A COGNITIVE/FUNCTIONAL PERSPECTIVE ON THE ACQUISITION OF "CLASSIFIERS"

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> *One of the most notable aspects of the grammar of ASL is the productivity of multimorphemic classifier predicates.*
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> -Brenda Schick (1990, p. 358)

> *Sign language makes use of dimensions of the spatial mode, which spoken languages lack, in creating visible shapes moving in space which reveal their mimetic origins yet are systematically and formationally constrained.*
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> -Edward Klima & Ursula Bellugi (1979, p. 66)

Our research deals with the acquisition of two sign languages, American Sign Language (ASL) and Sign Language of the Netherlands (SLN).[1] We have preschool-age data on the initial acquisition of each language by deaf children with either Deaf or hearing parents, along with data on the child-directed signing of the parents, as well as school-age data on ASL. The data include videotapes of naturalistic interaction in homes and preschools, and a variety of structured tasks in homes and schools. The first challenge we faced, in 1998, was to devise a transcription system that would capture the full array of simultaneous and successive meaning components in sign languages—that is, a representation of signed utterances that is neither phonological nor based primarily on spoken-language glosses. The result was the Berkeley Transcription System (BTS),

now available for application and evaluation across sign languages.[2]   Work on BTS led us to reexamine linguistic analyses of sign languages, calling into question the generally-accepted use of the term "classifier." In the process of transcribing child and adult utterances, we have also repeatedly faced the issue of the gesture-to-sign continuum and the linguistic status of a range of nonmanual components (face, body, posture, etc.).

We describe our approach as cognitive and functional, in that we are concerned with the learner's mental processes of analyzing (1) events and (2) signed utterances into components, with the aim of producing and comprehending utterances in communicative contexts. Our transcription system led us to reconsider the role of iconicity in ASL and SLN, bringing us to the new approach to classifiers presented here. To be sure, handshapes and movement paths are conventionalized and schematized in natural sign languages, yet early learners can make use of elements of natural gesture as a "bootstrap" device in entering the formal systems of the language. Research on both deaf and hearing toddlers has made it clear that there is no basic problem in using handshape and movement to make reference to similar objects and events across situations; and the same is true of hearing adult learners. However, although the entry into a sign language is easily accessible, mastery requires coordinations on many levels. The sorts of handshapes that have come to be called "classifiers" enter into combination with a number of simultaneous elements, using a range of motions, articulators (hands, arms, face, body), postures, and temporal variables. Furthermore, in representing events in a signed language, the signer has options of perspective and viewpoint which provide for multiple means of encoding the same event participants. "Classifier" handshapes are embedded in predicates and nouns, and serve to index or identify discourse elements on the basis of various physical criteria. Thus their function is not so much to *classify* as to *identify* or *designate*.

Our developmental focus, therefore, is on emerging abilities to flexibly manipulate such handshapes as parts of utterances that express particular meanings and viewpoints in ongoing discourse. We suggest that after an early phase of fairly successful mastery—for both deaf preschoolers and their hearing parents—there is a prolonged phase of learning to use the language as a flexible discourse tool. Problems are posed on several fronts: coordinating the use of two hands, choosing handshapes that allow for maintaining reference while shifting topic and/or focus—in short, constructing coherent and cohesive discourse. The "classifier" system is a central part of this complex task.

We begin with a discussion of combinatorial constructions in signed languages, in which classifiers are components of larger constructions. This will lay the groundwork for presentation of data on acquisition of such constructions.

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[2] BTS can be accessed as part of CHILDES (Child Language Data Exchange System), where it is presented as Chapter 11 of *The CHAT Transcription System Manual*.   CHILDES can be accessed on three URLs:

- in North America (organized by Brian MacWhinney at Carnegie Mellon University, Pittsburgh, PA): http://childes.psy.cmu.edu/pdf/chat.pdf
- in Europe (organized by Steven Gillis in Antwerp, Belgium): http://atila-www.uia.ac.be/childes/chat/CHAT.pdf
- in Japan (organized by Hidetosi Sirai in Chukyo): http://jchat.sccs.chukyo-u.ac.jp/CHILDES/pdf/CHAT.pdf

 The *Manual* has been published both as a book and a CD-ROM (MacWhinney, 2000). Updated versions and ongoing discussions of BTS transcription can be found on a website established by Brenda Schick: www.colorado.edu/slhs/btsweb. The rationale for BTS can be found in an article in *Sign Language & Linguistics* (Slobin et al., 2001).

1. Polycomponential analysis

The relevant part of BTS for present purposes is its treatment of what have traditionally been called "classifiers." In BTS, signs that incorporate "classifiers" are treated like other complex signs, which we refer to as *polycomponential signs*. Like Elisabeth Engberg-Pedersen (1993), Adam Schembri (this volume), and others, we seek to represent the range of meaning components, both manual and nonmanual, that co-occur in complex signs. Our motivation is to devise a systematic approach toward citing each meaning component in complex signs. We have chosen to use *poly**componential***, rather than Engberg-Pedersen's *poly**morphemic***, because we are not ready to determine the linguistic status of each of the components, manual and nonmanual, in complex signs. And we have replaced Engberg-Pedersen's *verbs* and Schembri's *predicates*, with **signs,** because the handshape expressions under study are used in verbal, adjectival, and nominal constructions.

While various categories of polycomponential signs can be proposed, our work has focused on alternative conceptualizations of "classifiers." Rather than emphasize classification as the central feature of "classifier" handshapes in polycomponential signs, it seems more useful to treat them as marking a relevant property of a referent. The major function of such a handshape is to evoke a relevant referent in discourse, indexing a particular referent according to properties that are appropriate for the current discourse. That is, the "classifier" handshape designates, or specifies, or indicates a referent with a particular property (e.g., two-legged, horizontal plane, etc.). In the Berkeley Transcription System such handshapes are designated as **property markers (pm).** However, in the text of this paper we will continue to refer to them using the traditional classifier term, in quotation marks. The focus of this paper is on the acquisition and use of verbs that contain property markers (with a few examples of nouns and adjectives).

Polycomponential verbs contrast with monomorphemic, or "plain" verbs. There are two types of polycomponential verbs: (1) those in which an unvarying handshape or handshape configuration follows a directed path through space ("agreement verbs" LOOK-AT in ASL and SLN), and (2) those in which both handshape and path direction can vary systematically and meaningfully ("classifier verbs," i.e., verbs of object transfer and movement, such as PUT, MOVE).[3] BTS does not distinguish between the path components of these two types. That is, all five verbs mentioned above can use the same set of path (source and goal) components. What is central to our analysis here is the elaboration of the handshape component. Specifically, an entity that is given or put, or that moves, can vary in size, shape, animacy, etc. (while the handshapes in verbs such as HELP and TELL do not vary.) Our focus in this paper is thus on the second type of polycomponential verb, in which the "classifier" handshape is a meaningful component.

The signs in question have both manual and nonmanual components, and both types are given equal status in BTS (although the developmental and psycholinguistic issues raised in this paper deal primarily with the manual components). We determine if an element of a complex sign is a **meaning component** on the basis of substitution tests, working with native signers as

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[3] For convenience, on the assumption that our readers are familiar with one or more sign languages, we will use upper-case glosses as a shorthand, though we eschew such notation in our own work with BTS. Our presentation of examples from the data will be discursive, using recognizable descriptions of handshapes and movements, along with BTS transcriptions.

experts.[4] For example, a variety of "classifiers" can be substituted in the same slot in the verb PUT in ASL and SLN, indicating the type of object that is being transferred, in addition to the default or lexical handshape that can be used when object characteristics are not at issue. Or the "two-legs" (inverted-V) component can assume a variety of postures and orientations, indicating that posture and orientation are meaning components. (See BTS for details.)

Because handshapes always occur simultaneously with movement/location, we think it is unproductive to argue whether one or another component is the "root" or "stem"; rather, we treat polycomponential signs as bearing similarities to "bipartite verbs" in spoken languages. For example, de Lancey (1999) describes such structures in the Hokan and Penutian languages of northern California and Oregon, where there are systematic sets of verbs in which both parts are necessary components, and neither is a whole lexical item on its own. For example, one element of a bipartite verb can refer to the shape of a theme argument, while the other element provides locative/directional information. Thus there are verbs with meanings such as 'rock_like_object—put_down', 'pole_like_object—move_up', and 'few_four_legged_animals —run_downhill". Verbs in signed languages go beyond bipartite structures. A fully elaborated polycomponential sign can include one or more "classifiers," in particular orientation(s) and location(s), with a particular internal movement pattern and path in signing space, aspectual modification, and nonmanual modulations indicating speech act, affect, and discourse status. For example, in BTS an ASL polycomponential verb meaning 'rapid mounted-riding comes to a halt' has the seven manual components listed below. (We have included BTS notation for those readers interested in pursuing the system further.)

