Simultaneity as a unique property of visual-spatial language: the simultaneous structure of two-handed classifier predicates in bimodal ASL/English narrative ebooks for Deaf children

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Abstract

Simultaneity, or the co-occurrence of linguistic material at any level, is widely recognized as a fundamental property of the grammar of signed languages, a natural consequence of their visual-spatial modality. Enabled by multiple separate articulation tracts, including both hands, the upper torso and face (the non-manual articulators), signers across a broad variety of unrelated signed languages exploit both sequentiality and simultaneity to transmit a linguistic message (Vermeerbergen et al 2007). In American Sign Language (ASL), simultaneity is particularly relevant to what many sign language linguists term ‘classifier predicates’, where the handshape parameter serves to specify an argument by indicating a noun class, while physio-spatial properties of the hand including location, orientation, and movement serve to predicate the argument (Supalla 1986). Often described as a means of ‘saying by showing’, classifier predicates inventively and efficiently exploit the related properties of simultaneity and iconicity to a much higher degree than frozen lexical signs. While research has begun to illuminate the complex form and function of simultaneity in classifier predicates in regular conversation, my thesis contextualizes this evidence in a new and increasingly important register: bimodal narratives directed toward children who use sign language. Using a small corpus of ASL/English ebooks from a collaborative project between students of Swarthmore College and Gallaudet University, my thesis describes the structure of two-handed classifier predicates in this dataset, concluding that the morphological constraints on simultaneity appear to be upheld in this register.

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Glossing Abbreviations

CL_o : Object classifier
CL_m : Handling classifier
CL_ss : Size and shape classifier
+ : repeated sign
--- : held sign
CHIMNEY_i : co-referentiality

( Adopted from Sallandre 2007)
# Table of Contents

1 Introduction
   1.1 Theories of Linguistic Simultaneity ........................................ 3
   1.2 Phonetics and Phonology ...................................................... 6
   1.3 Morphological Constraints ................................................... 8
   1.4 Syntax and Space .............................................................. 10
   1.5 Classifier Predicates ......................................................... 12

2 Methods
   2.1 Overview of the Dataset .................................................... 14

3 Analysis
   3.1 RH/LH Transcription ......................................................... 16
   3.2 Two-Handed Simultaneous Classifiers ................................... 17

4 Discussion .................................................................................. 20

5 Conclusion .................................................................................. 22

6 References .................................................................................. 24
1. Introduction

1.1 Theories of Linguistic Simultaneity

According to Saussure, a crucial theorist in the foundation of modern linguistics, two fundamental properties of language are linearity and arbitrariness. In this view, language consists of a sequential stream of symbols that have an unmotivated relationship to their referents in the physical universe (Perniss 2010); (Pietrandrea 2002). While certain properties of spoken language, such as the two-dimensional nature of sound waves and the linearity of sound perception (Woll 2007) give credence to Saussure’s view, this strict emphasis on linearity in relation to structure began to receive greater scrutiny following the revolutionary work of Noam Chomsky from the 1950’s onwards. Chomsky demonstrated that sentences can be seen as generated representations of an underlying, hierarchical and multi-layered “deep structure”, formulated in the rules of generative grammar (Chomsky 2005).

Where Chomsky’s ideas implicate the concept of simultaneity most explicitly is in the field of generative phonology. As linguists struggled to cope with the inherent limitations to segmental representations of phonological processes such as assimilation, tone, and prosodic structure, generative phonology posited a new approach: a relaxation of the requirement for a one-to-one mapping between phonological features and segments, as well as a separate tier of representation for autosegmental processes. This advancement automatically allowed analysis to turn to a wide range of nonlinear relations in phonological representation, such as multiply-linked constructions, shown in the following figure:

Figure 1. Nonlinear phonological relations in spoken language (from Kenstowicz 2003)
Generative phonology has shown that the relations in Figure 1, many of which have nonlinear structure, are abundant across the phonologies of spoken languages (Kenstowicz 2003: 311). Thus, even before rigorous analysis of sign languages had begun in the 20th century, simultaneity had already begun to emerge as a relevant property of the structure of human language in general.

