ABSTRACT

ACCESSING THE SEMANTICS OF JAPANESE NUMERAL CLASSIFIERS

By

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For learners of Japanese, the semantics associated with numeral classifiers are non-transparent and often a source of difficulty in language acquisition. To better understand the accessibility of the semantics governing numeral classification and the metacognitive processes involved, this study examined acquisition of Japanese numeral classifiers in second language learning. Native speakers ($N = 48$) and second language learners of Japanese ($N = 41$) were presented with images of 20 items and asked to provide an appropriate classifier and explain their rationale. Items consisted of familiar and less familiar items in order to determine the role of frequency. That is, unfamiliar objects would rule out a reliance on previous exposure to the object while inducing participants to draw on semantic features or to supply a default counter. Results revealed that (1) non-native speakers defaulted to the most general inanimate classifier, and (2) when semantics were drawn upon, features of shape were the most salient, while size and function lacked semantic accessibility.

ACCESSING THE SEMANTICS OF JAPANESE
NUMERAL CLASSIFIERS

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LIST OF ABBREVIATIONS

L1	first language
L2	second language
FLA	first language acquisition
SLA	second language acquisition
NCAH	Numeral Classifier Acquisition Hierarchy
NNS	non-native speaker(s)
NS	native-speaker(s)

INTRODUCTION

In Japanese, numeral classifiers (also known as counters) are morphemes that attach to quantity expressions. Their use involves an understanding of the characteristics of the quantified object such that '1 person,' for example, would demand a different classifier from '1 car' (1-*ri*/-*nin*[1] and 1-*dai*, respectively, where the nouns for 'person' and 'car' are dropped). The classifier -*ri* is used for humans whereas -*dai* indicates an inanimate, concrete, functional machine.[2] Thus, quantifying an object first requires familiarity with its inherent semantic features and accordingly, the classifier that accompanies those characteristics.

Numeral classifiers do not appear cross-linguistically and can be difficult for second language (L2) learners to acquire. In Japanese, out of the approximately 150 numeral classifiers that exist, around 30 can be found in regular use (Downing, 1984). These classifiers can broadly be categorized into two groups—animate and inanimate—and are further subdivided to reflect size, shape, and function. For learners whose first language (L1) does not call for classifiers, the semantics associated with these morphemes are often obscure and can be a source of difficulty in language acquisition.

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[1] The classifiers -*ri* and -*nin* are allomorphs.

[2] It should be noted that because the nouns are dropped, some of these expressions can also represent other objects with similar semantic features (e.g., '1 bicycle' for 1-*dai*).

The bulk of research on numeral classifiers has focused on first language acquisition (FLA) contexts (Matsumoto, 1985; Muraishi, 1983; Sanches, 1977; Uchida & Imai, 1996; Yamamoto & Keil, 2000). While these studies have mapped children's conceptual development, our understanding of language acquisition is incomplete without considering how late learners acquire an additional language. According to DeKeyser (2005), investigating hard-to-learn elements of an L2 is an important way of shedding light on how humans use and acquire language. He reasons that by examining challenging grammatical forms, we can "better understand how weaknesses in the acquisition process interact with the design features of human languages" (p. 1).

In the realm of second language acquisition (SLA), of the few studies that have tackled numeral classifiers (for Korean, see Lee, 2006; for Chinese, Liang, 2009; for Chinese and Japanese, see Hansen & Chen, 2001), their focus has been on classifier production to reveal acquisition and attrition patterns without addressing how non-native speakers approach learning such a complex system. Liang's (2009) research on configurational classifiers yielded their order of acquisition—2D classifiers are acquired first, followed by 1D, and lastly, 3D, but remained within the most typically produced classifiers by L2 learners. Lee (2006) and Hansen and Chen (2001) designed production tasks that entailed asking participants (former, and at the time, current missionaries) to quantify objects in a series of pictures. They reported the following acquisition sequence (the reverse of which outlines the order of attrition): the production of a number without a classifier, an awareness of classifiers' obligatory role, and an eventual acquisition of the semantic rules. This last stage, however, conflates production with comprehension without ruling out frequency effects. Thus, L2 learners' comprehension of numeral classifiers has scarcely been researched.