- property marker: VERTICAL PLANE [ground entity] (`pm'PL_VL`)
- property marker: TWO-LEGS [figure] (`pm'TL`)
- location: TOP (`loc'PL_VL_TOP`)
- posture: STRADDLE (`pst'STR`)
- movement: FORWARD ROTATION (`mvt'LEX(ride)`)
- modification: RAPID (`mod'RAP`)
- aspect: CESSIVE (`asp'CES`)

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(ride_mounted)-pm'PL_VL-pm'TL-loc'PL_VL_TOP-pst'STR-mvt'LEX(ride)-mod'RAP-
asp'CES
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This example does not include simultaneous nonmanual components—which are applicable to all signs and sign sequences. Nonmanual components indicate such factors as negation, surprise, intensity, and so forth. The two "classifiers" are only ***part*** of the total sign; they are not meaningful without the components of location, posture, and movement. Clearly, verbs in signed languages—in comparison with bipartite verbs in spoken languages—tend to be composed of more than two elements that cannot stand alone as complete lexical items. Furthermore, each of the components can be substituted by others. For example, the figure could be a small animal, the posture could be on top of the ground entity rather than straddling, the ground entity could be flat and horizontal, and so forth. Furthermore, other verbs can be derived by adding and removing components. For example, removing movement, modification, and aspect results in a static predicate of location ('be mounted, straddle'); adding a path for the figure as it moves away from the ground results in a dynamic verb ('dismount').

Our goal in this paper is to explore the range of productive combinations in polycomponential verbs incorporating "classifier" handshapes as they develop in children and in adult second-language learners (hearing parents), and to begin to identify the discourse functions of such signs. We do not begin, in top-down fashion, with a fixed linguistic description of ASL or SLN. Rather, our analysis emerges in the process of attempting to transcribe signed utterances at a level of granularity that reveals their meaning components. BTS embodies our decisions about the componentiality of signs. Only after detailed comparison of learners' signs, using this form of analysis, will it eventually be possible to determine the extent to which the postulated components are productively used by signers. Nevertheless, the preliminary data sample presented here indicates quite clearly that novice signers—2-year-olds and hearing parents with as little as one year or less of signing experience—are able to productively combine meaning components of complex signs, using conventional ASL or SLN components, as well as ad hoc gestures and physical objects in some instances. "Classifier" handshapes are used to represent entities according to their size and shape and means of handling, as well as by less iconic, conventionalized handshapes ("class" or "semantic classifiers").

2. Previous studies of classifier acquisition

We have found only three studies of classifier acquisition in the literature; all of them deal with ASL, in deaf children of Deaf parents, and use elicitation tasks (Kantor, 1980: nine children aged 3;0–7;0; Schick, 1990: 24 children aged 4;5–9;0; Supalla, 1982: three children aged 3;6–5;11). (Our sample is quite different: 35 children of both Deaf and hearing parents, beginning at age 1;3.) These studies indicate—not surprisingly—that the full system of polycomponential signs is not mastered until late childhood. The youngest children who have been tested refer to moving or static figures by a referentially appropriate handshape, though sometimes failing to specify all relevant dimensions (e.g., appropriately indicating shape but not width), and sometimes using an incorrect form (e.g., using the 5-handshape for a person or car). Kantor reported that children as young as 3;0 "always matched classifier type to its object domain semantically" (1980, p. 201). That is, referent designation or specification does not seem to be a problem for learners. Supalla (1982) presented animated films in which a figure moves with respect to a ground. Using such stimuli to elicit descriptions, the three children tested by Supalla provided a correct classifier for the moving figure 84%-95% of the time, although—in his terms—sometimes a "general classifier" was substituted for a "specific classifier" (e.g., B-handshape for vehicles). However, children often omitted a secondary classifier for the ground entity. Schick found some classifier types to be used less accurately than others, but even the youngest children (4;5) used all of the types tested. These limited data indicate that by age 3;0 children designate the type of moving or located figure by the differential use of semantic handshapes. However, it will take them many more years to integrate the use of two hands, in relation to each other and moving through space with simultaneous facial and postural markers, incorporated into the flow of discourse.

Newport and Meier (1985) come to conclusions that are strikingly different from those suggested by our studies (reported below). Because children apparently have difficulty in integrating figure and ground classifiers, and in simultaneously indicating components of path and manner, Newport and Meier propose that "the relatively late acquisition of morphology in ASL may be due to its simultaneity" (1985, p. 911). What they seem to have in mind, however, is the morphology required for movement from source to goal, in particular the movements that are described as "agreement" (that is, relations between initiator and recipient of literal or metaphorical object transfer) and the movements that require superimposition of several path elements (e.g., ARC + UPWARD). The simultaneous marking of type of moving figure and

simple path seems to pose no problem for the youngest children tested in the studies described above (nor for the even younger children that we report on—and most of them with hearing parents). What is apparently more difficult is the representation of paths that have several meaningful components (e.g., both source and goal, or complex directions), as well as controlling the hands separately to indicate relations between figure and ground.

Newport and Meier also propose that the classifier system is a relatively late acquisition because the cognitive ability to classify is a relatively late cognitive development for children in general (1985, p. 915):

> Acquisition of the classifier system thus requires that the child have the ability to categorize objects into semantic or size/shape classes: human, animate nonhuman, plant, vehicle, and the like, or straight, round, large, small, and the like. It may in part be for this reason that the acquisition of classifiers in ASL does not begin until approximately age 3 and continues until perhaps age 8.

The abilities in question almost certainly develop earlier than Newport and Meier propose, as supported by a wide range of studies of infant and toddler cognition over the past two decades or so. But, in any event, their proposal assumes that the referential use of a handshape requires an act of classification (suggested by the misleading term, "classifier"). ***But all that is required is that the child indicate some property of the referent when choosing a handshape that takes the role of the referent.*** This is no different than, for example, the use of the pronouns *he*, *she*, and *it* by English-speaking preschoolers. That is, the child must recognize that mommy is female, that the ball is inanimate, and so forth. Even before the age of 2, children show evidence of recognizing distinguishing features of objects and responding to them differentially. And, as we will show, 2-year-olds make appropriate— and even creative—use of handshapes to differentially reference different types of entities. In so doing, they make "depictive" use of handshapes.

It is evident in the data of these early studies—and even more so in our own studies—that very young children use "classifier" handshapes that are, in varying ways, ***iconic***. As Mark Mandel argued almost a quarter-century ago: "An adequate account of American Sign Language must include the fact that the form various elements take in the language depends in part on the visual appearance of their referents" (1977, p. 57). His definition of iconicity is useful here: the "use of signs and other gestures perceived as bearing ***some*** visual relationship to their referents" (p. 58). We have added the emphasis on "some" because there seems to be a tendency in a portion of the sign language literature to make a simple opposition between mimetic depiction, on the one hand, and arbitrariness, on the other. However, a sign or handshape can be quite schematized and conventionalized, and still have some visual relationship to its referent. We have underlined this point in selecting the epigraph from Klima and Bellugi at the outset of this paper. As Penny Boyes-Braem (1981) laid out clearly in an early Berkeley dissertation on sign psycholinguistics, there is a necessary structural level in signed languages that is both iconic and constrained. Boyes-Braem built a detailed morphophonemic model of ASL handshapes, based on a "symbolic representation level." She discusses the generally arbitrary relationship between phonology and morphology in spoken languages, and draws a contrast with signed languages (pp. 41-43):

> In sign language, the relationship between the semantic components and the phonological forms is also arbitrary in that there are no semantic concepts which are universally and absolutely bonded with a particular manual form. Between the semantic and the phonological levels in sign language, there is also dual patterning and an ultimately arbitrary relationship.
> However, it seems necessary to postulate for sign language lexical structure an additional intermediary level which has no counterpart in most spoken languages. Whereas the

semantic elements of spoken language are usually related directly to patterns of morphological forms, in sign languages there seems to be an intervening 'symbolic representation' level.

