The most probable interpretation of all the observed activity, with context taken into account, was then assigned. In total, approximately 3,500 utterances were transcribed and subsequently analyzed for this study. The following five sections present the results.

	Taping Times				
	1	2		3	
	Taping I	Taping II	Taping III	Taping IV	Taping V
Subject: LV Communication Partner Subject's Age	Researcher 6;4	Researcher 7;5	-- --	Researcher 8;2	Peer 8;2
Subject: FL Communication Partner Subject's Age	Researcher 7;10	Researcher 8;3	Peer 8;3	Researcher 9;0	Peer 9;0
Subject: DR Communication Partner Subject's Age	Researcher 9;0	Researcher 9;6	Peer 9;6	Researcher 10;3	Peer 10;3
Subject: MS Communication Partner Subject's Age	Researcher 10;1	-- --	Peer 10;10	Researcher 11;9	Peer 11;9
Subject: SL Communication Partner Subject's Age	Researcher 13;7	researcher 14;0	Peer 14;0	Researcher 14;9	Peer 14;9
Subject: TW Communication Partner Subject's Age	Researcher 15;4	Researcher 16;1	Peer 16;1	Researcher 16;7	Peer 16;7

Table 1. Videotaping schedule.

1. LINGUISTIC ANALYSIS

Grammatical processes not in Signed English. The particular grammatical analysis used for this study was derived from the systematic, regularly occurring linguistic behavior of the subjects. It can best be described as a surface-structure analysis of the observed utterances based on the subjects' intended meaning, which was gleaned primarily from their linguistic activity in combination with the context of their utterances.

The results of this analysis revealed that the subjects regularly used grammatical processes that were not representative of the Signed English system to which they were exposed. Once analyzed, these grammatical processes grouped rather naturally into five major categories, which represented the five most distinctive aspects of the language observed in this study. The categories are: Basic Forms, Use of Space, Ordering Strategies, Repetition, and Contextual Subordination. Representative samples of utterances in each category, as well as the context of the utterance, are provided below. Explanation of the notation and abbreviations used is given with the first examples below. (A more detailed account of the subjects' use of context can be found in Livingston 1981.)

The results of the grammatical analysis also showed that the subjects used structures that could be considered partial or pidgin-like representations of Signed English; a characterization of these structures follows the description of the processes not representative of Signed English. Finally, the semantic feature analysis used to characterize the subjects'

emerging semantic systems will be briefly described at the conclusion of this section.

For all the analyses utterance boundaries were determined by the transcribing team on an intuitive basis, with heavy reliance on pause length between complete expressions of meaning. Stress patterns within sentences, also noted by the transcription team, helped to determine intra-sentence structure.

Basic forms. What I call basic forms are the main structural components of sign sentences. Those most basic are composed of a subject and a predicate, (a) either in that order, (b) reversed, or (c) expressed simultaneously. (Simultaneous expression of subject-predicate relations was achieved through a variety of means, as will be seen in the discussion of simultaneity below. Here only the simultaneous expression of subject and predicate via the simultaneous use of left and right hands is illustrated.):

(a) PC: FL sitting with sister, smiling.

ME SMILE

PI: I was smiling.

(b) PC: Jack wakes up to see the beanstalk.

GROW PLANT

PI: A plant grew.

(c) PC: SL as a little girl.

R LITTLE

L ME

PI: I was little.

[Key to transcription abbreviations:

PC: picture content KS: knowledge of a situation
PS: previous statement Upper case, a sign
+, repeated sign L,R, r. & l. hands
PI: probable interpretation CL: classifier sign
, / // denote pauses, by increasing heaviness
nonmanual acts, in lower case above sign]

Frame of reference indicators were regularly added to sign sentences to express information related to the time or duration, place, topic(s), or reality of events under discussion. (In the examples below '*' indicates the preferred placement of frame of reference indicators, as documented in Livingston 1981):

(time indicators)

PS: I like Puerto Rico.

*J(une), ME FLY-TO-PR

PI: I'll fly to Puerto Rico in June.

PC: SL on her bed in many pictures.

BED, ME ALWAYS

PI: I'm always on the bed.

(place indicators)

PC: Hansel and Gretel dropping bread in the forest.

*FOREST, BREAD

PI: They were dropping bread in the forest.

PC: Gretel pushing Witch into fire. PUSH, FIRE

PI: Gretel pushed the Witch into the fire.

(topic indicators)

KS: MS explains about Sue's crashed car to peer.

SUE CAR, CRASH PETER

PI: Peter crashed Sue's car.

PC: Jack giving the cow to the man in the story.

MAN, HE-GIVE-TO-HIM COW

PI: He gave the cow to the man.

(reality indicators)

KS: DR referring to a friend who's hard-of-hearing.

*HEAR, TRUE

PI: He can hear.

PC: Researcher's husband holding a cardboard prop
that looks like a rock.

TRUE, HEAVY

PI: It's really heavy.

Questions are also basic forms. In the data non-wh-
questions are posed through (d) eye contact alone, or
(e) with eye contact and a final YOU sign:

(d) PC: Researcher at San Diego Zoo
eyes look up at researcher
TRIP

PI: Did you go on a trip?

(e) KS: Researcher describing barren desert she saw.
eyes look up at researcher
NOTHING YOU

PI: You saw nothing?

Wh- question signs and the sign CAN were also used to

pose questions:

PC: Researcher's husband standing in front of a motel.

*YOUR HOUSE, WHERE

PI: Where's your house?

KS: Researcher tells TW she went out West.

WHERE YOU WEST, WHERE?

PI: Where did you go in the West?

KS: MS thinks that Hansel and Gretel's father is asking his wife to get some money for them.

FATHER SAY, CAN FIND YOU

PI: Father said, "Can you find money?"

Frame of reference indicators and wh- question and non-wh- question expression as exemplified above are part of the grammar of American Sign Language (Baker & Cokely 1980, Friedman 1976, Ingram 1978). Early establishment of topic is also a structural feature of the sign language used on Providence Island (Washabaugh 1979).

Conjoined sentences also display basic forms; the forms shown above in examples were most often the forms used in longer, more complex utterances. These component sentences were conjoined or juxtaposed by implied not explicit signed conjoiners:

KS: Researcher asks SL if she has any dolls

ME DOLL neg. nod / BIG

PI: I don't have dolls because I'm too big.

PC: The Witch in H & G catching them eating cookies
from the gingerbread house.

HOUSE, COOKIE TAKE / MOTHER shakes finger

PI: They took cookies from the house and the
Witch shook her finger.

PC: DR's girl friends.

PT. to picture LONG-HAIR / NOW, NECK-LENGTH

PI: This one had long hair but now it's
neck-length.

These basic forms should be thought of as the skeletal structure of the subjects' linguistic system, onto which other grammatical processes and structures are either layered or added in ways described below.

Use of Space. All the children in this study capitalized on their use of space, and in so doing expressed complex utterances which would not have been evident if this investigation had concentrated solely on the signs their hands performed.

One of the ways the subjects established pronominal reference (other than by pointing proximally to the objects or people in their pictures) was to point away into space to (a) a location specified either immediately before or after the distal point, or (b) someone or something physically present:

(a) PS: "I was born in China and stayed there until I
was eight."

PT. off to distance SCHOOL//PT. off to distance
CHINA, SCHOOL PT. off to distance

PI: I went to school there. I went to school in

China.

(b) KS: SL talking with peer prior to taping.

PT. to picture on floor, YESTERDAY, DROP-DOWN-
FROM-WALL

PI: That dropped down from the wall yesterday.

At times the subjects would point into space, and only the context could determine to whom, what, or where they were pointing.

(c) PS: Re-telling LRRH--the Wolf knocked and opened the door and quietly tiptoed in.

MOTHER LOOK-UP / SURPRISE PT.in front of body
(eyes forward)

PI: Grandmother looked up and was surprised when she saw the Wolf there.

The use of space exemplified in (a) to (c) above is termed Indexic Reference (Kantor 1982); i.e. pointing establishes arbitrary locations for present or non-present referents, if these are previously introduced. When used in conjunction with verb modulation in ASL, Indexic Reference forms the basis for understanding ASL morphology and syntax (Kegl cited in Kantor 1982).

Simultaneity. In addition to the concatenation of signs as a means of accruing linguistic information, the children in this investigation layered additional meaning onto their manually expressed utterances through a variety of grammatical processes briefly described and exemplified below.

Negative nods that occurred at the same time as the non-negative manual signs served to negate an otherwise positive utterance:

PS: Then the girl ate.

neg. nod

LIKE FOOD

PI: She didn't like the food.

Head movement and facial expressions could overlay an entire sentence on a single sign, expressing what in English would be a compound sentence:

PS: I once saw a dead cat

head turns away

revolted expression

ME SEE

PI: I saw it and turned away disgusted.

Eye gaze used simultaneously with other signs either indexed communication with another person or persons, provided the signer with a way of describing communication between two or more different people, indicated the location of events under discussion, or referenced communication between two different people. Only the use of eye gaze to index location is illustrated below. Examples of the other uses will be given in the section on the development of these processes over time.

PC: SL as a little girl with short hair.

PS: This was before when I had a hair cut.

looks away
off to side

MOTHER STORE / HAIR-CUT

PI: Mother went to the store over there (with me)
and I had a hair cut.

Use of left and right hands simultaneously indicated plurality or expressed two different but related lexical elements or phrases. Use of one hand then the other served to separate the actions of or comments about one person from those of another. Only the use of both hands simultaneously to express two different lexical elements is shown below, because as with the use of eye gaze other uses will be illustrated later.

PC: Jack climbing the beanstalk.

PS: Inside, up there, is a bad Giant.

R PT. to picture BOY GIANT

L SMALL-----

PI: The boy is small compared to the big Giant.

Body movement, by shifting stance and stepping into a new body position, was another use of space; it provided the children with a way of indicating a change in subject. In the new position, all subsequent signing would be attributed to the particular individual occupying that place; e.g.

PC: The Giant's wife in the beanstalk story opening
the door and seeing Jack; Jack is looking up at
the woman.

takes position of takes position of

woman in the picture Jack in the picture

SEE

/ HAPPY

SEE

PI: The woman saw Jack, and he was happy to see her.

Negative nods, eye gaze, simultaneous and consecutive use of left and right hands, and body movement -- the uses of space observed in the subjects' utterances and illustrated above -- function as linguistic processes in American Sign Language as well (Baker & Cokely 1980). Mandel (1977) and Friedman (1976) have also shown the linguistic uses of body movement in ASL. Mandel claims that there usually is some pre-establishment of the nominal referents by assigning a location in space to them before body movement or role switching occurs. In this study, however, most of the time pre-establishment was not necessary, since picture content (context) clearly located the referents. All that was necessary was a switch in stance, as seen above. Classifiers, blends, directional signs, and setting up locations in space are further uses of space found both in the subjects' output and in ASL.