As these research programs in generative grammar, all largely stemming from Chomsky’s work, were underway in the mid-20th century, another revolution was taking place in linguistics that involved the scientific realization of signed languages, communicative systems used by Deaf people around the world for at least two centuries. In the early 20th century, including in Saussure’s intellectual context, sign languages were largely disregarded as non-linguistic pantomime due to the assumption that they were built on highly iconic and completely non-decomposable sequences of signs (Humphries 2013). This inaccurate and inadequate view of sign languages changed radically following the groundbreaking work of William Stokoe and others in the mid 1960’s. Stokoe proved that signs are in fact composed of analyzable parts, the key distinction with spoken language words being that these parts occur simultaneously. The four parameters of handshape, orientation, location, and movement, in addition to the non-manuals, are still widely used to describe the phonological and morphological organization of sign languages (Battison 2000). The figure below gives an example of a minimal triplet - three signs of American Sign Language (ASL) which share the
same parameters of Movement, Orientation, and Handshape, but are distinguished by the parameter of Location. Note how the contrast of just this one internal parameter results in a change of meaning.

Figure 2. An ASL Minimal Triplet (from Klima & Bellugi 1979)

Stokoe’s analysis of sign language shows that at least at the phonological and morphological level, simultaneity is an indispensable tool sign languages exploit in forming structure. This last point brings attention to another important and related feature of the visual-spatial modality, iconicity. Iconicity refers to a motivated relationship between the semantic and phonological components of a linguistic sign (Pietrandrea). While Saussure argued that arbitrariness is a principle design feature of language, research has shown that iconicity is largely exploited by both signed and spoken languages as a non-negligible part of the grammar, suggesting it is a broader feature of natural language. In sign languages, iconicity has been shown to facilitate language learning in small children, and is also a motivating factor in the dispersion of contact signs (Pernis et al 2010).

In visual perception, the eye takes in multiple elements at the same time, ultimately forming a composite image. Thus, sign languages, which operate using in the visual-spatial modality, can exploit the compositeness of visual perception to simultaneously encode a
linguistic message. The simultaneous nature of the visual-spatial modality ultimately ties back to
the encapsulating property of iconicity, or the motivated relationship between signifier and
referent. An important nuance to the pervasiveness of iconicity in sign languages is that
arbitrariness is also present. As Pietrandrea notes in “Iconicity and Arbitrariness in Italian Sign
Language”, while the vast majority of signs have iconic parameters, it is completely arbitrary as
to what the distribution of those iconic features across a sign are. She concludes her analysis by
suggesting that iconicity and arbitrariness are in a dependent relationship that is grounded in the
principle of linguistic economy (Pietrandrea).

In reviewing the discourse on the linguistic significance of two sets of opposing
properties: linearity and simultaneity, and iconicity and arbitrariness, it is wise to conclude that
these properties are in fact all present in natural language, regardless of modality, albeit to
varying degrees of relevance (Woll 2007). While Saussure originally formulated that linearity
and arbitrariness are defining properties of spoken language, the opposing concepts of
simultaneity and iconicity clearly motivate the design of sign languages at every level of the
grammar, in ways which will be discussed in detail in the following section.

1.2 Phonetics and Phonology

Simultaneity is grounded in the phonetic reality of sign languages, since the three
separate articulation tracts of each hand and the upper torso and face (non-manuals) can
theoretically all be used and perceived at the same time. Despite of the relative slowness of the
manual and non-manual articulators compared to the tongue in the vocal tract, sign languages
can exploit simultaneity to generate complex phonological and morphological structure (Fernald
& Napoli). Research has since revised and built upon Stokoe’s original phonological framework
to conclude that more accurately, sign languages are both simultaneous and sequential, noting that the hands alternate between periods of movement and stasis in the signing stream. Liddell conceptualizes this phenomenon with the terms Hold and Movement, the two articulatory states which the hands can be in at a given time. Both a Hold and a Movement can be conceptualized as feature bundles, much in the same way spoken phonology characterizes phonemes, meaning they encompass the simultaneous realization of the basic sign parameters described earlier.