At the postulated Symbolic Representation Level, the underlying semantic concept is matched up with a visual symbolic representation or kind of visual metaphor. The metaphor might be based, especially for verbs, on some portrayable aspect of the underlying semantic components—e.g. the underlying agent can be symbolized by a grasp handshape; an underlying change of location represented by the location and movement parameters; an especially noted manner by the manner of the movement parameter (e.g. fast, slow, bumpy, smooth, etc.).

Boyes-Braem goes on to clearly highlight **both** the representational and the arbitrary components of "visual metaphors" (pp. 43-44):

[W]hat all the metaphors have in common are (a) their representability on moving hands, and (b) their representability with only those handshapes and movements belonging to a restricted set of handshapes and movements used in that particular sign language.

Building systematically on these ideas, Boyes-Braem succeeds in identifying a set of 26 morphophonemic handshape features which she tests against all of the non-initialized signs in the *Dictionary of American Sign Language* (Stokoe et al., 1965). She succeeds in demonstrating systematic "visual metaphors" in a large portion of the ASL vocabulary.

Sarah Taub has recently expanded on this theme in a Berkeley cognitive linguistic dissertation on signed languages (2001, p. 67):

In brief, ASL's iconic devices draw on our perception of hands, arms and fingers as having overall shapes, locations and movement; our ability to "see" the path that a moving object traces out in space; our knowledge that the signer's body is a human body, in shape and function like other human bodies; our additional knowledge that animal bodies often resemble human bodies in shape and function; our ability to recognize the body movements that go along with particular activities; our perception that body gestures take place over time and in space; and our knowledge of the movements of signing itself.

We believe that these cognitions and symbolic capacities are available to 2-year-olds—deaf and hearing, with or without sign-language input. Yet the literature is full of claims that iconicity plays no role in the acquisition of sign languages. Newport and Meier take this position forcefully (1985):

In producing citation forms and omitting morphologically marked forms, the young signing child demonstrates a surprising disinterest in, or inability to take advantage of nonarbitrary relations between form and meaning (p. 907). … These studies, taken together and in combination with the other findings of relatively late acquisition of ASL morphology, demonstrate convincingly that the potential iconicity of ASL morphology does not assist in its acquisition (p. 908). … [I]conicity is virtually never a contributor to the acquisition process. … [I]t may be the case that the young child is cognitively unable to exploit the available iconicity, and that the iconicity of mapping between form and referent is accessible only to the older child or adult … (p. 916).

However, the iconicity that is at stake here seems to be that of movement patterns; there is no discussion of the iconicity of handshapes, which is central to the acquisition and creative use of

"classifiers." [5] Indeed, Supalla gives a relevant example in his thesis, though without mention of iconicity (1982, p. 111):

> For a film in which a wing moves on top of the fuselage of an airplane, Randy [age 5;11] starts with the thumb of the airplane classifier bent, and then unbends the thumb to indicate that the airplane now has a wing. This kind of manipulation with classifiers is not part of the productive morphological system of ASL… It is interesting, however, that this occurs in the oldest subject, suggesting that he is beginning to "play" with the morphological system (as adults sometimes do).

Clearly, this child sees the L-I-handshape for 'airplane' as having a 'wing'—that is, it is not a totally arbitrary sign to him.

In contrast to Newport, Meier, and Supalla, Schick (1990) notes that SASSs (size-and-shape-specifiers) are produced accurately by her child subjects "because the morphosyntactic nature of SASS predicates is consistent with the fact that they categorize according to physical characteristics" (p. 368), and "that handshape use, for the most part, nears adult behavior at an earlier age than the use of spatial morphemes" (p. 370).

It is the motivated, nonarbitrary use of handshapes—across situations—that seems to be most relevant to arguments about both the developmental and the linguistic status of "classifiers." As discussed below, both deaf and hearing children—from very early on—use handshapes and gestures to refer to entities on the basis of salient properties of the entity or the means of its manipulation. We now turn to our data, from children younger than 3, to suggest that iconic principles are available for productive and creative use of "classifiers" from early on.

3. Early uses of semantically-motivated handshapes in polycomponential signs

Deaf 2-year-olds, as well as their hearing, signing mothers, use handshapes meaningfully and productively as components of polycomponential signs. Our data are videotapes taken in children's homes in California and the Netherlands.[6] Here we report on Deaf families who use a natural sign language at home and families in which hearing parents have undertaken to learn sign language (ASL or SLN) and use it as the basic means of communication with their children. Thus we can observe two kinds of learners: children acquiring an L1 and adults acquiring an L2. Because the children are no older than 3;9, and generally no older than 3;0, the mothers have been learning the sign language for

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[5] Morford, Singleton, and Goldin-Meadow (1995) do attend to handshape classifiers; but they, too, conclude "that native signing children do not exploit the iconicity in signs to aid them in their mastery of the language" (p. 317). They used Supalla's films of motion events, and found that children made errors that either increased or decreased iconicity. However, both types of "errors" show reliance on iconicity (e.g., representing a bird in metonymic fashion, using the part of the BIRD sign that represents the beak; representing a round, lumpy frog with a C-handshape). They seem to restrict "iconicity" to a detailed mimetic depiction. Thus we do not agree with their conclusion that native ASL-signing children "do not [have] a strategy to produce handshapes that resemble their referents iconically" (p. 319).

[6] The ASL data were gathered by Reyna Lindert as part of her Ph.D. dissertation at the University of California, Berkeley. Deaf children between the ages of 2;1 and 3;8 participated in a spatial language comprehension task that included their mothers (three hearing, two non-native Deaf) and a native ASL-using Deaf assistant. The adults were asked to furnish the children with a description of a series of photographs depicting dolls and dollhouse furniture arranged in a variety of ways. Relying only on the adults' descriptions, the children were asked to use a set of dolls and dollhouse furniture to set up the toys to match what had been described to them. The ASL examples presented here are drawn from this task, as well as naturalistic activities (playing with toys, book reading, etc.). The SLN data were gathered by Nini Hoiting as part of the parental guidance program of the Royal Institute for the Deaf "H. D. Guyot," in Haren, Netherlands. Children were videotaped regularly, at home and in preschool (18–36 months), in naturalistic activities. Examples presented here are drawn from home videos. Full presentations of the data will appear in dissertations and papers.

two years or less—in some instances, as little as four months (SLN). We present the L1 and L2 data together here in order to demonstrate that similar processes are at work in both cases; that is, "early uses" refers to utterances produced early in the learning process. It is evident in our data that the fact that the mothers are acquiring a new language (and in a different modality than spoken language) in adulthood does not keep them from productive use of ASL or SLN morphology (as opposed to many claims in the literature that learners beyond a putative "critical period" do not analyze complex signs into their meaning components).

There is a plethora of terms for grouping "classifiers" into types. Schembri has provided a useful summary (this volume, p. xxx), and we will adopt his terminology simply for the purposes of organizing our presentation, without making theoretical claims for the ontological status of these types:

- *Handle* handshape unit ("instrument(al)," "handle," "manipulator"): model of the shape of the hand when manipulating an object, or of the shape of the object being manipulated (see examples below)
- *Entity* handshape unit ("semantic," "whole entity," "static SASS," "object")**:** conventional means of representing an object (e.g., 3-handshape for vehicle in ASL)
- *SASS* handshape unit ("size and shape specifier," "descriptive"):   model of relevant physical dimensions of an object

In addition, we subdivide the ***handle*** category on the basis of whether the handshape represents the hand that is manipulating an object—***manipulative handle***, or whether the handshape represents the object being manipulated—***depictive handle***. For example, in ASL the use of a screwdriver can be represented by a rotating S-handshape for the grasping hand (manipulative handle), or by a rotating H-handshape for the tip of the screwdriver (depictive handle). Although depictive handles and entity handshapes may use the same property marker (pm) components, they are distinguished in that handles imply agency.