Classifiers were used by the children to show the movement of objects or persons. These sign forms do not directly specify particular objects or persons but represent classes, sizes, and shapes just as they do in ASL (Baker & Cokely 1980, Klima & Bellugi 1979, Mandel 1977). They are used much the way pronouns are, to refer to previously established referents; e.g.

KS: TW discussing how he went to see who was at the door of his apartment building.

ME PT. downwards // 1-CL 'downwards'

PI: I went downstairs.

Such use of classifiers afforded the subjects an efficient means of expressing sentential meanings.

Phonetic and mimetic blends were also used: in addition to using nonmanual signals, left and right hands, and classifiers to express meaning simultaneously, the children in this study sometimes blended the parameters of two and sometimes three signs together so as to express complex semantic relations at the same time. For example, in the sign unit glossed as FLY-TO-PUERTO-RICO, as the handshape of the sign PUERTO-RICO was being executed, the subject's entire hand moved forward and up, blending the movement for the sign FLY with the handshape for the destination. The result was the meaning rendered by the hyphenated sign gloss above.

Similar kinds of phonological blends were observed in the expression of object-attribute relations and subject-predicate relations; e.g. the sign LONG-HAIR in an example given earlier, and the following:

PC: Hansel and Gretel looking at birds that have
just eaten their bread trail.

PS: Researcher asks, "What happened?"

BREAD, BIRD-EAT

PI: The birds ate the bread.

Other types of blends expressed semantic relations in a more mimetic way. In these cases, sign handshapes would mimetically blend to conform to the physical attributes of objects; e.g. in the sign

LIFT-UP-CONTAINER-TOP the handshape for the sign LIFT-UP mimetically blended to conform to the physical attribute of the specific container top under discussion. In PUT-CAT-IN, the handshape for PUT was modified to suit the shape of the object CAT. In the last part of the utterance, the handshape of CLOSE-DOWN was again blended to conform to the object depicted:

LIFT-UP-CONTAINER-TOP / PUT-CAT-IN / CLOSE-DOWN-CONTAINER-TOP.

PI: He lifted up the container top, put the cat in, and closed it.

Other semantic relations expressed as mimetic blends were object-location relations, where signs for objects were performed at their respective locations, and action-object relations, where signs for objects blended mimetically with their respective movements:

PC: Hansel & Gretel's father in old, patched clothing.

OLD / PATCH-ON-KNEE / SEW

PI: His pants are old and there's a patch sewn on the knee.

KS: Re-telling Little Red Riding Hood

PS: She (Grandmother) ran but he (Wolf) caught her.

CLOSE-DOOR / TURN-KEY

PI: He closed the door and turned the key.

Most of the grammatical processes described above were ways in which different meanings were expressed simultaneously and visually as opposed to discretely,

sequentially, and arbitrarily. The visual aspects of the expressions reflected the visual features of the referents; whereas the simultaneous aspects served to blend these features in ways that are only partly understood. As can be seen from the long-hair and patch-on-knee examples, the blending process is not restricted to the mutability of verb forms alone and seems to be used in a more general way than the incorporation phenomenon found in ASL and described by Fischer (1978).

Directional signs were also used by the subjects of this study; i.e. they changed the direction of motion in their verb signs to indicate sentential arguments much the way Deaf adults accomplish this in ASL (Klima & Bellugi 1979). This inflectional process was found to differ from blending in that the former process dictates that the hand configuration of spatially modifiable verb signs remains the same and only the direction of movement changes (Fischer & Gough 1978); whereas in the latter, hand configurations of citation-form signs can change so as to enhance the mimetic nature of the expression. In the example below the subject (Greg) was identified; the next reference to him was in the changed initial placement and direction of the sign TELL. This change in direction of the sign indicated that Greg did the telling:

PC: TW in his classroom with his friend Greg.

PS: I was sleeping and was tapped on the shoulder.

PT. to Greg in picture WAKE-UP / TIME ,

HE-TOLD-ME , SIX

PI: He said wake up and told me it was 6 o'clock.

Setting Up Locations in Space. The participants in this investigation in their expressions staged or created real life events in much the same way as Deaf adults do in ASL. Mandel calls this "staging" a kind of "construction" or building of a complex picture that involves spatial relationships that exist in real life situations (1977: 78f). Staging in this study was evident in the way that the subjects set up locations in space. From these established locations, they would describe events that happen or happened at that particular spot. In essence, they would act out a scene for their partner in communication:

KS: Retelling the story of Goldilocks.

PS: They (the bears) went upstairs quietly.

(1) BED , PT. to place in front of body NOTHING /

(2) moves to different location

NOTHING

(3) nods yes

PT. to a different place

PI: They saw no one in Father Bear's bed, and no one in Mother Bear's bed, then they saw her in Baby Bear's bed.

In this example SL created different locations for each of the three bears' beds in front of her. First establishing that she was talking about beds, she signed NOTHING twice, each in a different position, signifying different beds. Knowledge of the situation filled in the information about whose bed each location signified.

Through the use of space, via the grammatical processes of pointing, simultaneous signals, and

staging, as this section has demonstrated, the subjects in this study were able to produce complex utterances. The utterances were for the most part bundles of mimetically based simultaneous information not expressible in the same way that utterances are expressed in the more arbitrary, discrete, and sequential ways of most spoken languages.

It was significant that so much could be said by seemingly so little, yet what seemed so little was actually only the number of concatenated manual signs per utterance. Once simultaneity was considered, it became obvious that the subjects in this study built meaning into and layered meaning onto manual signs and that they did not perform additional signs sequentially only to express meaning as spoken languages must do. Therefore, the crucial grammatical feature would seem to be not the length of utterance but the number of layers of meaning per manual sign. As Liddell has stated, sign language seems to be a "many layered system" (1977).

Ordering Strategies. In addition to transmitting information simultaneously, the children in this study expressed their intentions sequentially, employing chunking and object-fronting strategies.

Chunking refers to the way basic grammatical relations were juxtaposed to form more complex ideas. These chunks of information took the form of "small snapshots" or "frames," to use an analogy, that piled up additional information. They were composed of lexical elements that seemed to have strong structural bonds in that the particular forms used appeared consistently throughout the data.

KS: (At a previous taping SL was asked if her father helped her mother cook); she was now asking her communication partner the same question
eyes at researcher
MOTHER, FATHER HELP / FATHER COOK / KNOW YOU
PI: Do you know if your father helps your mother cook?

In this example, instead of one integrated structure that incorporated all information, the subject juxtaposed three structurally complete sentences; each sentence (chunk or capsule of information) gives a glimpse of part of the entire question.

Fronting. Thus far, the trend in the utterances observed for this study seems to be to build up information either from context, from initial specification of Time, Place, and Topic Indicators, or from structurally complete chunked sentences. The process seems to be one of establishing a frame of reference (either overtly or assumed from context) and then adding information to that frame. Interestingly enough, the core of many utterances observed for this work abided by this "frame-plus-added-information" principle as well. As exemplified below, objects of utterances occupy initial position and thereby create a framework to which additional information is added:

PC: TW at restaurant table holding chopsticks.

RESTAURANT MY UNCLE

PI: This was at my uncle's restaurant.

PC: Jack knocking at castle door in beanstalk tale

DOOR BIG KNOCK

PI: He knocked on the big door.

Sign Order was flexible, even though object (or topic) fronting was a pervasive strategy in the data. Non-fronted objects were observed as well. That Time and Place Indicators were fluid structures has been established, as has the fact that the subject-predicate arrangement could at times shift to a predicate-subject grouping. As this section will indicate, other structures of the language observed could "twist and turn" as well. This fluidity of order is well documented in the literature: according to Friedman,

Word order -- the linear sequence of lexical items -- plays an insignificant role in ASL's grammar. ASL need not depend on fixed word order or case markings (it has none) to indicate the relation of argument to verb. (1976: 5).

There are several possible reasons for this flexibility in sign order. First, the richness of structure of individual signs has been illustrated in the section on mimetic blends; with such mutable morphological structure, there is little need for order to signal syntactic structure. Second, spatially modifiable action signs that inflect to incorporate subject and object preclude the need to have an order for these relations made clear other than in the verb's production. Third, the use of body movement for role switching, setting up locations in space, and eye gaze serves to depict at once as opposed to ordering in sequence. Fourth, if as has been shown, basic

grammatical relations are chunked,

then twisting their position should not affect meaning. For instance, if the two constituents Det + N can at any moment shift to N + Det and back again, this in no way alters their relationship to each other or to the other elements in the sentence. (Stewart 1976: 158)

Nor should positioning them at different points in the signed utterance, as long as bound elements remain together. This idea coincides with the rule of adjacency: "The more closely related the denotata of two signs, the stronger is the tendency to place the signs close to each other" (Namir & Schlesinger 1978: 123).

Taking this one step further, it is easy to envisage a movement of these "bound chunks" in specified ways to express ideas. Just as sign language uses movement to express relationships, perhaps so should the system that attempts to describe it. Moulton (cited in Stewart 1976) describes one possible structure: "A phrase-structure mobile [which] ... consists of putting a phrase-structure (immediate-constituent) tree into three dimensions, suspended by its unique beginner, S, so that it floats in space" (1976: 156).

According to Stewart, and as Wundt has contended (cited in Namir & Schlesinger 1978), although the terminal elements are free to swing, since hierarchical structure lies on the vertical dimension, it is preserved. This means that not all combinations of terminal elements are possible, because the higher constituents are exercising their "power" over them and, to use an analogy, preventing them from "tangling." What

twists and turns then are the constituent chunks as B in Figure 1 depicts.

Figure 1. Phrase-structure mobile
(after Stewart 1976: 156).

The twisting and turning of constituent chunks was a productive process evident in the data for this investigation. In the examples that follow, the second utterance appeared either right after the initial utterance or in close proximity to it; i.e. the context was the same. This would seem to indicate that the structures were equivalent in meaning to the subjects and implying that their order was acceptable either way:

PC: SL as a child sitting on a stone ledge.

SOILA ME NAME // SOILA NAME ME

PI: This is me, Soila.

PC: Photo of huge fake telephone.

ELECTRICITY NOTHING // NOTHING ELECTRICITY

PI: There's no electricity for it.

KS: Researcher was discussing a car accident that had happened.

eyes at researcher

YOU AFRAID // AFRAID YOU

PI: Were you afraid?

PC: Researcher's husband standing at the side of a pool.

Motel is in background.

YOUR HOUSE, WHERE // HOUSE YOUR, WHERE

PI: Where's your house?

PC: Jack in the story looking down from inside a cup on

a shelf at the Giant.

CUPS, BOY LOOK-DOWN // BOY LOOK-DOWN, CUPS

PI: The boy looked down from the cups.

From the examples above, free sign order within constituent groups was evident for attribution, negative, and subject-predicate structures when they appeared alone as a single group or chunk. When these constituent groups appeared with additional signs, they still twisted on the mobile, but only with each other; i.e. they preserved the same hierarchical relationship and tangling was prevented. For example, *ME SOILA NAME, NAME SOILA ME, and *YOUR WHERE HOUSE, HOUSE WHERE YOUR did not occur (first and fourth examples above). Preservation of the hierarchical relationship was also evident in the last example above.