Figure 3. Featural Representation of a Hold and Movement (from Liddell 1989)

In this figure, the left hand box represents a Hold, while the right hand box represents a Movement, including both initial and final articulatory features. From this analysis, it becomes clear that even the simplest of signs, ones which do not move, (H) have complex simultaneous structure (Liddell 1989).

Building on this theory, researchers have also turned their attention to the notion of what encompasses a sign syllable. In spoken language, a syllable is largely defined by its only obligatory component, a nucleus or vowel. The nucleus, which bears additional features such as tone or stress, is in fact the most prosodically salient, or sonorous part of the syllable. Brentari applies what is known as the Sonority Sequencing Principle to analyze the phonological
parameters of signs. She concludes that the Movement parameter is the most sonorous parameter, while Hand Configuration (the combination of orientation and handshape) is much less so. While Liddell noted that a sign syllable consists of the sequence H-M-H, presided over in scope by a Hand Configuration, Brentari extends this analysis to emphasize the role of prosody in sign language structure, positing that the sequence H-M-H is an analogue to the spoken language sequence of CVC (Brentari 1993). What these analyses of syllable structure show is that simultaneity is very much involved in phonology at this level. The complexities that emerge with this degree of simultaneity are represented visually in the following table:

Figure 4. A 3-dimensional representation of a signed syllable (From Sandler 2012)

In this diagram, the numbers 1-4 indicate nodes corresponding to the four parameters of a syllable. This diagram further includes the non-dominant hand, adding another element to the complexity of simultaneous structure that will be described in the following section.

1.3 Morphological Constraints

From a typological perspective, the morphology of sign languages can be regarded as monosyllabic, non-concatenating, and polymorphemic (Schembri 2001). The typological property of non-concatenation means that sign languages are more likely to alter the
Holloway 9

morphic form of a word not by affixing morphemes at either end, but by modifying the simultaneously occurring internal parameters of the sign (Aronoff 2005). While
non-concatenative is widely distributed among spoken languages such as Arabic, Brentari notes that sign languages may be the only languages to possess the unique typological distribution of favoring single syllables but being heavily polymorphemic. As will be demonstrated, this polymorphemic tendency can be attributed directly to the property of simultaneity. Consider the following table from Brentari:

Figure 5: A Monosyllabic, Polymorphic ASL Classifier Predicate (Brentari)

<table>
<thead>
<tr>
<th>Distinctive features</th>
<th>Morphological identity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Movement class node</td>
<td>&quot;more forward&quot;</td>
</tr>
<tr>
<td>[tracing: straight]</td>
<td></td>
</tr>
<tr>
<td>Handshape/orientation node</td>
<td></td>
</tr>
<tr>
<td>[H1 selected fingers: 1]</td>
<td>&quot;upright being&quot;</td>
</tr>
<tr>
<td>[H2: selected fingers: 1]</td>
<td>&quot;upright being&quot;</td>
</tr>
<tr>
<td>[nonselected fingers: flexed]</td>
<td>&quot;side by side&quot;</td>
</tr>
<tr>
<td>[H2: radial plane of finger]</td>
<td>&quot;stooped&quot;</td>
</tr>
<tr>
<td>[joints: flexed]</td>
<td>&quot;facing forward&quot;</td>
</tr>
<tr>
<td>[hand orientation: prone]</td>
<td></td>
</tr>
<tr>
<td>Location class node</td>
<td>&quot;from a&quot;</td>
</tr>
<tr>
<td>[HPOA: proximal]</td>
<td>&quot;to b&quot;</td>
</tr>
<tr>
<td>[HPOA: distal]</td>
<td></td>
</tr>
<tr>
<td>Nonmanual class node</td>
<td>&quot;carefully&quot;</td>
</tr>
<tr>
<td>[pursed lips]</td>
<td></td>
</tr>
</tbody>
</table>

The image on the left shows a visual description of the sign, while the right hand table shows its full morphological description. Note that under Liddell’s analysis, such a sign would be quite simple: H-M-H, or one ASL syllable. Despite this simplicity, the full predicate expressed is incredibly complex: “Two hunched over humans move forward side-by-side in a careful manner.” Thus, while this sign has only one salient movement, there are as many as 10
distinct morphemes nearly all conveyed simultaneously. This type of sign, called a classifier predicate, has uniquely productive morphological capabilities and will be discussed in full detail in section 1.5.