I contend that among the few existing SLA studies on numeral classifiers, findings on L2 learners' comprehension carry little weight. While Lee (2006) incorporated a task intended to assess comprehension (match the spoken quantity expression to one of three pictures), not only did chance likely play too great a role, the narrowing down of semantics into relatively high contrasting features led to unenlightening results, at least where comprehension is concerned. Liang's (2009) comprehension task presented subjects with 10 objects shaped from molding clay, eight of which could be classified according to only one shape counter. The remaining two were of irregular shape to prevent participants from relying on process of elimination. As a semantic feature, for L2 learners, shape has shown to be quite salient (Hansen & Chen, 2001; Li, Dunham, & Carey, 2009). The findings from Liang's (2009) study are so tightly focused within one highly accessible feature that they do not add to our greater understanding of how adult language learners approach complex grammatical forms.

To address this glaring gap in SLA research on numeral classifiers, particularly with respect to L2 learners' approach to and comprehension of a difficult structure, the present study investigated how advanced learners of Japanese navigated their way through the numeral classifier system. Given the difficulty associated with numeral classifiers, this study set out to determine if L2 learners rely on a default counter (and if so, what counter and under what circumstances), and to understand their thought processes when applying counters.

Chapter 1 lays the theoretical foundation to frame the present study. It begins with organizing universal semantic characteristics in an implicational scale of accessibility known as the Numeral Classifier Acquisition Hierarchy (NCAH). Its implications are echoed throughout the next two sections exploring FLA and SLA studies on numeral classifiers. Throughout the review of these studies, it becomes apparent that not only is there an insufficient amount of SLA research conducted on the topic, but that comprehension has not been properly assessed. Chapter 1 closes with the research questions that motivated the present study.

Chapter 2 explains the methodological approach taken to investigate particpants' production and awareness of the semantic qualities associated with numeral classifiers. After a description of the subjects is given, the elicitation instruments are explained in detail. The elicitation instruments include a classifier suppliance task (Classifier Fill-in) followed by participants' explanations for each suppliance (Metacognitive Inquiry). Thereafter, the means of conducting analyses on the quantitative and qualitative data gathered are outlined. The results from which are shown in Chapter 3. The quantitative results are shared first so that the qualitative data can substantiate the empirical findings.

A thorough discussion of the results is found in Chapter 4 where distinctions are made between native and non-native speakers of Japanese and their production and comprehension of counters. I also explain the decision to group heritage speakers with L2 learners and discuss the ongoing refinement process that L2 learners face. This section makes it clear that on the topic of numeral classifiers, FLA and SLA processes are quite different, and as such, further SLA research is warranted.

Chapter 5 is the conclusion wherein I propose a slight reorganization of the Japanese numeral classifier system based on the study's findings so that language learners and instructors can approach semantically-based categories not only more explicitly, but in a more native-like fashion. Lastly, I discuss the limitations and suggestions for future research on a topic that has garnered little attention. Like DeKeyser (2005) urges, considering our thirst to understand language acquisition, it is worthwhile to examine how adult learners navigate complex language features because it can reveal a greater understanding of the human ability to use and acquire language.

CHAPTER 1

PRIOR RESEARCH

Numeral classification requires categorizing an object according to its attributes rather than a group of its referents. It entails knowing what semantic features to draw upon and the classifiers associated with those characteristics. As such, examining comprehension and production of classifiers may lead to our understanding of semantic and conceptual development in language acquisition.

The Numeral Classifier Acquisition Hierarchy (NCAH)

The cross-linguistic semantic features that dictate classification have been placed in an implicational scale referred to as the Numeral Classifier Acquisition Hierarchy (NCAH). The broadest points on the scale in order of accessibility are as follows: Animacy > Shape > Function, where the most accessible attribute, animacy, is the least marked while function is the most inaccessible of semantic features. Adams and Conklin (1973) break the NCAH down even further to include descriptions (not definitions) of these broad classifications:

Animacy: animate (human versus nonhuman) and inanimate

Shape: basic shapes including long, round, flat

Function: tools, written materials, machine-like objects, etc.

Within these broad categories exist classifiers that accompany each characteristic. Once categorization takes place at the broadest level, the referent's feature(s) dictate the classifier. Figure 1 roughly illustrates the Japanese numeral classifier system with some of the early counters acquired by children.