There is the possibility that other structures are as free as those just illustrated, but in this study the above structures were the only ones that "floated" when the context was kept constant. If the context is not kept constant, the possibility exists that other fluid

structures might be ordered on the basis of contextual or semantic principles. As Fischer (1975) has suggested, there is the possibility that ASL uses different orders for different topicalization effects. For example, when Goldilocks finally decided that Baby Bear's bed was the "just right" bed, the "just rightness" of the bed was stressed:

KS: Retelling of the Three Bears from memory.

PERFECT GIRL BED BOY BEAR

PI: Baby Bear's bed was perfect for the girl.

Along similar lines, Wieman (cited in Dale 1976) proposes the following hierarchy of stress assignment:

new or contrasting information	
locative	
possessive	
noun object	
action	
pronoun object	
agent	increasing stress

Wieman claims that if two elements from the above list appear together, the one higher on the list will receive more stress. This could offer a reason why the subjects in this study organized their language as they did; e.g. it is possible that new or contrasting information as well as noun objects were fronted to stress them, and that subjects and pronouns were basically contextual or anaphoric and so unstressed.

Whether the reason for the order described in this section is stress assignment, latent iconicity, or

possibly even phonological (i.e. mutable signs formationally easier to perform in utterance-final position), the significant fact is that definite ordering strategies existed and that the subjects of this investigation showed evidence of linguistic systemization.

Repetition. Repetition of single signs and, to a lesser extent, repetition of phrases and sentences occurred frequently in the data. At times repetition was used for no apparent reason other than for what seemed to be a necessary part of the execution of a sign -- much for the same reason some signs are repeated in ASL (Battison 1978). However, there were other times when signs were repeated to signal specific aspects of meaning, such as those exemplified below.
(to stress a point)

KS: LV was becoming impatient after looking at several pictures taken in his classroom, none of which was of him.

PC: Classmates of LV playing with a puzzle.

NOT + + ME

PI: That's not me (either)!

When the subjects were supplying information that was not readily discernible from context, they would repeat it. It was as if they were giving their communication partners more time to process the new information. With respect to ASL, Fischer states, "Perhaps because of the latitude in lack of redundancy, there is a tendency to repeat sentences verbatim, as though to give the listener or viewer a second pass at

the sentence" (1978: 325).

(to focus on new information:

PC: SL standing in front of a store window.

(PERFUME STORE) +

PI: This is a perfume store.

Repetition was also used when the subjects were referring to the degree or the quantity of something. In these contexts it was analogous to the English use of very or a lot of.

(to indicate degree)

PC. Researcher and husband at Bryce Canyon, Utah.

eyes at researcher

FAR + +

PI: Is this very far away?

There was repetition that indicated the continuous nature of an activity--

(to show duration)

PS. Researcher asks TW if he was born in China. TW

says, "I was born in China and stayed in the place where I was."

CHINA MORE + + +

PI: I stayed in China for a while.

(to indicate recurrence)

PS: TW explains that he had to wait in line to see George Washington's retreat at Mt. Vernon.

(WALK WAIT) + [both signs repeat]

PI: We had to walk and wait, then walk and wait.

Repetition that functioned to pluralize signs resulted in very iconic representations as in the next example.

(to indicate plurality)

PC: Three tall thin tree trunks inside a glass-enclosed hothouse.

PLANT + + GROW + +

PI: Three plants are growing

Pairing the iconic and three times performed signs PLANT and GROW together visually depicted three plants growing.

Mention should be made here of the difference in the form of the repetition strategy noted above for expressing meanings of degree, duration, and recurrence from what is known about the form of such expressions in ASL. The only form apparent to the researcher used regularly by the subjects was an exact repetition of what had just been done. Klima and Bellugi have found complex "distinctions in dynamic qualities of movement superimposed on signs -- distinctions in speed, tension, and length" (1979: 245) that subtly differentiate distinctions of aspect in ASL. Although these subtle distinctions were not apparent to the researcher in the data for this investigation, it is of course possible that they do exist in the language of Deaf children of Deaf parents the same age as these children exposed only to MCE; or it may be that the distinctions Klima and Bellugi found are later in development and appear in the signing of all deaf children at a later age.

Repetition in the form of ABA patterns. There was a pattern that consistently appeared in the data: a sign would be uttered (A), a different sign would follow (B), and the first sign would be repeated (A). Upon investigation of the rhythm and the pause structure of the pattern, it became apparent that two kinds of structures were being used: one with a slight pause after the second sign (AB,A) was used for emphasis; the other with pause after the first sign (A,BA) was used to add new information. E.g. AB,A:

PC: A huge elephant being pulled by a Volkswagen.

PT. to picture BIG ELEPHANT, BIG

PI: That's a big elephant.

E.g. A,BA (The following structure was actually composed of two separate sign sentences, with the second functioning as an expansion of the first):

PC: DR with a glass of water.

PT. to picture WATER, DRINK WATER

PI: I was drinking water.

Contextual subordination was the only kind of subordination evident in the subjects' utterances; i.e. clauses that from the context would seem to be dependent were expressed as distinct sentences, without the subordination markings of ASL such as the head position and facial expression noted by Liddell (1978). E.g.

PC: DR riding a horse.

PT. to picture HORSEBACK-RIDING, TOLD YOU

PI: I told you I went horseback riding.

Since Liddell was looking at older signers using a language developed in contact with ASL signers, it is quite possible that the use of head position and facial expression to signal subordination is a factor of development.

Summary: regularly occurring ASL processes. The grammatical processes in the language of the subjects presented under five major heads were not representative of the Signed English system of signing to which the subjects were exposed. In the Basic Forms section, the sign sentence was described as an utterance that could be composed of a subject and a predicate (either in that order, reversed, or simultaneously) with frame of reference indicators creating questions and expressing information related to the time, place, topic, and reality of events.

The powerful process of simultaneous expression of meaning units was the primary focus of the Use of Space section. Here was seen how the subjects "layered" additional meaning onto manual signs through the use of body movement, eye gaze, and facial expression and built meaning into the hand signs by mimetic blending and directionality -- also how they set up location in space.

The section on Ordering Strategies gave an account of the chunking of utterances and the fronting of signs within sign sentences. Several hypotheses for what appeared to be a lack of fixed sign order (though not a totally free order either) were offered. Some of the ways the subjects stressed certain elements and

indicated degree, duration, recurrence, and plurality were exemplified in the Repetition section.

Finally, the subjects' expression of subordinate ideas was characterized as subordination implied by context rather than subordination overtly expressed by syntactic marking. The grammatical processes and structures in the language examined here were for the most part quite similar to processes known to be characteristic of American Sign Language. Most of the basic forms of the utterances, the efficient use of articulators (i.e. different hands for meaning that could be parallel-encoded), of classifiers, and of directional verbs have been documented as part of the linguistic structure of ASL. Because of this, from this point in the study, these processes will be referred to as ASL grammatical processes.

Summary: regularly occurring Signed English structures. In addition to the ASL grammatical processes, the subjects used structures that conformed at least in part to the requirements of the Signed English system to which they were exposed. Their structures were considered expressions of Signed English if one manual sign represented one English word and if English word order was maintained throughout the utterance. These are best characterized by the semantic relation, grammatical category, or grammatical morpheme they expressed, as the following tabulation shows:

Semantic / grammatical category	Example in data
Negation	ME NOT ASSENT
Conjunction	FLO AND ALBERTO AND JOHN
Action-Object	ME BUY FOOD
Attribution: Possession	MY PARTY
Action-Location	PLAY OUT
Preposition-Object	IN CUP
Action-Modifier	GO WALK AWAY
Object-Location	CLOWN CIRCUS
Question formation	eyes at researcher YOU SCARED
Apposition	SISTER LIZ
Wh- question	WHERE FOOD
Genitive	PICTURE TRIP
Dative	GATHER SURPRISE FOR YOU
Disjunction	CATHY MOTHER
Indirect object	MOTHER GIVE GRETTEL BAG
Conjoined sentences	BOY CHOP / TREE FALL
Contextual subordination	POLICE SAY, PEOPLE BAD

Morphemes

Progressive ending	HANSEL LOOK-ING GRETTEL
Plural -s	GIRL-S CRY
Pronoun forms	IT STORY
Auxiliaries	THEY WERE TO LISTEN 'They were listening'
BE used as main verb	HE WAS STRONG
Determiners	WITCH PUSH THE BOY
Apostrophe-s	SUE-'S HUSBAND
Expressions	REST IN m-e-m-o-r-i-e-y

Clearly most of these utterances do not present

standard English; they are only partial representations of the structures to which the students were exposed. Nevertheless, I consider them representations of Signed English because they fulfill the criteria stated above and in so doing serve to distinguish the subjects' ASL system from their Signed English system for the purposes of this investigation.

Summary: semantic development.

In order to investigate the nature of the subjects' developing semantic system, I noted mismatches of form (subjects' signs) and meaning (referents from context) within the following lexical categories: Kinship terms / Names for people; Negation; and Wh- questions. From these mismatches the semantic features the children were most likely perceiving were hypothesized (Clark 1973), from their intended referents, based on the semantic features inherent in the signs they used to label those referents "incorrectly."

For each subject, learning the meaning of signs was a process composed of perceiving and labeling increasingly specific features of the signs' referents. In their effort to express their intentions, they used signs that were both too general as well as signs that were too specific for the meanings they intended. They assigned too-general signs by perceiving from the referents features of meaning that were appropriate but not restrictive enough to label them properly. These broad features of meaning were assigned labels according to what lexical features of meaning the subjects possessed and seemed to them to match the broad features of meaning they were perceiving. Accordingly, men and husbands were apparently perceived as 'mature males' and

referred to as FATHER, the label in the subjects' lexicon for the features mature plus male. Similarly storybook characters with grey hair were perceived as "very mature males or females with grey hair" and labeled GRANDFATHER or GRANDMOTHER. Sisters were apparently perceived as "young females" and labelled GIRLS. Also the general question sign WHAT was used to mean the same as the more specific question WHO, and the more general sign NO was used instead of the more specific sign CAN'T.

The subjects also used signs too specific for their intended meanings; e.g. BROTHER to mean 'boy' and WHO to mean 'what'. In these examples, although the subjects had learned more specific forms, they were still in the process of acquiring the more specific features that would differentiate these new forms from the more familiar forms they were taken as equivalents of.

By perceiving and labeling increasingly specific features of meaning, the subjects also learned new signs in the categories of Time, Description, and Preposition/Conjunction. The acquisition of semantic features thus played a central role in the development of sign meanings for the subjects in this investigation.