For each of these three types we offer several examples demonstrating that the learner is using a handshape beyond a "frozen" form. That is, the handshape is used creatively to designate an object of a particular type, involved in the predication of an activity or state. The following abbreviations are used: HM = hearing mother, DH = deaf child of hearing parents, DD = deaf child of Deaf parents. Age is indicated in the format *years;months*, designating the age of child (*C*) with regard to both the child's and the mother's utterances. For mothers' utterances, we also indicate, in the same format, the length of time that the mother (*M*) has been learning sign language. Utterances with only a *C* are signed by the child; those with both *C* and *M* are signed by the mother. The line labeled "Utterance" is a discursive description of the signing, including designations of handshapes using the ASL manual alphabet (see Appendix). This line is intended to enable readers to visualize the utterance. We also provide BTS transcriptions of each utterance, in order to demonstrate our use of the system. Note, again, that we are not claiming that the signer has active and productive control of each of the units in the transcription; productivity can only be ascertained from patterns attested in a large corpus of utterances from an individual signer. Rather, the componential analysis suggests the degree of complexity that is inherent in a sign and which may form the basis for analytic activity on the part of the learner.   (BTS transcriptions are presented in a different font, so that the reader can easily focus on them, or ignore them. We have tried to make the examples clear on the "Utterance" line, without reference to BTS conventions.)[7]

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[7] In normal BTS format, various dependent tiers, following the transcription line, provide information about phonology, context, interpretive comments, etc. Such tiers are generally not presented here; however, the line labeled "Utterance" in our examples often provides such ancillary information.

3.1. Manipulative handle handshapes

These handshapes are perhaps the easiest to acquire because they represent the movement of the hand(s) in manipulating the object that is referred to (generally an incorporated patient of the verb). As Taub points out (2001, p.77): "The use of body and instrument classifiers is strongly motivated by the distinctiveness of body actions: sometimes it is easier to produce and recognize body movements associated with an object than an analogue of the object itself." Often such handshapes are literal gestures of an activity, and it is only the factor of conventionalization in the speech community that distinguishes sign from gesture. (We will return to this point in discussing the psycholinguistics of sign acquisition and the role of gesture for children who do not receive sign language input.) For example, a Dutch girl of 2;6 tells the researcher about a photograph of her father pushing her in a baby buggy:

(1) **MANIPULATIVE HANDLE [DH, SLN, C:2;6]**
Situation: Child seated on floor; describes photo in which she is seated in a baby buggy (pram) being pushed by her father.
Utterance: Extends 2 S-hands, palms down, arms straight, and moves arms forward.
Translation: '(He's) pushing.'
Transcription: `(push)-pm'HO_S(2h)-pth'F` .

The next example, from an American girl of 2;5, is similar. Note than in both (1) and (2) the sign is performed in space, without a ground object. That is, the buggy or the suitcase have to be imagined as located at the point of manipulation.

(2) **MANIPULATIVE HANDLE [DD, ASL, C:2;5]**
Situation: Mother asks child how she should open a suitcase (HOW OPEN HOW ?). Child responds by   demonstrating how to unzip the suitcase.
Utterance: Baby-O handshape moves from front of signer leftwards.
Translation: 'This is how to unzip it.'
Transcription: `(unzip)-pm'HO_BO-pth'S` .

Hearing mothers also use handle handshapes with ease, incorporating handshapes into gestured actions. This feature of signed languages allows novice signers to produce utterances that are meaningful and comprehensible (whether or not they correspond to conventional signs). Consider an utterance from the mother of the child in example (1). She had begun to learn SLN only eight months earlier, and produced an utterance that is appropriate in the language:

(3) **MANIPULATIVE HANDLE [HM, SLN, C:2;6, M:0;8]**
Situation: Child puts doll in toy cradle and kisses it goodnight. Mother tells child to close the curtains around the cradle.
Utterance: 2 S-hands move in closing arc towards mother's chest.
Translation: 'Close the curtains.'
Transcription: `(close)-pm'HO_S(2h)-pth'B_EO` .

3.2. Depictive handle handshapes

Depictive handles are more demanding than manipulative handles, in that they require the learner to choose an appropriate handshape for representing the salient dimensions of the object to be handled, rather than representing the manipulating hand itself. Nevertheless, they appear very early in our data. The range of appropriate and inappropriate uses reveals the learner's mastery of the conventional parameters of the language. Note that these parameters map out a lexical space that retains depictive or iconic features, in that the handshapes reflect general physical properties of the referent objects. Examples (4), (5), and (6) all deal with placement of a thin, flat object. While the first

two, representing placement on a flat surface, present no problems, the third example shows that the child has to learn when depth or thickness is a relevant parameter in the language. Note the precocity of (4): depictive handles appear to be available to DD children at a very early point in development.

(4)   **DEPICTIVE HANDLE [DD, ASL, C:1;10]**
     Situation: Deaf assistant tells child to put a book underneath a table where another book is already located. Child comments, putting her book on top of the other one.
     Utterance: Closed-5 on non-dominant hand, palm up. Closed-5 on dominant hand, palm down, makes contact with palm of non-dominant hand (instead of back of hand, as conventional).
     Translation: 'I'm putting the book on another book.'
     Transcription: `(put)-pm'PL_G(G)*-pm'PL_H(F)-gol'TOP_PL_G [*] .`
                            `%err: PL_G $hs = PL_H`

(5)   **DEPICTIVE HANDLE [DH, SLN, C:2;11]**
     Situation: Child comments to mother about putting flat rubber alphabet letter in the corresponding puzzle space.
     Utterance: Points to puzzle space then moves horizontal flat 5-hand (palm down) to the space.
     Translation: 'Put it here.'
     Transcription: `PNT_3(puzzle_space) (put)-pm'PL_H-gol'OBJ(puzzle_space) .`

The child can also mis-categorize an object from the point of view of conventions of the language. In the following example, the child treats a flat, round puzzle piece as a cylindrical object with depth, while an adult would treat it as essentially two-dimensional. Perhaps the task of inserting it into the puzzle highlighted its three-dimensional quality to the child; or perhaps this is a phonological error, reflecting lack of fine digit control.

(6)   **DEPICTIVE HANDLE [DD, ASL, C:2;6]**
     Situation: Child is commenting on what she has to do with a round puzzle piece in order to fit it in to its correct location on a puzzle board.
     Utterance: C-handshape (palm sideways) moves downwards to make contact with puzzle board.
     Transcription: 'I have to put the circle here.'
     Transcription: `(put)-pm'CYL*-gol'OBJ(puzzle) [*] .`
                      `%err: CYL $pm = FD`

There are instances in ASL and SLN in which a handshape functions as both a manipulator and a depictor. For example, the C-hand can represent both a hand that is manipulating a cylindrical object and the object itself. That is, in some cases the hands that depict physical characteristics of the object are also the hands that move the object from one location to another. In other instances, there are subtle differences between the handshape form for manipulation and depiction. For example, in SLN the B-hands that move a box-like object have extended thumbs, indicating that the object is being held, while flat B-hands are used—in the same facing-palm configuration—to depict a box-like object. It may well be that early learners do not clearly distinguish manipulation from depiction in such instances. Consider, for example, the following utterance of a girl of 2;6. She is relating an event in a photograph to the researcher, explaining that her father had to maneuver a large, heavy object through a doorway.

(7)   **MANIPULATIVE/DEPICTIVE HANDLE [DH, SLN, C:2;6]**
     Situation: Description of photograph of father carrying a large, heavy object and turning it through a narrow doorway.
     Utterance: 2 flat, lax, closed-5-hands, palms facing, arms outstretched; child turns to left, turning wrists and rotating right hand over left hand, keeping palms facing; straining face: squint, tight mouth
     Translation: '(Daddy) carried a big, heavy box and had to turn it to get it through the doorway.'
     Transcription: `(carry)-pm'BOX(2h)-mvt'PIV_L-^mod'EFFORT .`

The presence of nonmanual indications of effort and straining, accompanied by turning of the body, suggest that this utterance is heavily gestural, while yet bearing the seeds of grammatical form. That is, depiction may begin with a strong gestural component, and only later develop into more abstract and general forms.

3.3. Entity handshapes

Schick (1990), using a picture elicitation task with DD children aged 4;5–9:0, found that entity handshapes (her "CLASS") were the most likely classifier type to be correctly produced by the youngest children. The entity handshapes in her task were the V-handshape for a person and the 3-handshape for a vehicle. She attributes this finding to the fact that such handshapes do not undergo modifications for physical dimensions of size and shape. Entity handshapes also occur in our data, indicating that 2-year-olds can combine components of figure and path in a single sign (in contrast to Supalla's [1982] report that even 3-year-olds have difficulty in integrating such components). The following free-play utterance clearly demonstrates appropriate use of an entity handshape at 2;8. Note that the child is using the SLN "classifier" for 'airplane' to refer to a helicopter, indicating that he is treating the handshape as referring to a type of entity.