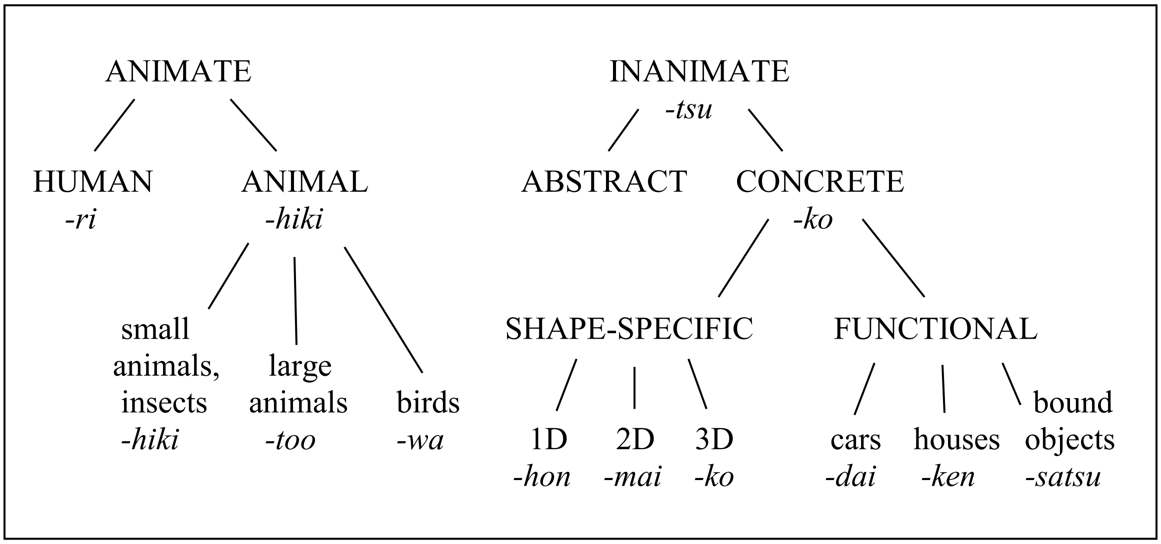

FIGURE 1. Abridged version of the Japanese numeral classifier system.

Early research by Matsumoto (1985) supports the ordering of the NCAH. In a series of tests examining L1 acquisition of numeral classifiers, he looked at the subcategories within the largest groups by presenting children with pictures of objects and asking them to state the number of objects (i.e. number + classifier) they found in each. Among the inanimate categories, he found that *-tsu* (for generic, inanimate objects) and the slightly more specific *-ko* (for shape-specific 3D inanimate objects) emerged most often, followed by *-mai* (for flat, 2D-like items) and *-hon* (for long, skinny, 1D-like objects). *-Dai* (for functional items) appeared to be the least accessible.

First Language Acquisition (FLA)

Interest in FLA has led researchers to examine children's comprehension and production of numeral classifiers. FLA research presents the development as one that favors unmarked, general classifiers to begin with, but becomes more varied with age. Uchida and Imai (1996) outlined three specific phases starting with children's inability to apply a counter, followed by an awareness of a classifying system during which children overgeneralize, and concluding with their ability to differentiate more specific quantifying morphemes. These three stages correlate with findings from Yamamoto and Keil (2000). In their examination of children's order of acquisition of numeral expressions, 157 children (ranging from 3-6 years of age) identified objects that matched the given spoken numeral expressions. To compare strong and weak contrasting counters, stimuli were presented in two groups: classifiers from different domains (e.g., animal and function) and the same domain (e.g., long-shaped and flat-shaped). Not surprisingly, the children demonstrated more accuracy with classifiers from high contrasting categories than from within the same hierarchy of characteristics. At the younger ages, when specific counters are the least accessible, *-tsu* and *-ko* were supplied as default counters. Yamamoto and Keil concluded that children's understanding starts broadly as they are able to differentiate among the general categories, and with age, becomes more specific within each. This not only supports earlier findings that only initially do children produce more general classifiers, but adds to the depiction of an underlying schema taking shape. Additionally, Yamamoto and Keil's data revealed that children's semantic awareness becomes more adult-like around six years of age. Figure 2 depicts the first numeral classifiers acquired by children. Note that the initial emergence of -*ko* is indicative of its overextension, and that adult-like usage of the counter takes place at a later, undetermined age.