2. DEVELOPMENT OF ASL GRAMMATICAL PROCESSES

How levels of development were formulated. The ASL processes observed in the subjects' language utterances immediately pose questions: How do they develop over time? When do new processes appear and how do utterances become longer and more complex? In this section the ASL grammatical processes used by the youngest through the oldest subjects of this study will be organized into five levels of development. The guiding principle for the recognition of these levels comes from Bloom and Lahey:

With respect to form, children will characteristically learn and use certain, particular words that will relate in an important way to the phrase structures they can be expected to learn and use subsequently. In turn, certain early two- and three-word phrases will be necessary antecedents to the more complex sentence structures that will be used subsequently. (1978: 374)

The levels then will show what seem to be the necessary antecedents to successive changes in form over time, by showing when along the path of development new grammatical processes appeared and how these processes grew longer and more complex. The criteria used to hypothesize these levels are explained below:

1. If a grammatical process appeared for the first time and was found to be used by the older subjects, it was thought to be an indication of a qualitative change in expression and therefore a shift to a new step of development; e.g. the simultaneous appearance of time, place, and topic indicators (structures that were used

by all the older subjects as well) at ages 8;2 and 8;3 in subjects LV and FL, respectively, suggested that these two were entering a new, additionally complex phase of linguistic growth.

2. If a particular grammatical process was initially used for one purpose and then the same process was used later by the older subjects for a different purpose, the new use of this process was viewed as an indication of development; e.g. one simultaneous use of left and right hands was to express the same sign on both to indicate plurality; whereas a more mature use of the same process was to express two different lexical elements or phrases simultaneously. Because the latter use of the two hands thus appeared in the data obtained from the older subjects, it was considered to be part of a later level of development of the use of left and right hands.

3. If a particular grammatical process coordinated with other grammatical processes and thereby incorporated that process in a longer more complex utterance, the utterance was assigned to a different level of development and grouped with other utterances of similar length and complexity; e.g. utterance 2 below coordinates a place indicator with a question indicator and a conjoined sentence; while utterance 1 coordinates a place indicator only with a one-sign predicate. Therefore, utterance 2 uses a place indicator in a more complex way and is assigned to a different developmental level for place indicators, where it agrees with other utterances in length and complexity.

1	2 eyes at researcher
FOREST , BREAD	FIRE, BURN-UP / DIE
PI: They were dropping	PI: Did she burn up in the

bread in the forest. fire and die?

4. If a particular grammatical process expanded to create a longer utterance (a sentence composed of more signs), it was considered a signpost of new development and the utterance was assigned to a different level of development. Therefore, utterance 4 below was considered a longer and more complex expression of the grammatical process of fronting compared with its expression in utterance 3 and was placed in a different level of development with other utterances of similar length and complexity.

3 MONEY TAKE

4 DOOR BIG KNOCK

PI: He'll take the money. PI: He knocked on the big
door.

When the data from the six subjects in the study were conflated and organized according to similar length and complexity, the effect was as though a single subject were viewed developing over ten years (instead actually of six of different ages over fifteen months). While such a longitudinal study could produce considerably different results were a six year old actually followed for ten years, the analysis here reported shows some of the benchmarks of development that might be found in single-subject longitudinal studies.

From the pooled, conflated data five levels of increasingly complex linguistic development were hypothesized. The boundaries between these hypothetical levels are by no means fixed or rigid, but tentative as they are they do characterize a certain level of

lingusitic complexity that children may attain at different ages, though in the same order. When ages are indicated in the examples below, they refer to the earliest noted occurrence of the process or structure under discussion and signal that the regular use of that process or structure will be found in older subjects.

Table 2. Grammatical processes (ASL) at Levels 2 & 3.

(on following page)

Level 1

Level 2

Basic Forms

Agent-action/
action-agent relations

Subject-attribute; subject-
attribute of unspecified object;
subject-object relations

Time, place and topic indicators

Yes-no questions

The Use of Space

Distal pointing to index location

Head movement and direction of
eye gaze refer to location of
event under discussion

Left and right hands express a
proximal point and a sign
simultaneously and two different
signs that refer to two
different people consecutively

Left and right hands articulate
the same sign or classifier
simultaneously as a way of
indicating plurality

Blends convey action-location
and action-object relations

B+ and classifiers appear

Blends convey object-attribute
and action-object-location relations

Directional sign GIVE incorporates
subject and indirect object
relations

Ordering Strategies

Fronted objects of attribution
(possession) and negation

Fronted objects of attribution,
location, action; objects defined
by context; fronted modifiers
of action; fronted, modified
attributes

Repetition

Single sign repetition to
focus on new information;
ABA repetition to stress
the importance of a previous
comment

Single sign repetition to stress
information and indicate degree;
ABA repetition to add new
information

Development of ASL grammatical processes: Level 1.

At Level 1 the Basic Forms agent-action and action-agent are used, and two sentences with one-sign predicates conjoin. Pointing and simultaneity make use of space; distal pointing indexes a particular location identified before or after the point; the two hands may express a proximal point and a sign at once. Predicate-constituent groups front objects of attribution and negation. Repetition focuses attention on new information, and in the AB,A pattern stresses the importance of a particular comment.

New processes at Level 2. The simple Basic Forms of Level 1 begin to indicate new subject-attribute and subject-object relations; time, place, and topic indicators and yes/no questions (using context and eye contact) also appear at this level. Nonmanual activities overlay meanings on manual signs; use of both hands denotes plural; classifiers begin to appear (these subjects use B-hand as vehicle classifier and I-L-Y-hand for airplanes). They use blends to express object-attribute and agent-object-location relations. The first use of a directional sign emerged at Level 2. The sign GIVE is used to indicate subject and indirect object arguments. New relations: object-attribute, object-location, object-action. Action modifiers and modified attributes are fronted. Repetition stresses information and indicates degree, size, etc., and the A,BA repeating structure is now used to add new information.

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Type	Su	Age	Utterance	Probable interpretation
BF	LV	7;5	MOTHER TAKE-PICTURE	Mother took this picture.
	LV	6;4	HUG ME	I'm hugging the baby.
	LV	6;4	MONEY / SURPRISE	She saw the money and was surprised.
US	LV	6;4	PT. to picture	PT. to distance / HOME
				This one is over there -- at home.
	LV	7;5	R PT. to picture	
			L MY	It's Luis.
	LV	6;4	STAND-THERE	She was standing there.
	LV	7;5	LIFT-ROCK	You can lift the rock.
	OS	LV 6;4	BABY ME	She's my baby.
Rp	LV	6;4	SISTER NOT	This is not sister.
	LV	6;4	PT. to picture	BREAK+++ It's broken.
	LV	7;5	NOTHING HOLD-BAR, NOTHING	I wasn't holding the bar.

Table 2.1. Examples of Level 1 ASL-like structures.

Key:	BF	basic forms
	US	use of space
	OS	ordering strategies
	Rp	repetition
	TI	topic indication
	PL	plurality indication
	TP	topic plus predication
	YN	yes-no question
	BH	use of both hands
	Cl	classifier
	OA	object-attribute
	OAL	object-attribute-location
	DVB	directional verbs

At Level 2 additional semantic relations were expressed: object-attribute, object-location, object-action, and action modifiers and modified attributes were fronted as well. Repetition stressed information and indicated degree, and the A,BA structure first seen at Level 1 was now used to add new information.

At Level 1 conjoined utterances were composed of

two sentences with one-sign predicates; at Level 2 three sentences are similarly conjoined, an indication of the subjects' growing ability to connect related ideas; e.g.

LV 6;4 MONEY / SURPRISE

FL 9;0 PT. to picture POOR / NO /CRY

They were poor and couldn't have
anything and she cried.

Type	Su	Age	Utterance	Probable interpretation
BF	LV	8;2	GIRL BAD	The girl is bad.
	FL	8;3	ME RED	I had a red car.
	LV	8;2	MOTHER MONEY	Mother wanted money.
TI	LV	8;2	BEFORE, SNOW	This was when it snowed.
			TRIP, BEFORE	This was on a trip.
PL			FOREST, BREAD	They were dropping bread in the forest.
			PUSH, FIRE	Gretel pushed the witch into the fire.
TP	FL	8;3	PT. to picture YOUR, LOVE NO	I don't love you.
YN			eyes at researcher	
			BAD	Was it your fault?
US	FL	9;0	eyes look around, head back-forth, mouth open	
			TRAIN	I looked all around from the train and was amazed to see all this.
BH	FL	8;3	R BOY DOG NO	There are no boys and no dogs
			L NO	here.
C1			R B-	
			L B-	Two cars crashed.
			Y	A plane can crash.
OA	FL	8;3	LONG-TEETH	He had long teeth.
OAL			PUT-RING-ON-FINGER	Someone puts a ring on your finger.
DVB	FL	8;3	PT. to picture MY, I-GIVE-TO-HER	I gave her my dog.
OS	LV	8;2	MONEY GOLD	That's gold money.
	FL	8;3	BED SLEEP	She was sleeping in bed.
			MONEY TAKE	He'll take the money.
			ELEPHANT AFRAID	I was afraid of the elephants.
			FAST CHOP	He chopped the stalk fast.
			HOT VERY+++	It was very, very hot.
Rp	LV	8;2	NOT+++ ME	That's not me.
	FL	8;3	eyes at researcher	
			FAR++	Is this very far away?
			BORN, BABY BORN	The baby was born.

Table 2.2. Additional ASL structures seen at Level 2.

New processes at Level 3. The sign YOU is added to the one-sign question sentence (with eye contact and context) of Level 2. Wh- question signs appear, as do reality indicators. In Use of Space, points now indicate more than one person or object in a sentence, non-negative signs are made negative with head shake, and eye gaze is now used to refer to persons previously established in places. In Level 3 the display of two different signs on left and right hands expressed simultaneous components of a structure, and body movement was used to signal change in subject.

Repetition was used here to indicate the recurrence of an event. One idea is made contextually subordinate to another. The length and complexity of utterances increases also in Level 3, when one-sign subjects are coordinated with one-sign predicates or the latter expand to include another relation. Mimetic blends also appear.

At Level 3 very complex utterances were created by the coordination of processes that make efficient use of space. In the utterance below, with the aid of a picture, subject DR initially established the fact that she was talking about herself as a baby and indexed a position for the baby with her right hand. Her next point, to her brother in the picture, was made with her left hand. This was followed by the mimetic blend PICK-PERSON-UP, which was performed at the previously established location for the baby. This one example shows clearly how processes exploiting the use of space begin to coordinate at Level 3, even if only through the use of a picture.

DR 9;0 ME BABY, R PT. to side of picture

L PT. to brother in picture, PICK-
PERSON-UP, AFRAID When I was a baby over
here, he'd be afraid to pick me up.

Single sentences composed of constituent groups became longer and more complex at Level 3 through the coordination of sentence subjects and the expansion of predicate constituent groups. This expansion marks the first appearance of hierarchically structured predicates; e.g.

FL 8;3 MOTHER MY NO This is not my mother's house.

DR 9;6 NOT MOTHER ME That's not my mother.