In analyzing the morphology of sign languages, there appear to be morphological constraints on the type of simultaneity shown in figure 5. A general rule that appears in the discourse, is as follows, taken from Hendriks discussing Jordanian Sign Language:

(1) Manual simultaneity can only take place when at least one of the hands makes no lexically specified movement, or when the movement of the two hands is symmetrical. (Hendriks 2007)

This rule can be interpreted as a more general version of Battison’s Dominance Condition, which evidence suggests may be universal not only in frozen lexical signs but also in classifier predicates, and across all sign languages (Battison 2001). Researchers have also addressed the question of constraints on simultaneity from a variety of perspectives, including phonology, morphology, syntax, and cognition. Evidence suggests that although simultaneity may be freely employed, cognitive constraints on short term memory inhibits its overuse (Napoli 2010) (Napoli and Wu).

With these constraints on the non-dominant hand in consideration, what then are the roles of the non-dominant hand in sign language grammar? Research shows that the non-dominant hand is involved in two separate but related constructions, dominance reversals, and what Liddell terms “buoys”. In buoy constructions, the non-dominant hand provides syntactic ground for the predicate, which it holds as the active hand articulates the predicate (Liddell et al 2007).

1.4 Syntax and Space
Another feature of simultaneity in sign languages that is directly related to the visual-spatial modality is the use of spatial referents, or areas of the signing space that are given semantic value despite being unoccupied by an active articulator. As discussed earlier, sign language grammars pattern typologically as non-concatenating, and the vast majority of sign languages are shown to have complex inflectional modifications to their verbs to code modality, tense, person, number, and aspect. An example of this complex manipulation of the movement parameter is shown in the figure below.

Figure 6. Spatial inflectional processes on the ASL sign GIVE, with the canonical form appearing at the top left (Klima & Bellugi 1988)
As this figure shows, subtle nuances in movement, such as contouring of the movement path occur simultaneously and encode substantive linguistic meaning.

1.5 Classifier Predicates

For the purposes of this thesis, I will be analyzing one aspect of ASL grammar in particular: classifier predicates. A classifier predicate involves the morphological use of handshape to specify an argument, while the parameters of orientation, movement, and location, which indicate physio-spatial properties of the hand, are used to predicate the argument. Thus, in classifier predicates, the phonological and morphological aspects of the sign, or its form, are suddenly meaningful at the level of syntax and semantics, or only its content (Vermeerbergen et al 2007). In European schools of sign language linguistics, classifier predicates are treated somewhat differently, with the distinctions summarized in the following passage, from Schembri 2003:4:


Acknowledging the underlying similarities between these terms, I have chose to frame my analysis around the term ‘classifier predicate’.

Classifier predicates in ASL broadly fall into three groups based on three different types of visual iconicity. In the first, which Brentari terms handling classifiers (CI_h), the hand represents how an actual hand manipulates an object. For example, the ASL uses the F handshape as a handling classifier for very small objects (Supalla 1986). For the second group,
object classifiers (CL_o), the hand represents a whole entity; for example, a B handshape can be used to represent a book or a flat surface. This group of classifiers is special in that a particular handshape represents an entire class of nouns. Some examples include the ASL 3 handshape for vehicles, the bent-V handshape for animals, and the 1 handshape for upright people. The following table, from Brentari, details the three categories of classifier handshapes, with two examples for each category.