Age	Acquired Classifiers		
1.5	Start of acquisition		
↓	-*tsu* (general, inanimate classifier)		
	-*ko* (small 3D objects)		
	HUMANS		
	-*ri/nin*		
4			
↓			
5	ANIMALS		
	-*hiki* (general)		
	-*too* (large animals)	SHAPE-SPECIFIC	FUNCTIONAL
	-*wa* (birds)	-*mai* (flat, 2D-like)	-*dai* (mechanical objects)
		-*hon* (long, skinny, 1D-like)	
		-*tsubu* (0D, tiny objects)	-*ki* (airplanes)
			-*soo* (boats)
			-*satsu* (bound objects)
↓			-*ken* (houses)
		-*ko* (adult-like usage)	

FIGURE 2**.** Children's order of acquisition of Japanese numeral classifiers. Data organized by Yamamoto & Keil, 2000 and compiled from Sanches, 1977; Muraishi, 1983; Matsumoto, 1985; Uchida & Imai, 1996.

L1 production studies have offered insight into the order of acquisition of numeral classifiers. It has been shown that children prefer unmarked, more general classifiers and use them as placeholders for later acquisitions of more specific ones (Matsumoto, 1985; Muraishi, 1983; Sanches, 1977; Yamamoto & Keil, 2000). In cases where errors are made, children creatively categorize objects based on semantic similarities that Matsumoto deemed as natural classifications. SLA research suggests that, like children, adults search for conventional ways to classify objects.

Second Language Acquisition (SLA)

Hansen and Chen (2001) compared adults' L2 acquisition and attrition sequences of Chinese and Japanese. Employing the same elicitation technique as found in Matsumoto (1985), the learners/attriters were presented with drawings and asked to state the quantity shown in each image. In both languages, Hansen and Chen found animacy classification to be the least marked followed by general counters for inanimate objects. In instances when more specific counters were supplied, the ordering of NCAH's broadest categories was made evident. Lee (2006) also investigated acquisition and attrition but among non-native speakers of Korean. As a reiteration of the NCAH and confirmation of Hansen and Chen's findings, Lee documented a high usage of general classifiers. This strong preference for general classifiers is not surprising considering that they carry the greatest semantic range and, as Lee pointed out, they are not required to communicate effectively (p. 58). What prevents L2 learners from achieving native-like specificity? A closer look at the semantic features associated with the more specific classifiers may offer some insight into this topic.

Research on numeral classifiers in SLA is limited but one study suggests that within the general categories, accessibility in and across subcategories can vary significantly. Recall that aside from shape, relevant semantic features also include size, function, and dimensionality. In a series of studies involving entity construal, Li, Dunham, and Carey (2009) reported that English speakers tend to focus on shape. This suggests that English speakers do not have a solid grasp of the numeral classifying system and perhaps, require more explicit instruction about semantic features other than shape. This bears significance not only for its acquisition but for its attrition as Hansen and Chen (2001) point out that the NCAH is closely associated with input frequency. That is, acquisition and loss of this system can be traced back to the amount of input. Frequency can influence markedness and ultimately dictate accessibility. As has been found by L1 and L2 studies, as a semantic feature, function is cross-linguistically the least accessible. A notable exception can be seen in Hansen and Chen's (2001) research. Hansen and Chen found that their missionary subjects were able to correctly classify the bicycles according to the function counter -*dai* due to their daily interactions involving bicycles. In this case, frequency seemed to play a significant role in making -*dai* more accessible. It remains to be seen, however, if frequency also unlocks an object's inherent semantics. In other words, with greater frequency, have the semantics that -*dai* specifies been made salient such that it can be extended to other items that are mechanical and/or gadget-like? Or is their production a reflection of frequent exposure to the object rather than semantic awareness?