Type	Su	Age	Utterance	Probable interpretation
BF	FL	9;0	eyes at researcher	
			SWIM YOU Did you swim?	
			SMELL, WHAT What smelled?	
			BEAUTIFUL, TRUE They're really nice (pictures)	
US	FL	7;10	HUG PT. fwd & to side PT. to self	She and I hugged.
	DR	9;6		neg headshake
			PT. to picture ME	It's not my baby.
	FL	7;10	eyes up & to side	nods yes
			NOW+ DAY EXCITED	ME On the day (my
			mother and father told me)	I was excited.
BH	DR	9;0	R PT. to picture BOY	BIG The boy is
			L	SMALL small compared
				compared to the big Giant.
BM	DR	9;0	body to rt. body to lft.	
			TAKE-PICTURE / POSE	Someone took the picture & I posed.

C1	DR 9;6	V-CL 'walk across ledge'	I walked across it.
	FL 8;3	F-CL 'take wafer'	'put it in mouth' You take the wafer and put it in your mouth.
	DR 10;3	upright-arm-CL 'fall over'	The stalk will fall over.
Rp	DR 9;0	PT. to picture ANGRY / AGAIN+	She was angry because it happens again and again.
CS	DR 9;0	PT. to picture HORSEBACK-RIDING, TOLD-YOU	I told you I went horseback riding.
CS	DR 9;6	MOTHER ANGRY / NO	Mother gets angry and says no. STOP / PLAY DON'T She says don't stop and play.
	MS 10;1	TALL / GROW-UPWARDS	The stalk was tall & grew upwards.
	DR 9;0	HIT-IN-EYE / CUT-UNDER-EYE	He was hit in the eye and got a cut under it.

Table 2.3. New ASL structures at Level 3.

New processes at Level 4. At Level 4 eye gaze coordinated with distal pointing or indexing and enabled the signer to portray or switch into the role of the subject of discussion. Because of ordering, meaning can be obtained from some utterances at Level 4 through the accumulation and then synthesis of chunked two-sign utterances. At this level also signs within some constituent groups begin to twist and turn within their groupings. Repetition was used now to indicate plurality

(in subject and verb).

Increases in length and complexity from Level 3 to Level 4 are best distinguished by comparison of the sentence structures. Conjoined sentences become longer as one-sign subjects and predicates are used in both sign sentences; one-sign subjects coordinate with a predicate constituent group in one of two sign subjects; and constituent groups begin to appear in one of three conjoined sentences:

Lev 3: DR 9;6 MOTHER ANGRY / NO

Mother gets angD* o3& 8o*8 3I"

Lev 4: MS 11;9 ME SAME / PT. to picture DIFFERENT

I have the same but this is different.

Lev 4: MS 11;9 HOUSE / WINDOW / TV BIG

This is my house and this is my window
and this is my big tv.

A major difference between Level 3 and Level 4 utterances is the way locations are set up in space. At the lower level the subjects depended on the pictures they were looking at as a foundation on which to add their comments; i.e. their signs were either performed at a particular place on the picture or were performed in space exactly where the referents were seen in the pictures. At Level 4 however, since the subjects either went beyond what was in the picture or did not use a picture at all, they began to stage scenes for their communication partners by using body movement, distal pointing, and eye gaze. These utterances made dependence on context less crucial, though still necessary, for correct interpretation.

Constituent groups continue to become hierarchically structured at Level 4 and constituent groups begin to appear in subject position:

DR 10;3 BIRD DEAD SEE We saw a dead bird.

MS 10;10 ME FATHER GRANDMOTHER SHOOT

My father shot the wolf in
grandmother's clothing.

Type	Su	Age	Utterance	Probable interpretation
US	SL	14;0	MOTHER LOOK-UP / SURPRISE, PT. in front	eyes forward
			Grandmother looked up and was surprised when she saw the wolf there.	
OS	MS	10;10	MAYBE GROW / MAYBE ONION / MAYBE SEE	Maybe we'll see onions grow.
	SL	14;9	YOUR HOUSE, WHERE / HOUSE YOUR, WHERE	Where's your house?
Re	MS	11;9	PLANT++ GROW++	Three plants are growing.
Eyes out				
US	MS	10;10	ME TV / PEEK-THROUGH-HOLE // body turn/PT. outwards	I was watching TV and someone was peeking through the keyhole. I turned and saw who it was.
Position change				
	SL	14;0	BED, PT. to front, NOTHING / NOTHING	They saw no one in this (Father Bear's) bed and no one in that (Mother Bear's) bed.

Table 2.4. Examples of additional structures at Level 4.

New ASL processes at Level 5. In Basic Forms, overtly specified direct and indirect objects begin to emerge at Level 5. The objects could appear either at the beginning of the sentence or at the end. The sign CAN to express a direct question also appears here. Use of space is also more sophisticated at this level. In one

example TW (at 16;1), talking about a classmate, Barner, who had already been assigned a location at the signer's left, points and looks to the left, then points and looks at researcher, returns pointing hand and eyes to left, assumes an angry facial expression as the hands sign SIT twice, and finishes by pointing left. The probable interpretation: 'You angrily told Barner to sit down.'

Left and right hands are used at Level 5 to show that people are being listed in a series: TW (at 16;1) points to three persons with the right hand at the same time her left hand uses index, middle, and ring fingers to give each a serial number. Alternation of hands also indicates change of subject, as when TW (at 15;4) uses her left hand to sign her actions and right hand to relate what another person said. The anaphoric use of the person classifier and the inflected use of the sign GIVE to signal temporal aspect are also found at Level 5:

TW 16;1 ME PT. downwards // 1-CL 'went downstairs'
I went downstairs.
TW 16;1 LA PLACE GIVE "over time" [modulation]
Mr. Laplace kept giving out (hot dogs).

Increases in length and complexity in Level 5 utterances came from joining several predicate constituent groups with one subject; e.g.

TW 16;1 KEVIN BALLOON BLOW-UP / WATER IN / TIE / THROW
Kevin blew up balloons, put water in them,
and tied and threw them.

Frame of reference indicators expanded at Level 5

to include an additional constituent; e.g.

TW 15;4 BEFORE YEAR TWO, LONG-HAIR

This was two years ago when she had long hair.

Also at Level 5 the second of two time or place indicators served to restrict or comment more specifically about the time or place of the first, and time and place indicators began to appear together in one utterance; e.g.

TW 16;1 THURSDAY, EIGHT FLOOR, MOTHER FATHER COME-HERE

My parents will come to the eighth floor on Thursday.

Level 5 utterances use classifiers in addition to body shifts for scene setting, even using different kinds of movement to distinguish between 'each one' and 'every one.' Also at this level subjects of utterances become hierarchically structured; e.g.

SL 14;0 PERFECT GIRL BED BOY BEAR

Baby Bear's bed was perfect for the girl.

Finally, at Level 5 frame of reference indicators coordinate with contextually subordinate sentences and constituent groups within the subordinate sentence expand; e.g.

SL 14;9 HANSEL AND GRETEL SURPRISE, HOUSE CANDY OR COOKIE

Hansel and Gretel were surprised to see the candy or cookie house.

Summary: levels of development, ASL processes. The subjects' ASL grammatical processes developed over time in a systematic progression of growth characterized by the appearance of new processes, the use of these processes for different communicative functions, and the coordination and expansion of these processes in longer and more complex expressions. More specifically, this development proceeded in the manner described below.

By the end of Level 2, most basic sentence forms, the use of space, basic semantic relations, and some grammatical uses of repetition have emerged. These processes appear to be the first to develop and are set off from later developing processes by a significant change that emerges at Level 3. The crucial change seems to be the increased use of space by indexing and directing eye gaze to portray interaction between the signer and others, the use of left and right hands to express two ideas simultaneously, and the first use of body movement to signal a change in subject. Level 3 sees the coordinated use of these and other processes. Such use, however, was tied to the specific pictures the subjects were describing; their actions and comments were performed directly on the pictures or copied from them. This strategy seemed to lay the groundwork for the subsequent, more complex use of space noted at Levels 4 and 5, where the actual locations of people or objects or both were set up or staged in front of the signers' bodies by use of indexing, eye gaze, body movement, and (at Level 5) classifiers.

Thus, no longer relying on a picture to make referents clear, the signer at Levels 4 and 5 first established objects or persons in a scene in signing

space and then referred back to the same place for further reference. In this way context became less crucial for interpretation. The subjects at this level seem to be thinking through their intentions to sort information which must be stated first from that which naturally follows; they also seem to be more able to take into account the addressee's perspective. The appearance of this more complex use of space at later stages (4 and 5) accords with the finding of Ellenberger and Steyaert (1978) in their study of deaf children of deaf parents; i.e.:

While one might expect spatial modifications to appear earlier because of their pictorial nature, they are, relatively late acquisitions, perhaps because such representations may require a fairly advanced mastery of cognitive skills involving spatial relationships. Also, setting up a spatial framework as a background for the subsequent representation of an action requires a type of advance planning that may be beyond the capabilities of a younger child. (1978: 268f)

Development at Levels 3, 4, and 5 was also marked by the increasing length and complexity of utterances. This was accomplished by the coordination and expansion of processes within conjoined, contextually subordinate and single sentences, as well as in the coordination and expansion of frame of reference indicators. The process was orderly: the complex structures occurring later were composed of simpler structures mastered earlier; e.g. relations expressed by two-sign constituent groups (object-negation, object-possessor, object-attribution) appeared alone first and were the first to coordinate

with other relations. In the same way, before any one of three conjoined single-sign sentences could expand, expansion of two conjoined single-sign sentences had to have been accomplished.

The development of ASL grammatical processes was described in terms of the sequence of development of these processes as well as the coordination and expansion of them; it proceeded in general from use of fewer, less complex processes to the use of more and more complex processes.

3. STRUCTURES REPRESENTATIVE OF SIGNED ENGLISH

Here the questions to be answered are: How do utterances representative of Signed English develop over time? When do new structures appear? How do these structures become longer and more complex?

As with the development of ASL grammatical processes, the answer lies in analysis of data from each subject at each taping session, but fewer criteria were needed to formulate levels for these structures than for levels of ASL development. This is because the processes of Signed English were not used by the subjects as were the processes of ASL, first for one purpose and later for another purpose (e.g. eye gaze in ASL). Therefore the new use of formerly used processes was not a criterion. Also, Signed English utterances became longer and more complex by essentially one process: increasing length. ASL grammatical processes, on the contrary, became longer and more complex not only by increase in utterance length but also by processes that expressed information simultaneously and so layered complexity onto utterances without necessarily lengthening them.

The two criteria used to hypothesize levels of development of structures representative of Signed English were:

1. If a particular semantic/grammatical category appeared for the first time and was subsequently used by the older subjects, it was taken as indication of qualitative change in expression and so a shift to a new step in development. E.g. prepositions appeared with objects for the first time in SE order at 9 years and 6 months. Since the relation was subsequently used by older subjects as well, it was taken to indicate that

those first using it were entering a new level of linguistic growth.