Figure 7. Categories of Classifier Predicates (Brentari)

(1) Handling classifiers
   a. handle flat object: open, flat B-handshape
      \[\text{all fingers bent only at the knuckle joint}\]
   b. handle small object: F-handshape
      \[\text{index and thumb touching at the pads of the fingers}\]

(2) Whole entity classifiers
   a. vehicle: 3-handshape
      \[\text{thumb, index, and middle finger extended}\]
   b. airplane: ILY-handshape
      \[\text{thumb, index, and little fingers extended}\]

(3) Size and Shape Specifiers
   a. long-thin-object: 1-handshape
      \[\text{index finger extended}\]
   b. small object: C1-handshape
      \[\text{index finger curved}\]

Figure 2. Examples of handshapes used for three types of classifiers in ASL.

The specific identity of the classifier is made clear by the signer before the classifier is introduced. The third and final group is known as size and shape classifiers (CL_{ss}) where the hands ‘draw’ the object in space, indicating its size and shape. A distributional pattern that has
been observed in many sign languages is the preference for handling handshapes in agentive clauses and object handshapes in non-agentive clauses (Brentari et al 2013). The employment of classifier predicates is that they are a faculty acquired with time, just like any other aspect of a language’s grammar. Studies have shown that children take up until age 10 to use classifier predicates with the full morphological complexity of hand shape as native adult signers (Schembri 2001). Interestingly however, children as young as 3 have been shown to understand the agentive/non-agentive split between handling and object classifiers, as discussed previously (Brentari and Coppola et al).

For the purposes of this thesis, I will be examining two-handed classifier predicates in ASL in a small corpus of bimodal ebooks through Gallaudet University’s RISE project. Two-handed classifier predicates can be defined as two simultaneously produced handshapes, where at least one hand is a classifier predicate. In order to abide by, only one hand would be expected to produce a lexically specified movement.

2. Methods

2.1 Overview of the Dataset: Bilingual-Bimodal Ebooks

For this project, the signing data that I will analyze comes from five videos, varying from 4 to 7 minutes in length, that are taken from a collaborative project between students of Swarthmore College and Gallaudet University. The videos, available online for download, are a component of a set of ebooks designed to be used by children who are deaf or hard-of-hearing and use American Sign Language (ASL), along with their families. Each page of each ebook contains lines of English text, accompanied by illustrations and videos of students from
Gallaudet University performing a signed version of the action of that page. The following figure shows a page from *Jemima Puddleduck*.

**Figure. A Page of a Bilingual English-ASL version of Jemima Puddleduck** *(https://www.youtube.com/watch?v=aRjZbKWyJA&feature=youtu.be)*

As the layout of this page demonstrates, the ebooks are arranged to place emphasis on visual details that keep the child reader engaged and attended to the narrative. For example, the basket of eggs on the bottom right increases in number from page to page, a visual complement to the narrative itself. When tapped, the still image of the signer in the upper left expands to a full screen video of the ASL sentence, which range from 10 to 30 seconds in length.

These ebooks serve the important function of increasing access to the practice of shared reading for Deaf and hard of hearing children. Shared reading has been shown to facilitate a set of emerging literacy skills in young readers that includes understanding and expectation of narrative structure. (Sonnenschein 2002). According to Burnstein & Roskos, additional research has indicated that shared reading “substantially prepares children prepares children for the
learn-to-read process, developing their print knowledge, comprehension strategies and
vocabulary.” (Burnstein & Roskos) Thus, the ebooks serve to both address the disadvantages to
access in shared reading in Deaf children who use ASL, and most importantly provide material
that is engaging and enjoyable for deaf and hard-of hearing children.

From a linguistic perspective, the two most important distinguishing aspects of this
dataset that are relevant to this analysis are (1) that the signing is directed toward young children
and (2) that the signing is in the register of storytelling. I will argue in my analysis how these two
factors most likely influence the linguistic structure of the signing, providing a motivation for
increased simultaneity in morphological structure. A caveat is that because this thesis analyzes
the five videos present in the ebooks corpus, but does not contrast them with a baseline video of
prototypical signing, the analytical observations about the signing content cannot be taken as
positive claims for evidence. In spite of this, I will argue that the description and analysis of
these five videos will provide a rich framework for understanding and integrating simultaneity
into not only further linguistic and pedagogical research, but also development of real world
materials which can be accessed by the children who need them most.