(8)   **ENTITY [DH, SLN, C:2;8]**
        Situation: Child describes descent of helicopter.
        Utterance: Y-hand moving in downward arc.
        Translation: 'Helicopter descends.'
        Transcription: (descend)-pm'AIRPLANE*-pth'DA [*] .
                            %err: pm'AIRPLANE $pm pm'PTH

The data contain examples of skillful use of entity handshapes in utterances that have several simultaneous or overlapping meaning components. The following examples are from two signers who are competent, one a younger DD child (2;9), and the other an older DH child (3;8). In the first example, the child is engaged in book-reading with her Deaf mother (she also has a Deaf father). She describes a picture of an ambulance with lights on top, modulating her 2-handed CAR into a 1-handed VEHICLE entity that serves as ground for the LIGHT indicated by the other hand.

(9)   **ENTITY [DD, SLN, C:2;9]**
        Situation: Child describes picture of ambulance with light on top.
        Utterance: Points to picture. Signs CAR with 2 hands, then changes left hand into flat plane, raises right hand to sign LIGHT, then lowers right hand, onto top of left hand. Points to picture.
        Translation: 'There's a car with a light on top. There.'
        Transcription: PNT_3(on_picture) CAR(2h) LAMP (located)-pm'VEH(G)-~
                LAMP-loc'TOP_VEH PNT_3(on_picture).[8]

The next example is interesting, in that Supalla (1982) found that simultaneous signing of path and manner posed difficulties to DD children in the task of providing descriptions of animated film clips. It may be that such combinations are easier in free play situations such as the following:

(10)   **ENTITY [DH, ASL, C:3;8]**
        Situation: Child pretends that lego tower is a bell-tower; He describes person entering tower to ring bell.
        Utterance: Inverted-V handshape with fingers wiggling, moves forward away from signer's body.
        Translation: 'The person walks forward.'
        Transcription: (walk)-pm'TL-pst'ERC-pth'F-mvt'WIG .

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[8] The vehicle-handshape in SLN is a closed-5. Note that here the closed-5 could be interpreted as either designating the vehicle or its top (or, most likely, both—without distinction).

There are numerous examples in our data demonstrating that learners—children and adults—often treat entity handshapes as having "depictive" or "iconic" characteristics, rather than simply being unanalyzed designations of objects of a particular type (as in Supalla's "airplane wing" example cited above). In the following example, a hearing mother gives evidence that she considers the V-handshape (=person) to have internal components:

(11)   **ENTITY [HM, ASL, C:3;9, M:2;7]**
         Situation: Mother instructs child to place doll on bed with legs extended outward (elicitation task).
         Utterance: V-handshape bent back at knuckles, placed on flat palm of other hand.
         Translation: 'Put the doll on the bed with her legs extended in front of her.'
         Transcription:`(sit)-pm'PL_G-pm'TL-pst'SIT(bent_waist)*-loc'TOP_PL_G [*] .`
                        `%err: pst'SIT(bent_waist) $hs = pst'SIT`

It is evident that this mother sees the V-handshape analytically: the two fingers are legs, the back of the hand is the torso, and the knuckles are the waist, which can be bent to indicate a figure whose body is bent at the waist. By contrast, a Deaf mother, using the same doll in an elicitation task with a child of about the same age, appropriately indicates the posture of the doll, placing the V-handshape according to the conventions of ASL, which, although arbitrary, still have some iconicity.

(12)   **ENTITY [DM, ASL, C:3;8]**
         Situation: Mother asks child to make doll sit with its legs straight out, in contrast to the previously produced handshape, indicating the doll kneeling.
         Utterance: Non-dominant hand is a closed-5 handshape (palm up); dominant hand is a V-handshape (palm contacts palm of non-dominant hand).
         Translation: 'Sit the doll with her legs extended in front of her.'
         Transcription: `(sit)-pm'PL_G-pm'TL-pst'SIT-loc'TOP_PL_G .`

Entity handshapes are also used to describe objects that are remembered, as well as present objects and pictures of objects. The following example includes depictive elements in referring to an object with an entity handshape configuration. A child of 2;6 is reminiscing with her mother about having seen a hot-air balloon at a shopping mall. Note the use of both hands and accompanying arm extension and nonmanuals to indicate exceptional size.

(13)   **ENTITY [DH, SLN, C:2;6]**
         Situation: Child describes hot-air balloon seen on earlier occasion.
         Utterance: 2 curved vertical 5-hands, palms facing, arms extended wide and drifting about, puffed cheeks and pursed lips
         Translation: 'A very big balloon (was) floating about in the air.'
         Transcription: `(float)-pm'SPHERE(2h)-mvt'WANDER-^mod'AUG .`

Children's imitations of adult utterances provide information about the "growing points" or "zone of proximal development" in their signing. In Lindert's comprehension task[9], 2-year-olds generally had difficulty coordinating two handshapes when one represented a type of figure and the other a type of ground, or two figures in relation to one another. (Signing on objects and on the body—the child's or adult's—is often a solution to the difficulties of providing simultaneous signed information about figure and ground. This is also a part of child-directed signing.) It is interesting, therefore, that a child can manage to control both hands—indicating figure and ground—when provided with an adult model. This sort of simultaneity is apparently understood before it can be integrated in the child's own productions, as shown in the following example.

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[9] In this task, descriptions of object arrays were elicited from parents, and children's comprehension of those descriptions was assessed.

(14)   **ENTITY [DD, ASL, C:2;1]**
        Situation: Child copies mother's description of doll standing on toy chair.
        Mother's Utterance: Non-dominant hand in a relaxed 5-handshape (palm down). Dominant hand in an inverted-V-handshape located on the top of the non-dominant hand.
        Translation: 'The doll is standing on it.'
        Transcription: `(stand)-pm'PL_H-pm'TL-pst'ERC-loc'TOP_PL_H .`
        Child's Utterance: Non-dominant hand in a relaxed 5-handshape (palm down). Dominant hand in an inverted-H-handshape located on the top of the non-dominant hand.
        Translation: 'The doll is standing on it.'
        Transcription: `(stand)-pm'PL_H-pm'TL(closed)*-pst'ERC-loc'TOP_PL_H [*].`
                    `%err: TL(closed) $hs = pm'TL`

3.4. SASS handshapes

We have not yet found examples of SASS handshapes in our child data. This may be because, in naturalistic and elicited description settings, the physical objects are generally present, and the conversation centers around identifying, describing, and manipulating individual objects. Schick (1990) found good control of SASSs in her elicited picture description task, where they were used adjectivally to describe inanimate objects. Her youngest subjects, however, were 4;5—far beyond the range of our samples. In our data, thus far, we have only found such descriptive uses of SASS handshapes in adult utterances. For example, a hearing mother in Lindert's placement task describes the shape of an object that the child is supposed to identify and place. Note, however, that this is not a correct ASL use of a SASS. She does not use the form purely as a description, but also uses it to designate an object in a verb of location:

(15)   **SASS [HM, ASL, C:3;1, M:1;7]**
        Situation: Mother indicates where toy couch should be located.
        Utterance: Two open-G-handshapes, palms down, start out with thumb sides in contact. Hands move away from each other.
        Translation: 'Put that object, shaped like this, here.'
        Transcription: `(located)-pm'TR_G(2h)*-trc'LONG [*] .`
                    `%err: TR_G = $hs TR_C`

4. Meaningful use of handshapes by children with no exposure to sign language

Depictive gesture is a natural part of human symbolic competence, found in the gestures that accompany speech, as well as in homesign systems used by deaf children raised orally, and even in prelinguistic hearing infants. Here we will focus on the forms of handshapes used in iconic or mimetic gestures, although the dynamic components are also a necessary part of depictive gesture. It is already evident from the discussion of learners of ASL and SLN that there is a continuum from ad hoc gestural use of handshapes to conventionalized sign components. It is often not possible to determine if a learner has devised a handshape on the fly or is using a conventionalized "linguistic" element. Consider, for example, the 2-handed handle handshape in example (1), used by a child of 2;6 to refer to pushing a baby buggy. Similar referential uses of handshapes are found in the gestural communications of deaf children raised without sign language input ("homesign").