2. If a sign or constituent group coordinated with the other signs or constituent groups, or if a particular constituent group expanded to create a longer utterance (a sentence composed of more signs), it was considered a signpost of new development, and the utterance was assigned to a different level of development and grouped with other utterances of similar length and complexity. Thus, utterance 2 below was considered a longer and more complex expression of negation than utterance 1:

(1) LV 7;5 NOTHING AFRAID

(2) LV 8;2 ME NOT ABSENT

As with the ASL data, when the Signed English data of the six subjects in this study were pooled and organized according to length and complexity of utterance, and when the appearance of new structures was noted, five levels of increasing development were hypothesized; though it should be noted that the boundaries between levels are not absolute.

Level 1, Signed English development.

The first semantic categories seen expressed in English sign order were agent-action, negation, and conjunction; seen respectively in LV at 7;5:

ME SMILE

NOTHING AFRAID

FATHER MOTHER

Level 2.

Although negative relations are expressed with a

simple subject and negative sign earlier, what clearly distinguishes Level 2 from Level 1 is the appearance of a variety of semantic/grammatical relations expressed still in two-sign utterances. These relations and examples of each are shown below:

subject-object	FATHER MONEY	LV 8;2
subject-attribute	GIRL BAD	FL 8;3
action-object	HOLD PLATE	LV 8;2
attribute-object	GOLD MONEY	LV 8;2
action-location	GO-AWAY-FAST	LV 8;2
object-location	CLOWN CIRCUS	FL 8;3

Table 3.1. Features of Signed English at Level 2.

Yes-no questions begin to be asked at Level 2, as in the example, with one sign and gaze at communication partner:

LV 8;2 eyes at researcher
 YOU 'Is that you?'

Level 3.

New semantic/grammatical categories at Level 3 are:

modifier-attribute	MANY DARK	FL 9;0
possessor-object	ME FRIEND	DR 9;0
preposition-object	WITH MARRY	DR 9;6

Table 3.2 lists the semantic/grammatical categories that appear at Levels 1, 2, and 3.

Level 1	Level 2	Level 3
agent-agent	subject-object	
modifier-attribute		
negation	subject-attribution	possessor-object
conjunction	action-object	
preposition-object	attribute-object	
	action-location	
	action-modifier	
	object-location	
	yes/no question	

Table 3.2. Signed English semantic/grammatical categories at the first three levels.

Level 4.

At this level appear wh- questions, appositives, genitive, and disjunction; respectively (in MS at 10;10):

WHAT YOU, WHAT 'Who are you?'
 PT. to picture SISTER LIZ 'My sister Liz'
 PICTURE TRIP 'picture of a trip'
 CATHY MOTHER 'Cathy or her mother'

Also simple sentences are conjoined with implied conjunction, and one sentence is contextually subordinate to another (MS at 11;9):

BOY CHOP / TREE FALL
 POLICE SAY , PEOPLE BAD

The emergence of Signed English grammatical morphemes in the subjects' recorded utterances best distinguishes Level 4 from preceding levels. The forms

first to appear are the present progressive -ing and plural -s:

(MS 11;9) PETER . . . COOKING

(SL 13;7) GIRLS CRY.

Third person possessive pronoun forms, which require initialized signs in the Signed English system, appear within constituent groups at Level 4; subjective first person form is also used:

(MS 11;9) HER HUSBAND; HIS WIFE; I SEE.

At Level 4, predicate constituent groups, which emerged at Level 3, expand to include an additional constituent, thus marking the first appearance of hierarchically structured groups; e.g.:

L.3. (LV 8;2) ME NOT ABSENT

L.4. (MS 11;9) HAVE NOTHING FOOD

Constituent groups begin to conjoin in subject and in predicate positions, and the sign AND conjoins signs and sentences:

L.3. (FL 9;0) BOY GIRL FATHER

L.4. (MS 11;9) AND GRETTEL HANSEL WATCH

Level 5.

Dative and indirect object relations are used at Level 5:

(MS 11;9) FATHER SURPRISE FOR YOU

(SL 14;9) MOTHER GIVE GRETTEL BAG

Also at Level 5 several new Signed English morphemes appear: reflexive and IT pronoun forms, auxiliaries WERE and DO, BE as main verb, determiner THE, apostrophe-S both for possession and in the contraction IT'S.

Certain English phrases were expressed as units at this level. It seems likely that the subjects picked up the phrases as hearing children do and used them appropriately, even with humor, to make a point; e.g.

(TW 16;7) GET OUT

REST IN m-e-m-o-r-i-e-y.

Table 3.3 lists the semantic/grammatical categories that appear at Levels 4 and 5.

Level 4	Level 5
wh- question	dative
appositive	indirect object
genitive	
disjunctive	
conjoined sentences	
contextual subordination	

SE morpheme signs

-ING (v. ending)	IT & -SELF
-S (n. plural)	WERE, DO (aux. v.)
initialized pronouns	BE (main v.)
	THE (det.)
	-S (possessive)

Expressions

GET OUT
REST IN m-e-m-o- etc.

Table 3.3. Signed English semantic/grammatical categories at Levels 4 & 5.

Summary: development of Signed English structures. By the end of Level 2, most basic semantic/grammatical relations were expressed by the subjects in English sign order. At Levels 3 and 4 the relations preposition-object, appositive, genitive, and disjunction were added, and at Level 4, dative and indirect object relations. A number of different Signed English signs for grammatical

morphemes appeared at Levels 4 and 5. The order of acquisition of these morphemes was logical in terms of grammatical and semantic complexity. The Level 4 morphemes -ing and plural -s are considered less complex because according to Brown (1973) they are acquired earlier by hearing children, are less complex in grammar and semantics (smaller number of elements of meaning) than later to appear morphemes. This implies some initial similarity between the way deaf and hearing children acquire grammar and semantics.

Coordination and expansion was also an orderly process; longer and more complex structures being composed of simpler structures earlier used in isolation. The process began at Level 3. In conclusion, the development of structures representative of Signed English proceeded from the expression of a few relations to the expression of a great many that coordinated and expanded in an orderly manner.

4. SEMANTIC FEATURE DEVELOPMENT.

Again the subjects' developing semantic systems are described by hypothesizing levels of development, here specifically within six lexical categories; Kinship Terms and Names for People, Negation, Time Expressions, Wh- Questions, Descriptive Terms, and Prepositions and Conjunctions. Like the levels of ASL grammatical processes and features of Signed English, the levels of semantic development chart the growth of semantic maturity and not the progress of an individual subject. Ages given below refer only to the age at which the feature illustrated first appeared in a particular subject's output and are not to be taken as markers of a precise time for a feature to emerge.

Table 4.1 shows the accretion process of semantic feature acquisition. The meanings first assigned to a sign are given at the top of each column, and lower in the column the meanings develop toward the adult meaning or meaning intended by the subject at the bottom of the column. Thus the progression of feature development for the acquisition of the meaning of brother and sister, as seen in Table 4.1, is strikingly similar to the progression of feature development for these same terms by hearing children.

Table 4.1. Levels of feature acquisition: Kinship terms; Names for people.

(following pages)

	Subjects' Sign	Possible Perceived Features	Subjects' Sign	Possible Perceived Features
Level 1	GIRL	"young female" (LV 7;5)	BROTHER	"young male" (FL 8;3)
Level 2	FRIEND	"companion" (FL 7;10)		
Level 3	SISTER	"group of young females" (DR 10;3)	BROTHER	"older brother only" (DR 9;0) "group of young males" (MS 11;9)
Level 4	SISTER	"reciprocal relation" (SL 13;9)		
Adult Sign	SISTER		BROTHER	
	FATHER	"mature male" (LV 6;4)		
	MAN (LV 8;2)	a	WOMAN (FL 9;0)	b
	MAN		WOMAN	

Table 4.1. Levels of feature acquisition: Kinship terms; Names for people.

	Subjects' Sign	Possible Perceived Features	Subjects' Sign	Possible Perceived Features	Subjects' Sign	Possible Perceived Features
Level 1	FATHER	"mature male" (LV 6;4)	MOTHER	"mature female" (LV 6;4)		
Level 2	HUSBAND	"mature male with marriage band" (FL 8;3)			MARRIED	"wears marriage band" (DR 9;6)
Level 3	KISS- MARRIED	"mature person of one sex that kisses a mature person of the opposite sex" ^c (DR 10;3)	KISS- MARRIED	"mature person of one sex that kisses a mature person of the opposite sex" ^c (DR 10;3)	KISS- MARRIED ^d (wife)	"two mature people of different sexes that kiss each other" (DR 10;3)
	MARRIED	same features as above (DR 10;3)				
Level 4			WOMAN (wife) ^d	"mature female that kisses a mature male" (DR 10;3)	MARRIED ^d (wife)	same features as above (DR 10;3)
Adult Sign	HUSBAND		WIFE		MARRIED	

^aExactly what feature was distinguishing MAN from FATHER was indiscernible from the data.

^bThe defining features of the word WOMAN were indiscernible from the data.

^cSex differentiation was from context in these instances.

^dWife was simultaneously spoken.

Stage 1.

"The most primitive definitions consist simply in saying that a brother is a boy" (Piaget 1928 [1959]: 104). Likewise, the youngest subject in this study signed GIRL when looking at a picture of his sister, and the next older subject signed BROTHER in reference to himself.

Stage 2.

"In order to be a brother there must be several in the family but they do not assign the title to all children" (ibid., 106). In this study, one subject used the sign BROTHER only in reference to her older brother, while repeatedly referring to her younger brother by his name. She also signed SISTER in her references to a group of friends who were sisters, and the next older subject jokingly revealed to the researcher that his communication partner and he were brothers.

Stage 3.

"The correct definition...implies in one way or another the idea that in order to be a brother one must have a brother or a sister" (ibid., 104). This was clearly distinguished by the subject who recognizing that she herself was a sister in addition to being a member in her group of sisters, stated that she has three sisters and that there are four sisters in the family. Table 4.1, however, illustrates an additional step in this progression of feature development, characterized at Level 2, whereby the notion of sister incorporated the feature of 'companionship' (noted when the subject looked at a picture of his sister and signed FRIEND). This coincides with Danziger's finding (cited

in Clark 1973) that semantic acquisition entails not only perceptual attributes but social and functional factors as well:

The first meanings for kinship terms were those things that are perceptually derived (e.g. sex- and age-based characteristics), followed later by the addition of social or functional factors (living in the same house, eating together, etc.). Thus, acquiring the full (adult) meaning of the set of kinship terms within a language necessarily involves knowledge of the social structure as well as of the perceived attributes of the people who can appropriately be called brother or sister. (Clark 1973: 108).