3. Analysis

3.1 Sample Video Transcription

The following transcription of the ebook “The Night Before Christmas in ASL” is useful
in illustrating the near constant presence of simultaneity in the signing stream. In many instances,
both hands will perform a two handed sign, with one hand holding this as a discourse marker
while the other hand continues to sign. The sustained hold of a sign is indicated by the dashed
lines -- which correspond roughly to that handshape’s duration.

Video #1 Transcription: The Night Before Christmas
‘It was the night before Christmas.’

‘Everywhere in the house was quiet.’

‘People were not walking around.’

‘Mouses were not scurrying about.’

‘In the house, the family carefully hung their red stockings on the chimney, which was decorated in white trim.’

3.2 Two-Handed Simultaneity of Classifier Predicates
The following figure lists 10 examples of two-handed classifier predicates found in the corpus of RISE ebooks, available on Gallaudet’s website. These configurations can be defined as two independent yet simultaneously realized handshapes produced by the dominant and nondominant hand, with at least one handshape specifying a classifier predicate.

**Table 1. Two-Handed Classifier Predicates in the RISE set of ASL ebooks**

<table>
<thead>
<tr>
<th>#</th>
<th>Discourse/Time</th>
<th>Gloss of Dominant Hand</th>
<th>Gloss of Non-Dominant Hand</th>
<th>Screenshot of Signer</th>
<th>English Translation of ASL Sentence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>“The Night Before Christmas” 0:38</td>
<td>( CL_{H}^{\text{CL}}: ) PLACING-STOCKING-ON-CHIMNEY, ( CL_{S}^{\text{CL}}: ) CHIMNEY,</td>
<td></td>
<td></td>
<td>‘The stockings were placed carefully, one by one, on the chimney.’</td>
</tr>
<tr>
<td>2</td>
<td>“The Night Before Christmas” 01:40</td>
<td>( CL_{H}^{\text{CL}}: ) PARTING-BLINDS</td>
<td>( CL_{C}^{\text{CL}}: ) MOON</td>
<td></td>
<td>‘Peering through the blinds, I looked out at the moon which was shining bright.’</td>
</tr>
<tr>
<td>---</td>
<td>----------------------------------</td>
<td>----------------------------------</td>
<td>----------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>“He leapt onto his sleigh”</td>
<td>He leapt onto his sleigh.</td>
<td>“He leapt onto his sleigh”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>“Three stockings hung from the chimney.”</td>
<td>Three stockings hung from the chimney.</td>
<td>“Three stockings hung from the chimney.”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>“As Humpty Dumpty sat on the wall, a rooster came by.”</td>
<td>As Humpty Dumpty sat on the wall, a rooster came by.</td>
<td>“As Humpty Dumpty sat on the wall, a rooster came by.”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>“While I get the pot ready, will you go to the garden and get parsley, onions and celery?”</td>
<td>While I get the pot ready, will you go to the garden and get parsley, onions and celery?</td>
<td>“While I get the pot ready, will you go to the garden and get parsley, onions and celery?”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Page</td>
<td>Title</td>
<td>CL_o:Look-at</td>
<td>CL_s:Look-at</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-------</td>
<td>--------------</td>
<td>--------------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>“The Slant Book”</td>
<td>CL_o:LOOK-AT</td>
<td>CL_o:LOOK-AT</td>
<td>‘Two men argued at a tennis meet, they didn’t know what to do.’</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>“The Slant Book”</td>
<td>CL_o:LOOK-AT</td>
<td>CL_s:STUMP</td>
<td>‘The carriage raced toward the stump.’</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>“Stick’s Masterpiece”</td>
<td>CL_s:TINY-DOT-O</td>
<td>CL_o:BRUSH</td>
<td>‘A little bird bumped her brush, making a golden dot.’</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>“Stick’s Masterpiece”</td>
<td>CL_o:BRUSH</td>
<td>CL_s:CENTIPEDE</td>
<td>‘She painted the centipede’s socks green.’</td>
<td></td>
</tr>
</tbody>
</table>
4. Discussion