4.1. Meaningful use of handshapes in homesign

Homesign systems have been extensively documented by Susan Goldin-Meadow and her collaborators (Goldin-Meadow, 1979, 1982; Goldin-Meadow et al., 1994; Goldin-Meadow & Mylander, 1984, 1990a, 1990b; Goldin-Meadow, Mylander, & Butcher, 1995; Morford & Goldin-Meadow, 1997; Morford, Singleton, & Goldin-Meadow, 1995).   These studies demonstrate that individual deaf children systematically use a limited set of handshapes, combined with motion, to refer to objects *on the basis of specific physical properties*. Goldin-Meadow, Mylander, and Butcher (1995) carried out a detailed analysis of components of handshapes in four homesign systems, created by children between the ages of 2;10 and 4;11. All four children used a set of basic handshapes, described by the researchers as Fist, O, C, Palm, Point, Thumb, V, and L. Handshapes were used as *handles*, *entities*, and *SASSs*, in the terminology used above. Components of hand breadth and finger curvature systematically mapped onto features of the referenced objects: Point and Thumb handshapes referred to manipulation of very narrow objects, Fist and O referred to wider objects, and C and Palm were used for the widest objects. For example, all four children used a large C-handshape to represent handling an object greater than 2 inches/5 cm in width. All of the children used Point (index finger) for straight skinny objects, such as straws, candles, pencils. Three of the children used a flat palm for vehicles. Overall, handshapes could be placed in systematic paradigms or matrices of contrasts for each child. In addition, most handshapes were combined with one or more type of motion.   Goldin-Meadow, Mylander, and Butcher conclude (1995, pp. 243-4):

> Thus, the gesture systems of the deaf children in our study appear to contain a subset of the handshape and motion components found in ASL. The similarities between sign forms in ASL and gesture forms in our subjects' gesture systems suggest that our subjects' set may reflect the units that are "natural" to a language in the manual modality—units that may form part of the basic framework not only for ASL morphology but also for the morphologies of other sign languages. … Whatever the details of the gesture systems, the fact that the gesture systems of all of the deaf children in our study could be characterized as having a morphological structure suggests that such structure is essential to the young communicator— so essential that it will evolve even in the absence of conventional linguistic input.

Homesign use of handshapes is systematic and productive, in that a gesture that indicates a particular object property is regularly applied to a range of objects for which that property is salient. It is also noteworthy that such a system can be maintained over the course of years by an individual child. The child called "David" used his handshapes consistently from age 2;10 to 9;5 (Morford, Singleton, & Goldin-Meadow, 1995). And, in fact, when he began to learn ASL, he had difficulty with referential ("classifier") categories that did not match those in his homesign system, while he easily acquired ASL categories that overlapped with his own.   Apparently he had stabilized patterns of "thinking for signing" in his L1 (homesign), and had difficulty acquiring alternative category structures for the same domains in L2 (ASL). (This parallels effects of "thinking for speaking" on L2 acquisition described by Slobin [1996].)

In the light of such findings, it is not surprising that deaf children with sign language input also make early meaningful use of handshapes in complex signs. Indeed, it would be difficult to gesture about the movement of an object—either as manipulated or self-moving—without in some way modifying the handshape to correspond to some component of the object or the hand that deals with it. The "classifier" systems of sign languages are, by and large, not made up of arbitrary symbols. Nonetheless, in mastering a natural sign language, the learner is faced with the task of acquiring the particular handshapes that are conventionalized in the language. This task becomes more difficult at the less transparent end of the gesture-to-sign continuum. Defining the parameters and dimensions of this continuum is an urgent task. The early uses of handshapes in acquisition of a standard sign

language, along with the productions of homesign children, can provide suggestive evidence about the "gesture" end of the continuum. Errors, substitutions in imitation, and later acquisitions in a standard sign language (discussed below) can illuminate the "sign" end of the continuum.

4.2. Meaningful use of handshapes by hearing infants ("baby signs")

Linda Acredolo has documented a wide range of symbolic gestures used by prelinguistic infants as young as 11 months, and continuing through the early one-word period (Acredolo & Goodwyn, 1988, 1990, 1992). This research builds on a long tradition in developmental psychology, best represented in the writings of Heinz Werner and Bernard Kaplan (Werner & Kaplan, 1963). Werner and Kaplan, following earlier work by Piaget, Guillaume, and Stern, saw early gestural representation as part of symbolic development:

> The formation of descriptive gestures … seems to suggest that the child has begun to translate realistic events into a medium with its own expressive features: the imitative expressions have developed into truly *pictorial* or *iconic* representations. Thus, with apparent spontaneity, the child, by means of sensory-motor patterns, creates what have been termed "natural symbols" (p. 89).

They trace such gestures to anticipatory or preparatory motor patterns, evolving into representational actions. For example (citing unpublished work from 1930), they describe a 15-month-old child, looking for a shovel to use in a sandbox, and making shoveling movements with his hand "in a scooping position" (p. 93). They note that such gestures can also be used outside of the sandbox context to communicate desires and intentions. And they emphasize that representative gestures become schematized:

> It is important to note that the transition from anticipatory behavior to representative gesture is often marked by a change in the form of the activity: movements which derive from pragmatic actions but which have become depictive gestures are in subtle ways distinct in pattern of execution from anticipatory responses. A good example of this is the difference observable between *anticipatory movements* in cutting with scissors and *representative gestures* of cutting with scissors. In the first instance, the individual sets thumb and forefinger in a way to fit into the handle of the scissors. When, however, one exploits the pragmatic action for representation, there is a change in the selection of fingers and in the manner in which they are held. The movements do not correspond with those of actual cutting; instead, they express the dynamic activity of "scissors-cutting" by imitating the movements of the instrument [i.e., a transition from manipulative to depictive handles] (p. 94).

Acredolo and Goodwyn have studied numerous infants, documenting "the spontaneous development by normal infants of nonverbal gestures to symbolically represent objects, needs, states, and qualities" (1988, p. 450).[10] They excluded gestures that were part of fixed routines, or one-time occurrences. The data consist of gestures that were regularly applied to multiple instances of the same referent or situation, across contexts. Some of these seem to be instances of SASSs, such as the infant who referred to the moon with a "cupped hand held high" (1988, p. 456). Others are handles, such as "fist to ear" for telephone. In a systematic study, it was found that "handles" were the predominant form, but SASSs were also found: "The results showed a clear preference for using an imitation of an action the child did with the object (45% of the total). An additional 13% of the total were imitations of actions inherent in the object, and 10% were depictions of some perceptual quality of the object" (1988, p. 460).

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[10] Similar findings are reported for Italian and American hearing infants (Bates et al., 1979; Caselli, 1983, 1990; Volterra, 1981, 1987; Volterra & Caselli, 1985; Volterra & Iverson, 1995).

4.3. Implications for acquisition of signed languages

It seems, thus, that the basis for gestural representation in homesign is part of general infant and toddler competence. If all children can invent and use handle (both manipulative and depictive) and SASS handshapes, the course of acquisition of a sign language, such as ASL or SLN, is rather different than acquisition of a spoken language. Verbal representation is a break from the earlier, expressive uses of vocalization and gesture. The hearing child cannot spontaneously invent vocal meaning components that will successfully communicate. For example, knowing the word *open*, the child cannot invent a vocal sequence that would be interpreted as *close*. The same is true of a child learning a "classifier language" such as Navajo. For example, having learned that *-ltsòòz* means 'lie: flat-flexible-object', there is no way that the child can invent a term for a pile of objects. Rather, the child has to wait and learn another unanalyzable element: *-nìl* 'lie: collection'. The deaf child, by contrast, can easily communicate within the general framework of the language. Transient innovations may be close enough to a conventional "classifier" to pass unnoticed, or to be easily shaped into the conventional form. The capacity to represent objects and their movements/locations by means of arm and hand is given from the start. The deaf child, therefore, follows a special developmental path, in that normal gesture can be "seamlessly" incorporated into the flow of signing. As a consequence, the deaf child—in contrast to the hearing child—has the task of "paring down" the gesture system to those elements that are conventionalized in the exposure language. The child acquiring a signed language must also learn how to appropriately incorporate ad hoc gestures into signed utterances in ways that match the adult system. At the same time, of course, both deaf and hearing children must acquire the less transparent parts of the language as well.