This progression of perceived attribute to perceived function was noted also in the acquisition of meaning of the terms husband and wife. As shown in Table 4.1, general physical characteristics (age and sex-related attributes) were first perceived, then a more specific physical attribute (with marriage band), and finally the functional role of kissing. "With marriage band" was used as a subject's explanation of the sign HUSBAND to his communication partner. In the next older subject, the sign KISS-MARRIED was used whenever the subject saw a picture of either the researcher, her husband, or the two together. For that same subject, when the spoken form 'wife' was learned, it meant the same as and was confused with 'married', but also began to mean 'wife' when the further restricting feature "female" appeared in references to the stepmother in the storybook "Hansel and Gretel." This process of feature accretion is best explained by

E. Clark in her comments on the process in hearing children:

The child therefore begins by using a single general feature, such as shape or contour, and considers that to be the meaning of some term. As he becomes compelled to differentiate more meanings, he can no longer use a single perceptual feature: He must begin to use more than one and eventually will encode the information from a bundle or combination of features (whose relations to each other are structured) and use this in attaching meaning to lexical items. (1973: 104)

Acquiring negation (Signed English expression). Semantic features of "rejection," "denial," and "nonexistence" characterized the early negative utterances of the subjects of this study as Table 4.2 (at Levels 1 and 2) shows. After these initial expressions with signs that represented single features of meaning, signs were used that coordinated more than one meaning component (Levels 3, 4, 5 in Table 4.2). Some of these signs coordinated the above meanings with features of temporality, ability, and degree, as shown. What seems to be happening is first expression of general features, and then more specific features are coordinated with them to convey more detailed meaning.

	"Rejection"	"Denial"	"Nonexistence"
Level 1	shakes palm (LV 6;4) I don't want to look at them.	negative nod (LV 6;4) That's not her. shakes index (LV 6;4) This is not Luis NOT (LV 7;5) That's not my sister.	NOTHING (LV 7;5) I wasn't afraid.
Level 2	DON'T-LIKE (FL 8;3) She didn't like the soup. NO (FL 9;0) Don't come out.	DON'T-KNOW (LV 7;5) I don't know. NO (FL 8;3) My father doesn't sit there.	NO (FL 8;3) There are no boys.
Level 3	DON'T-WANT (DR 9;6) I didn't want to have the picture taken. neg. facial expression/nod LIKE (DR 9;6) I don't like her.	CAN'T (DR 9;6) He didn't see it. NO MORE + "before--not now" (FL 9;0) I don't wear glasses anymore.	
Level 4		CAN'T + "ability" (DR 10;3) They can't see the house. NEVER + "thus far" (MS 11;9) My car was never crashed.	
Level 5	NO + "ability" (SL 14;0) You can't have food. DON'T (SL 14;9) Don't take cookies from the house.	neg. nod + "thus far" (TW 16;1) SEE I haven't seen Virginia. NOT GAS NOTHING + "degree" (TW 16;1) She didn't have any gas. NOT-YET + "thus far" (TW 16;1) You haven't seen her yet? DON'T (TW 16;7) They don't remember.	

Table 4.2. Levels of feature acquisition: Negation.

a Examples straddling categories show that an utterance incorporated features of both categories.

One other aspect of negation was using the same forms to express one feature of meaning at earlier stages and other features plus that at later stages; e.g. NO at Level 2 expressed rejection: 'Don't come out;' while at Level 5 it expressed "rejection" plus "ability:" 'You can't have food.' The accretion process was not restricted to the appearance of new forms but was evident in the way the subjects used what they already knew to express new meanings they were acquiring.

Time expressions. Level 1 and 2 time-related events were marked by global, unrestricted terms referring to past time. At Level 3, time expression expanded to include reference to present and future events, but temporal references were still broad and nonspecific; except that the sign TODAY was used to mean 'on that day,' an exact time reference.

The subjects began to talk more specifically about time at Level 4, as evident in their use of specific names for seasons, months, years, and hours. It was significant to see this specific temporal information here, before the general labels MONTH and YEAR appeared at Level 5. Semantic development has been characterized thus far as from general to specific features, but here with time reference it is in the reverse direction. However, even though the more general terms appeared at the later stage, the actual utterances made references quite specific (e.g. LAST YEAR, LAST MONTH, and LAST YEAR THREE). Feature development is seen thus as one facilitating factor in the coordination of more complex constructions.

From the data in Table 4.3 it is possible to see another aspect of acquiring temporal reference: the

features may be, YESTERDAY (past time, order, little bit of time), and TOMORROW (future time, order, little bit of time). The appearance of these signs only at Level 5 seems to imply that the features (expressed earlier in other forms) were somehow prerequisite to use of the signs.

	Subjects' Sign	Possible Perceived Features	Subject and Age at Which Feature First Appeared
Level 1	FINISH	"completed event"	LV 7;5
	TOUCH	"past event"	LV 7;5
Level 2	BEFORE	"past time"	LV 8;2
	KNOW-REMEMBER	"past time"	LV 8;2
Level 3	NOW	"present time"	DR 9;6
	TODAY (on that day)	"specific point in past time"	FL 9;0
	WAIT	"future event about to happen"	FL 9;0
	FUTURE	"future time"	DR 9;6
	NO-MORE	"before--not now"	FL 9;0
Level 4	LATER	"future event restricted in time"	DR 9;6
	SUMMER, JUNE, NIGHT 1963, CHRISTMAS, TIME 8:30	"specific points in past, present, and future time"	DR 9;6
	FIRST	"order"	MS 10;10
	FINISH	"order"	SL 13;7
	SOON	"little bit of time"	SL 14;9
	NEVER	"thus far"	MS 11;9

Table 4.3. Levels of feature acquisition: Time expressions.

	Subjects' Sign	Possible Perceived Features	Subject Age at Which Fea First App
Level 5	SECOND, THIRD, LAST	"order"/"next"	TW 16;
	YESTERDAY	"past time"/"order"/ "little bit of time"	SL 14;
	TOMORROW MORNING	"future time"/"order"/ "little bit of time"	MS 11;
	LAST YEAR	"order"/"temporal category--year"	TW 15;
	LAST YEAR THREE	"order"/"temporal category--year"/ "number"	TW 16;
	LAST MONTH	"order"/"temporal category--month"	TW 16;
	NOT-YET	"denial"/"thus far"	TW 16;

Table 4.3 (cont'd). Levels of feature acquisition:
Time expressions.

Wh- question acquisition. Acquisition of forms for asking wh- questions was for the most part a twofold process: broad general forms and features first (WHAT for 'who' and 'what-for' and WHO for 'what'). These mismatches between form and usual meaning often predicted the next wh- form to emerge, and as a result the pattern of development as seen in Table 4.4 was rather systematic in nature. The general progress from general identification to location, reason, or purpose, to person identification and manner and finally to choice, option or extent would support the claim that the process was one of increasing differentiation and specification.

Wh-Question Sign	Level 1	Level 2	Level 3	Level 4	Level 5
WHAT		"general identification" (What did I spell?) (LV 8;2)	"person identification" (Who is this?) (FL 9;0)		
WHERE			"location" (Where's Gretel?) (FL 9;0)	"location"/ "choice" or "option" (Which chair should she sit on?) (SL 14;0)	
WHAT-FOR			"general identification" (What's this?) (DR 10;3) "reason" or "purpose" (Why not?) (FL 9;0)		
WHO			"general identification" (What do you want?) (MS 10;10)	"person identification" (Who's this?) (MS 11;9)	
HOW				"manner" (He's learning how.) (MS 11;9)	"extent" (He wanted to know how long it was.) (TW 16;7)
WHICH					"choice" or "option" (Which shall I talk about first?) (TW 16;7)
WHY					"reason" or "purpose" (Why did you hit me?) (TW 16;1)

Table 4.4. Levels of feature acquisition: Wh-
questions.

Descriptive terms. There is evidence that unmarked, positive members of antonym pairs (long, in long vs. short) are acquired earlier and used more frequently than the marked, negative (absence of an attribute), members (H. Clark 1970: 274). As Table 4.5 shows, the subjects here expressed initially (Levels 2 and 3) only the extended dimension of several objects and attributes. At Level 3, however, the first use of marked members of antonym pairs appeared (LITTLE, LITTLE-BIT), signifying that they were beginning to learn the negative features or absence of attribute features after having learned the positive features earlier.

At Level 4 the form TALL (with more features) began substituting for the sign BIG in references to height. The use of this more restrictive form indicated that an additional feature was narrowing down the domain identified at Level 2.

Other adjectives at Level 5 were used contrastively to differentiate people and objects; e.g. the signs OTHER, ONLY, and ALMOST. And finally at this same level the only comparative form evident in the data appeared (BETTER). H. Clark, again speaking of hearing children, points out that, "It takes only one proposition to assert that a board has length..." but "three propositions to form a comparative..." (1970: 275).

Acquisition of (Signed English) prepositions and conjunctions. The use of locative prepositions progressed from simple relations, IN and OUT (outside), to relative locations (UNDER, AROUND, NEAR), to source and target reference points (FROM and TO). Over time the subjects of this investigation were learning to lexicalize the spatial relations of their referents in

	Subjects' Sign	Possible Perceived Features	Subject and Age at Which Feature First Appeared
Level 1	MANY	"positive number dimension"	LV 7;5
Level 2	BIG	"positive general object size dimension"	LV 8;2
	BIG ^a	"positive general height dimension"	LV 8;2
	FAT	"positive body size dimension"	LV 8;2
	FAR	"positive distance dimension"	LV 8;2
	FAST	"positive speed dimension"	LV 8;2
	MANY	"positive degree dimension"	FL 8;3
Level 3	LONG	"positive linear dimension"	DR 9;0
	STRONG	"positive strength dimension"	DR 10;3
	HEAVY	"positive weight dimension"	DR 10;3
	HARD	"positive firmness dimension"	DR 10;3
	LITTLE	"negative object size dimension"	DR 10;3
	LITTLE-BIT	"negative degree dimension"	DR 10;3
	SMALL	"negative object size dimension"	MS 10;1
	SMALL ^a	"negative height dimension"	DR 10;3
Level 4	SHORT (tiny)	"negative object size dimension"	MS 11;9
	TALL	"positive vertical dimension"	MS 11;9
Level 5	OTHER	"contrastive person"	SL 14;0
	ONLY	"contrastive person"	SL 14;0
	ALMOST	"contrastive description"	SL 14;0
	NEAR	"negative distance dimension"	SL 14;9
	THIN	"negative body size dimension"	TW 16;1
	BETTER	"more favorable than something else"	TW 16;7

^aThere are two sign forms for the meaning of big and, likewise, two sign forms for the meaning of small depending on if the reference is to object size or height.

Table 4.5. Levels of feature acquisition: Descriptive terms.