Analysis of this set of five ebooks reveals an abundance of two-handed classifier predicates. Furthermore, these configurations suggest a wide array of combinatorial possibilities as to the types of classifier predicates which may be produced simultaneously. These include two object classifiers (example 3 and 7), an object and a handling classifier (example 2), an object classifier and a size and shape classifier (8, 9, and 10), and a handling and size and shape classifier (example 1). In some cases, one hand may produce a classifier while the other hand produces a lexical sign (5) or a referential index (6).

In two-handed classifier predicates, the hands may have varying degrees of grammatical relation with one another. For instance, in examples 3 and 8, the two hands form a close semantic and syntactic relationship, with the dominant hand occupying the role of agent and the non-dominant hand the role of patient. The glosses in the figure further indicate this close relationship through coreference. On the other hand, the signers’ two hands in examples 5 and 6 do not participate in the same predicate. However, because their simultaneous occurrence positions them closely in the discourse, the two arguments most likely have a close temporal or
spatial relationship. The fact that these actions are realized simultaneously is a demonstration of the visual-spatial modality’s ability to replicate the iconicity of space.

In terms of morphology, the examples in Table 1 all abide by Hendriks’ constraint on simultaneity discussed in the introduction, that states if both hands articulate a lexically specified handshape, only one hand may articulate a lexically specified movement. Thus, the non-dominant hand is usually stationary while the dominant hand moves, which supports theories of simultaneity which attribute the dominant hand to the linguistic foreground and the non-dominant hand to the background. While the examples from the dataset all abide by these morphological constraints, further analysis of languages beyond ASL would be needed to support the theory that these constraints are universal to sign language grammar.

A final important feature to discuss with respect to these two-handed classifiers is the additional presence of the non-manuals, including facial expression, eye gaze, and mouth gesture. The non-manuals may be direct arguments of the predicate, as in example from figure 6, where eye gaze occurs toward the nondominant hand (MOON). The facial expression of squinting categorizes the action of seeing described in the sentence. As the non-manuals co-occur with the movement of the hands, they demonstrate the complexity of simultaneously encoded meaning in ASL. The abundance of non-manuals suggests that signers are fully capable of producing both two-handed classifier predicates and non-manuals at the same time under the given constraints of simultaneity.

5. Conclusion

While sign languages users across the globe have faced stigmatization and oppression by hearing majorities, linguistic evidence has widely refuted claims that sign languages are not
‘language’, and indeed shown the rich linguistic complexity engendered by their unique visual-spatial modality. This modality enables signers to exploit the inherent simultaneous properties of space to construct a linguistic message, which radically reorients our conception of language as purely linear.

This thesis has attempted to explore more in depth the concept of simultaneity through analysis of two-handed classifier predicates. The corpus of ebooks showed numerous instances of these predicates, suggesting that despite the cognitive demands on simultaneous articulation, these structures are smoothly and spontaneously produced by fluent ASL signers. This supports the fundamental importance of simultaneity to the functioning of classifier predicates and ASL grammar in general. Further research can be done to examine whether the complex possibilities of simultaneity are producible by the intended audience of the ebooks: child signers, which may be able to shed light on the development of simultaneity.

This corpus of ebooks illustrates the ways in which the Deaf community is at the forefront of generating passionate and innovative technologies that are modality-specific, and serve the ultimate aim of enriching the community through expanded access to shared reading. It is my hope that further research will continue to shed light on these technologies and their linguistic content.
6. References


-----------. Marit Vogt-Svendsen & Brita Bergman. 2007. "A crosslinguistic comparison of buoys:


Web. 8 Dec. 2015.