Beyond this, the greatest challenges lie in mastering the discourse functions of polycomponential signs, including nonmanual components of face and body. These challenges become evident by age 4 or 5 and continue through the school years.

5. Problems of mastering polycomponential signs beyond the early phases

Thus far we have dealt with issues of selecting semantically appropriate handshape(s) and integrating handshapes into polycomponential signs, along with other meaning components. Our data show clearly that these basic skills are established by age 3. However, even 12-year-olds do not use the entire set of options in adult-like fashion. By and large, our preschool recordings contain short utterances, usually scaffolded by interaction with adults. New demands are placed on the child when longer stretches of signing are required. This is especially evident in narrative, where the signer has to create a spatial scenario and maintain reference to individuals while shifting perspective. Additionally, the sequence of utterances must have coherence in terms of space, time, and causality. These are complex tasks for children learning any language, signed or spoken (see, for example, Berman and Slobin's [1994] crosslinguistic and developmental study of narrative from ages 3 to 9).

We have two sets of narrative data that allow us to focus on these issues. The first set comes from a late preschool setting (about age 5) in which an ASL-signing child presents a personal narrative to a circle of other children and a Deaf teacher. The second set consists of narratives elicited by a picture-storybook, *Good dog Carl*, signed by children aged 9-12. These school-age narratives are elicited in a test situation with a single Deaf adult as addressee.[11] In this part of the paper we provide

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[11] The preschool data were filmed and analyzed by Marlon Kuntze. The school-age data were gathered by Philip Prinz and Michael Strong, as part of their ASL competence test; they are being transcribed and analyzed by Michelle Anthony as part of her doctoral dissertation research.

more detailed descriptions of examples, in order to graphically demonstrate some of the discourse-pragmatic factors that are an essential part of mastering polycomponential signs. We have selected examples in which narrative coherence and cohesion require choices of "classifier" handshapes that are not simply motivated by semantics of reference, but also require attention to factors of viewpoint and narrative continuity. It will become evident, in going through these examples, that the mastery of "classifier" selection is an essential part of mature communicative competence.

5.1. Establishing Reference

Earlier in this paper, we described very young children's use of handle and entity classifiers in interactions with adult interlocutors. In those examples, the children often produced polycomponential signs without first naming the referents that were represented by the handshapes. Because the conversation generally revolved around present objects and people, this was usually not a problem. However, in order to use classifiers appropriately, especially in a monologue or a narrative without adult scaffolding, generally the signer must first name the referent which will then be represented by a handshape in a polycomponential sign. Without such indication, the intended reference may fail to be identified by the addressee. When the responsibility of clearly naming the referents of classifiers rests with young signers, they have difficulty, as illustrated in the following example:

(16) **ESTABLISHING REFERENCE [DD, ASL, C:5;0]**
    Situation: Child describes going swimming and sliding down into the water (as part of a longer narrative).
    Utterance: Non-dominant hand in B-handshape with palm facing the signer and fingertips pointing right. The dominant hand, in a bent-V-handshape, starts above the non-dominant hand and moves away from the signer with a downward slope, bending and unbending the fingers.
    Transcription: `PNT_1 HAVE BIG (slide)-pm'PL_VL-pm'TBL-src'SUP_PL_VL-pth'DF-mvt'BEND*-asp'ITR* [*] .`
                      `%err: referent of pm'PL_VL (noun SLIDE) is absent ;`
                      `mvt'BEND-asp'ITR $mvt = mvt'0-asp'0`

With the limited context and lack of clearly stated referents, there are two possible ways to interpret this child's utterance. She was probably referring either to a swimming pool with a slide or to a giant water slide. In either case, the combination of the path component 'going down' with the movement component 'repeatedly bending legs' is ungrammatical. (If she was referring to going down a slide at a swimming pool, her awkward construction may have been due to an attempt to depict both the ladder and the slide, superimposing the climbing component and the sliding component—in effect, signing that she was going down the steps on a slide). She may have thought that the polycomponential sign was sufficient to make clear reference to the slide. The complexity of the "classifier" configuration (as well as the complexity of the underlying visual image) may have given the child the false impression that her utterance was clear enough to be understood by the audience.

5.2. Specifying Ground

When using polycomponential signs, signers are often required to include "classifier" handshapes for both the figure and ground elements. The ground "classifiers" can serve to anchor a signer's description of an object, or they can serve to specify the shape, scale, and focus of the surface with which the figure interacts. Our data suggest that very young children often omit ground "classifiers," and that children of late preschool and early school age have difficulty incorporating ground "classifiers" correctly in polycomponential signs (as noted by Supalla, 1982). Older school-age children seem to exhibit a more sophisticated understanding of the various functions of ground "classifiers."

5.2.1. Ground as anchor

Describing an object is a complex process in which the description of the parts and their relationship to each other must be constructed in a manner that is semantically acceptable as well as grammatical. It often requires the simultaneous use of both hands, with each hand functioning as a separate articulator. In such a scheme, the non-dominant hand serves as the ground and is the reference point for depicting the location of another element being described. An example is the task of describing a cylindrical lampstand with grooves that run the length of the stand. The shape of the stand is first described using two cupped hands in which the non-dominant hand remains at the base and the dominant hand moves up away from the base. The non-dominant hand, still in the C-handshape, then moves up to assume a new grammatical function: It now serves as a ground representing the lampstand. The dominant hand simultaneously assumes a new handshape (4-handshape) in order to describe the grooves in the stand. While adult signers competently use the non-dominant hand to serve as an anchor when describing portions of an object, young children have difficulty coordinating the use of the non-dominant hand for this purpose, as seen in the following example:

(17)　**GROUND MAINTENANCE [DD, ASL, C:5;0]**
Situation: Child narrates a story to her preschool class about her family's summer camping trip class. In this example, she describes the tent her family used.
Utterance: Child uses forearm and 4-handshape of dominant (right) hand set at an angle with palm facing left and downwards to indicate the side of the tent; this configuration moves downwards and towards the right. Then to indicate the other side of the tent, the child dramatically moves her body towards the left and, using her dominant forearm and 4-handshape set at an angle with palm facing right and downwards, moves her arm downwards and towards the left.
Transcription: TENT MIXED COLOR .
ORANGE (located)-pm'TR_5*-trc'DR [*].
YELLOW (located)-pm'TR_5*-trc'DL [*].[12]
　　　　　　%err:　missing non-dominant hand as anchor

The child did not use her non-dominant hand as an anchor, as an adult signer would in this situation. The anchoring use of the non-dominant hand enables the signer to succinctly and grammatically indicate the location of the portions of the tent being described. In the case of this child's description, in the absence of an anchoring handshape, she had to use an exaggerated body shift to clarify which side of the tent was being described. The resulting description is both phonologically awkward and ungrammatical.

5.2.2. Scale of ground

When using a polycomponential sign which depicts a figure moving or located with respect to a ground, it is critical that the scale of the figure and ground "classifiers" correspond with each other. Problems of relative scale pose difficulties to learners, because the same referent can be represented by different handshapes, depending on how their relative sizes are conceptualized in the projection from mental space into signing space. Scale is also determined by viewpoint, requiring attention to perspective, as discussed in the next section. In the following example, the child is relating an attempt to crawl through a small opening (note that in addition to problems of scale, she also has failed to name the type of opening).

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[12] Note that this transcription introduces a novel feature, not present in the preschool examples, in that the path is metaphorical (tracing the extent of the color), rather than literal movement of a figure.

(18)   **SCALE OF GROUND [DD, ASL, C:5;0]**

      Situation: Child describes her attempts to crawl through some type of small opening.
      Utterance: F-handshape on non-dominant hand. V-handshape (fingers first) moves into F-handshape.
      Transcription: `(crawl)-pm'CIR*-pm'TL-pst'RCL-ori'B-mvt'WIG-gol'INT_CIR [*] .`

                              `%err: CIR $hs = CYL`

This signer's choice of a ground "classifier" does not provide an appropriate scale. The F-handshape represents a view from a distance, while the V-handshape represents a close-up view. This lack of correspondence between the scale of the figure and ground "classifiers" leads to a phonological problem, in that the signer cannot fully fit the figure "classifier" through the ground "classifier," as she presumably intended to do. An adult signer would probably choose a C-handshape for the ground, allowing the V-handshape, representing the figure, to pass through it.