Preposition Development				Conjunction Development		
	Subjects' Sign	Possible Perceived Features	Subject and Age at Which Feature First Appeared	Subjects' Sign	Possible Perceived Features	Subject and Age at Which Feature First Appeared
Level 1:						
Level 2	IN	"containment"	LV 8;2			
	OUT	"non-containment"	LV 8;2			
Level 3	WITH	"one person in accompaniment with another"	DR 9;6			
	UNDER	"one object beneath another"	DR 10;3			
Level 4	AROUND	"one object encircles another"	SL 14;0	AND	"additional element or idea"	DR 10;3
	FOR	"one person receives something from another"	MS 11;9	THEN	"order"	MS 10;10
Level 5	NEAR	"one object close in location to another"	SL 14;9	OR	"choice" or "option"	SL 14;9
	FROM	"beginning reference point"	TW 16;1			
	TO	"ending reference point"	TW 16;7			
	FOR	"reason" or "purpose"	TW 16;7			

Table 4.6. Levels of feature acquisition: Prepositions
& Conjunctions.

order from simple to relative notions. Other prepositions described relations between people: WITH (Level 3), and FOR (Level 4; see Table 4.6).

The developing use of conjunctions progressed from the joining or addition of lexical elements and ideas or propositions (with AND) to the ordering of these ideas (THEN), and finally to contrasting them (OR).

Summary: levels of semantic feature development. This section has hypothesized stages of semantic feature acquisition in six lexical categories:

1. The acquisition of kinship terms supports the notion that "semantic knowledge is closely related to the human organism's interpretation of perceptual inputs" (E. Clark 1973: 76).

2. Subjects in this study coordinated new features with their previously expressed old features (especially in expressions of time and negation) so that groups of features more restrictive and more specific replaced earlier single features; or, as E. Clark puts it:

To begin with only single features are interpreted and put down as the meaning for a word, but later on, configurations of perceptual features are used as a structured whole to code (some of) the word's meaning. (1973: 103).

3. The acquisition of members of unmarked and marked antonym pairs of the subjects in this study also accords with E. Clark's finding that perception is asymmetrical; e.g. "things in front are visible, those behind are not" (1973: 105f).

If these perceptual correlates do offer possible

explanations for the progression of semantic feature development, it is not surprising that young hearing children and the young deaf children in this study acquire meanings in similar ways and stages. Because of these similarities it is possible that the semantic features described above are the underlying basic components of the mental structures all children bring to the task of learning to mean. The order of development of the features, as specified, could be the progression in which children in general actively perceive, and cognitively operate on, the objects and relations in their environment.

5. CONCLUSION

The grammatical processes found in the utterances of subjects in this study were not part of the adult linguistic model to which they were exposed. These are processes that enable signers to express their intentions both sequentially and simultaneously with completeness and efficiency. Sequential utterances were composed of lexical signs in time order and showed basic sign sentence forms as well as chunking and fronting processes. Simultaneous expressions functioned to use space and time economically by layering meaning onto signs (cf. Liddell 1978) and incorporating in signs additional performative elements that increased the information. Simultaneous processes were negative nods, head movement and facial expression, eye gaze, use of left as well as right hands, body movement, classifiers, phonological and mimetic blends, and directional signs.

Two general characteristics of this naturally developing language were the cumulative nature of

sentence formation and the flexible ordering of signs within constituent groups. The cumulative effect was evident in the subjects' tendency to begin sentences with signs that established background information. Signs following would add to this background, filling in whatever additional information was needed. Consequently preference was given to initial use of time, place, or topic indicators. Body movement, eye gaze, and indexing were used at the outset of sentences to set up locations for referents in space. These locations then allowed additional description to be filled in and comments to be made and adjusted to the appropriate referent. The fronting strategy also allowed initial specification and later description or comment. The process here called chunking in which two or three simple sign sentences (chunks) accumulated to form a synthesized utterance also contributed to the cumulative nature of the language development of these subjects.

Flexibility of order was the other general characteristic of their language. Time and place indicators were fluid structures that occupied either initial or final sentence position; and subject-predicate order sometimes shifted to predicate-subject order. The significant finding, however, was that there was order within this flexibility; although order was free within constituent groups, hierarchical relationships were preserved. As a result, sign order was not fully free. No one specific sign order, as in English, was the defining feature of the subjects' language, but ordering strategies did exist.

The sequential and simultaneous ways of expressing intentions and the cumulative and flexible nature of

utterance formulation are the processes that best characterize the subjects' language. As has been noted at several points, these are also processes that characterize the grammatical structure of ASL, and because of this (and although none of their parents or teachers used ASL with the subjects), these are referred to as ASL grammatical processes.

Five levels of development were hypothesized and found for the acquisition of these ASL grammatical processes. By the end of Level 2 the subjects displayed knowledge of most basic sentence forms, simultaneous processes, fronting, and some grammatical uses of repetition. At Level 3 subjects showed a significant change in the use of space; e.g. distal pointing and eye gaze were used to index communication between the signer and others, and right and left hands began to express two different signs simultaneously. At Level 4 locations were set up in space as in adult ASL; and at Level 5 space was used in increasingly complex ways, with classifiers, indexing, and rhetorical as well as grammatical use of body movement.

It was notable that the Level 4 and 5 processes decreased the need for total dependence on context; thus, as the subjects became more linguistically mature, they developed ways of establishing what they were referring to by making efficient use of the dimensions auditory languages do not have -- the dimensions of space. The use of space in the later levels observed here agrees with the finding of Ellenberger and Steyaert (1978: 268f) that what appears to be simple gesturing may actually require a "fairly advanced mastery of cognitive skills involving spatial relationships." The more advanced ASL grammatical processes used by the

older subjects in this study to express linguistic information simultaneously reveals the growing ability to think through intentions, in order to express a logical progression of related events. Other linguistic growth was shown in the way that utterances increased in length and complexity with coordination and expansion of processes already used in single and simple utterances; thus the acquisition of ASL grammatical processes was both an orderly and a systematic process.

When the subjects' utterances were sequentially produced, they were representative of English word order and the Signed English system to which they were exposed in school. The structure of these utterances, however, were more like Pidgin Sign English than like the Signed English system their teachers were using. Again five levels of development were hypothesized and found for acquisition of these Signed English structures.

By Level 2, most basic semantic/grammatical relations were expressed in English sign order. Later occurring relations -- preposition-object, appositive, genitive, and disjunction -- appeared at Levels 3 and 4; and these were followed by dative and indirect object relations at Level 5. Signed English signs for grammatical morphemes emerged at Levels 4 and 5, but it was difficult to find an order of progression because most of them appeared only at Level 5. There was some evidence to indicate that the path of development followed the order of the acquisition of these morphemes (i.e. their spoken expression) in hearing children. Hierarchical structuring of predicate constituent groups began at Level 4. These continued to incorporate additional relations via an orderly process of coordination and expansion through Level 5.

Finally, what was the nature of the subjects' developing semantic system? What kind of meanings did they give to the signs they used and how did these meanings develop over time? The subjects chose labels for their referents that were both too general as well as too specific for the meanings they intended in Kinship, Wh- question, and Negation categories. Much like other first-language learners, they assigned labels for their intended meanings according to perceived features of their referents that were appropriate but not restrictive enough to label them properly. Conversely, they also used signs that were too specific for their intended meanings. In these cases, although they had learned new forms, they were still in the process of acquiring the more specific features that differentiated these new forms from the more general meanings they had intended to convey.

The development of sign meanings was shown by the order of acquisition of semantic features of signs within six lexical categories and was found to be like the general process of perception, in which single broad features of meaning are singled out and labeled (with new or formerly used signs) before more specific, more defining features are added to form "configurations" of meaning features.

The order of acquisition of semantic features also followed the order noted for hearing children; it progressed from noting the presence of an attribute to later noting its absence, from noting absolute spatial relations (IN) to expressing relational locations (UNDER), then to observing beginning and ending reference points (FROM, TO). It progressed from joining of lexical elements (with AND) to joining structures,

ordering ideas (THEN), and noting contrast (OR). Because this progression of feature development resembles aspects of the development of perception, it seems likely that the subjects' active perception of their experiences may be responsible for the order of semantic development observed in their language.

Implications. When the levels of development of ASL grammatical processes and of acquisition of Signed English structures are compared, the following differences are seen:

1. At Level 1 in both, more relations were expressed with ASL processes than with structures representative of Signed English; e.g. action-location could be expressed simultaneously (and not in English order) by blending, and attribution by object fronting. Use of left and right hands allowed two people to be referred to at the same time, and subtleties of expression like focus and stress could be conveyed at this level by repetition of signs.

2. The greater opportunity for expression in ASL processes increased at Level 2; frame of reference indicators and additional ways of simultaneous expression allowed subjects to express more of their intentions than did the rigidly ordered, sequential processes required by English. Additional processes at this level were left and right hands to express plurality, classifier use, verb directionality, and repetition to express degree.

3. Hierarchically grouped predicates expressed though the use of the ASL process of fronting appeared at an earlier level (Level 3) than their equivalents in Signed English (Level 4).

4. The increased use at Level 3 of the ASL processes that convey information simultaneously and their subsequent coordination at Levels 4 and 5 provided the subjects with the means to express their complex thoughts. At Level 3, for example, they could use body movement to indicate a change in subject, and use eye gaze to index communication. At Levels 4 and 5, by coordinating these processes, the subjects could describe entire events that included conversation between several people. With these processes as strategies, ASL grammatical processes showed a linguistic advantage over Signed English that was even more pronounced at the later levels of development.

Despite these differences, there were similarities:

a. Most basic semantic relations were expressed using either ASL processes or English sign order by the end of Level 2 development.

b. At Levels 4 and 5 there were increases in coordination and expansion of relations in both languages. When constituent groups expanded, they expanded both in ASL and in English sign order. This suggests that perhaps at a certain level of development the subjects of this study became in a limited sense bilingual; i.e. linguistically more mature in two languages.

c. In both languages longer, more complex utterances were composed of simpler structures previously mastered.

d. Also in both, more information was conveyed at each level, lessening to some degree the need to depend on context for interpretation.

This study has revealed that the subjects across a ten year age range have acquired greater facility in the

use of ASL grammatical processes than in those of Signed English and that ASL processes appear earlier than do their Signed English equivalents -- even though all signing to the subjects is in Signed English and not ASL. There were similarities, however, in the direction of development in both languages. Certain basic principles of language development were evident in both, and because these principles guided the development of both ASL grammatical processes and Signed English structures and were not unlike the principles that guide hearing children acquiring language, it is likely that they are aspects of the human capacity for language acquisition in general -- irrespective of modality difference. Because the subjects in this study had no exposure to adult ASL grammatical processes, and only limited exposure to Signed English, it seems possible that these similar developmental principles are part of "a genetically determined human language facility" (Trotter 1975: 33) that oversees the general design of language development while allowing leeway for both particular structural forms and for variation in exposure to linguistic models.

Quite clearly, however, the subjects of this study were more linguistically competent in a language for which they had no adult model. That the subjects created systematic ways to convey their complex intentions, for the most part independent of the system to which they were exposed, adds strong support to the notion that first language learning is an inside-to-outside, sense-making process, and one perhaps more child directed than has previously been thought.

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