Our school-age data show that by age 12, non-native but skilled signers can successfully choose figure and ground "classifiers" that correspond with each other appropriately in terms of scale. The following example is comparable to (18) in that the signer still intends to show a figure moving through a cylindrical ground. However, unlike the late-preschool-aged signer in the example above, the older signer correctly chooses the C-handshape to describe the ground.

(19)   **SCALE OF GROUND [DH, ASL, C:12;2]**

      Situation: Child describes a picture of a baby sliding through a laundry chute.
      Utterance: Dominant bent-V-handshape moves downwards through non-dominant C-handshape.
      Transcription: `(slide)-pm'CYL-pm'TBL-src'INT_CYL-pth'DF .`

5.2.3. Flexibility of focus

A third function of the ground "classifier" is to focus the addressee's attention on a particular feature of the ground in the scene being depicted. In example (19), the signer is focusing the addressee's attention on the fact that the baby is sliding down a chute. However, this utterance was actually part of a longer portion of the narrative in which the signer first described how the baby was perched at the edge of the chute before sliding down (20). (The actual sequence of utterances was 20-19.) Although the picture showed the baby sliding down towards the viewer, the signed perspective is from the point of view of a narrator watching from behind the baby. In this portion of the description, the signer focuses the addressee's attention on the baby's position at the top of the chute by choosing a B-handshape (palm down), rather than a C-handshape, to show the opening of the chute.

(20)   **FLEXIBILITY OF FOCUS [DH, ASL, C:12;2]**

      Situation: Child describes a baby perched at the top of a laundry chute, ready to slide down.
      Utterance: Dominant bent-V-handshape on top of non-dominant B-handshape (palm down). .
      Transcription: `(perch)-pm'PL_H-pm'TBL-loc'TOP_PL_H .`

After this polycomponential sign, the signer describes the baby beginning to slide down the chute, the baby's heart racing, and the chute whizzing by the baby, thereby changing the focus to the experience of the baby going through the chute. In accord with this new focus, the signer produces the utterance in (19), in which the ground "classifier" represents the opening to the chute. In this sequence of utterances we see perspective shifts from narrator to protagonist and back to narrator. In addition, the use of ground "classifiers" shifts along with focus. Thus, in order to create a coherent and cohesive narrative discourse, the signer has to attend to a range of pragmatic and semantic factors in choosing appropriate handshape "classifiers" in polycomponential signs.

5.3. Choosing from among multiple perspectives

Perspective, or viewpoint, thus presents major challenges to the sign language learner. There are several types of perspectives, depending on the roles of narrator and protagonist(s), and conditioned by phonological constraints. When signing as narrator, a scene can be presented from many different physical angles. An event can be viewed from one vantage point and then described further from a different orientation. In addition, the signer constantly faces the task of deciding which perspective will best allow for an encoding that is both grammatical and possible to articulate with ease. These issues are made even more complex when it is necessary to contrast the narrator's viewpoint from that that of one or more protagonists. An effective narrative shifts from a more global viewpoint to a focus on the perspective of a particular protagonist. A skilled narrator is able to jump smoothly from one perspective to the other, providing multiple cues of gaze, face, and posture to track varying perspectives. The ability to use classifiers correctly and effectively places demands on the child's skill in managing three types of perspective shifts: negotiating the narrator's multiple perspectives, shifting between narrator and protagonist, and moving among different protagonists.

5.3.1. <u>Shifts in narrator's perspective</u>

An important part of this learning task is the ability of the signer to anticipate the perspective that provides the necessary phonological latitude for incorporating the appropriate components and maximizing the number of usable classifiers to select. This must be done without adding on extraneous components. Young signers around age 5 may have difficulty changing viewpoints, tending to stay fixed with a given perspective. The following utterance illustrates problems of this sort. Our 5-year-old girl in example (16) narrated her desire to get to the top of the slide and go down quickly into the water.

(21)   **PERSPECTIVE CHOICE [DD, ASL, 5;0]**
Utterance: Child has retained flat-B-handshape (vertical plane) from previous utterance and signs "ME
WANT"; then moves V-handshape upwards in an upside-down posture, flips it, and descends rapidly
 in an arc over non-dominant hand towards self.
Transcription: `(located)-~pm'PL_VL PNT_1 WANT (stand)-~pm'PL-VL-`
`pm'TL*-ori'INV-loc'FRO_PL_VL* (ascend_descend)-~pm'PL_VL-~pm'TL*-`
`~ori'INV-~src'FRO_PL_VL*-pth'A_UD-gol'BAC_PL_VL-mod'RAP [*] .`
`            %err: TL $hs = TBL ; FRO_PL-VL $loc = BAC_PL_VL`

She takes the perspective of watching herself going down the slide. The phonological constraints arising from this perspective may have led her to a compensatory solution requiring the addition of extraneous components of posture and movement, pivoting the V-handshape (two-legs) into an upside-down orientation. In the previous utterance she had established the ground (`pm'PL-VL`) as the wall of the pool, in introducing the topic of the slide. She clings to the ground in order to continue the topic of swimming and sliding; however, maintaining the ground prevents her from choosing a different perspective which would have allowed her to create a more grammatical utterance. Thus the poorly formed utterance in (21) seems to result from her inability to maintain the topic without dropping the ground in order to shift to a different perspective. As the child comes to appreciate the importance of shifting to different perspectives while maintaining topic, she will gain flexibility in substituting the ground components in polycomponential signs.

5.3.2. <u>Shifts between perspectives of narrator and several protagonists</u>

The child must also learn how to describe an event from the perspectives of multiple characters within a narrative. Here we return to the 12-year-old narration of *Good dog Carl* presented in (19) and

(20). The narrator took his own perspective in (20), viewing the baby going down the laundry chute; and then he quickly shifted to the baby's perspective. The following example shows a shift between two protagonists, the baby and the dog that is caring for him. In the picture, the dog is holding a blow-dryer in its mouth and is blowing the baby dry after a bath. The narrator presents this single event from the perspective of the dog, and then that of the baby.

(22)   **PERSPECTIVE CHOICE [DH, ASL, 12;2]**
        Utterance: Child role shifts into dog, holding gun-handshape in mouth between teeth; then role shifts into baby and waves both hands in 5-handshape directed at self at either side of face.
        Transcription: `RS(dog) (blow_dry)-pm'MOUTH'B-pm'GUN-loc'MOUTH_INT'B*
[*] . `RS(baby) (be_blown)-pm'AIR-gol'FACE'B-asp'ITR^aff'SURPRISE .
        %err: loc'MOUTH_INT'B $loc = loc'MOUTH_FRO_EDG'B

Note that the perspectives of the dog and baby are presented sequentially, although this is a single simultaneous event in the story. With the change in point of view the selection of the "classifier" handshape must match the perspective of the character represented. This narrator correctly articulates the positions and directions of the handshapes in order to align them with the appropriate protagonist. Such flexibility in the selection of "classifiers" to illuminate different points of view within a narrative is the mark of a competent signer.

6. Towards a reformulation

Although we have presented this collection of discourse-pragmatic issues separately, it should be evident that they are tightly interrelated. Considerations of discourse reinforce the need to reformulate the role of "classifiers" in sign languages. In order to establish reference, specify ground, and shift perspectives, the signer must command an array of "classifiers," flexibly transferring a "classifier" from one hand to another, or flexibly replacing one "classifier" with another while maintaining reference. The two hands must function together to allow the addressee to successfully track figure and ground as they change through the course of dynamic event representation and changing perspectives. The signer must know when to introduce a referent with a full identifying expression (a noun or a point or a gaze) and when to refer back to it with one or another "classifier."

It is evident that these "classifiers" are performing a major function in facilitating fluent discourse. They do not serve simply to track referents in discourse, because referents are also subject to various **construals**. Perhaps it is most useful to think of "classifiers" as helping to "triangulate on a referent"—to use David Wilkins' felicitous term (personal communication). The "classifier" is a component of a construction that refers to a whole event. The various components function, in concert, to triangulate on an event, from a particular point of view. But the primary role of the property-marking handshape is certainly not to classify. The fact that a referent property is used to evoke an entity in discourse does not mean that the entity is being presented as a member of a particular "class." What is demanded of the learner—and the producer and receiver—is to attend to those properties that (a) are conventionally expressed in the language, and (b) are appropriate in the expression of particular event construals. We hope that considerations such as these will contribute to a more adequate designation of this vital component of polycomponential signs.

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