The Role of Frequency

The role that frequency and/or familiarity may play has scarcely been considered in prior studies' methodological approaches. Across FLA and SLA studies, classifier elicitation instruments have involved presenting subjects with line drawings or pictures of familiar objects. For their participants whose ages ranged from 3 to 6 years old, Yamamoto and Keil (2000) selected images from children's books to ensure their familiarity; familiarity, however, might have contributed to the results. The test items included animals, pencils, televisions, apples, and so on, and could hardly be considered unfamiliar to children. Previous exposure aside, all subjects went through at least one training session in which children were primed for the picture identification task.[3] The children were asked to identify the one picture (out of three) that matched the experimenter's spoken description. For example, the experimenter would say the quantity expression 1-*satsu*,[4] to prompt the child to select the correct image. Feedback was given after each session. Children were encouraged to focus on the spoken classifier and to repeat the correct phrasing when asked by the experimenter, *Doo kazoeta?* "How did I count it" or *Nante itta?* "What did I say?" (p. 391). While I do not doubt Yamamoto and Keil's findings that illustrate children's underlying schematic map forming, this provision of feedback, explicit focus on accurate classifier production, and use of familiar items surely tampered with children's natural conceptual understanding and developmental progress.

By contrast, Matsumoto (1985) included novel objects in his test materials upon the suggestion made by Gandour, Petty, Dardarananda, Dechongkit, & Mukngoen (1984). According to Gandour et al., unfamiliar objects are better suited in assessing one's knowledge of classifiers' semantic criteria. That is, it is in the application of a counter to a new instance that an individual's understanding of the governing semantics

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[3] While Yamamoto and Keil state that new images were used for the tests, it is not clear if the referents remained the same.

[4] The function counter -*satsu* specifies bound objects such as books or magazines.

at play is revealed. As such, Matsumoto had children quantify several objects that were intended to be unfamiliar to his young participant group (ages ranged from 5-7). These test items included imaginary tanks, test tubes, and cassette tapes, to name a few. His inclusion of infrequently encountered objects revealed two things: (1) general classifiers are warranted for less typical items, and (2) one's perception does not always align with the language's convention.[5] This suggests that classifier production and comprehension of their associative semantics do not go hand in hand. Furthermore, from a methodological standpoint, the inclusion of less familiar objects rules out frequency effects while putting a spotlight on semantic salience and the metacognitive process involved in numeral classification. Employing this method in a SLA context can reveal the extent to which L2 learners look to semantic information.

Assessing Comprehension

The scant research available on numeral classifier acquisition among adults has emphasized the role of semantics, however, has remained largely concentrated on the production of counters. As is evident in L1 (Matsumoto, 1985) and L2 (Hansen & Chen, 2001; Lee, 2006) studies, participants are typically presented with a series of images and asked how many of a particular item is depicted in each. As briefly mentioned before, in the few instances where comprehension tasks have been incorporated, (Lee, 2006; Yamamoto & Keil, 2000), subjects were asked to point to one of three pictures that matched the experimenter's spoken quantity expression. Given the 33% chance of randomly selecting the correct image, this assessment's characterization as a

[5]For example, some children produced the counter for flat objects -*mai* for cassette tapes when it demanded -*hon* because of the actual tape.

comprehension task is misleading. Furthermore, the three options were often from high contrasting semantic domains. For example, in FLA: fish versus women versus clocks (Yamamoto & Keil, 2000); and not too differently in SLA: boys versus birds versus balls (Lee, 2006). As these studies have shown, human animacy is easily discernable from animals, leaving behind the highest contrasting classifications from which to choose and, as a result, likely raising that 33% chance of correctness to 50%—if not higher—particularly for adults who have established these semantic concepts. This brings into question the validity of the findings from these comprehension tasks and points to the need to refine how semantic awareness is assessed.

The Research Gap

The vast majority of research on Japanese numeral classifier in a SLA context has revealed similar patterns of acquisition to children wherein general counters are relied on until more specific counters are learned. However, given the fundamental difference between conceptual development (among Japanese children) versus conceptual organization (among adult learners of Japanese), qualitative differences between the two have scarcely been explored. Of the SLA studies available (Hansen & Chen, 2001; Lee, 2006; Liang, 2009), researchers have largely concentrated on classifier production and have taken their participants' performance as an indication of semantic awareness. Without ruling out potential frequency effects and examining the metacognitive processes involved, we cannot conclude that production is representative of comprehension. The present study attempts to address these issues.

The Present Study: Research Questions

Due to the dearth of available information on numeral classifiers in SLA, two questions motivated the present study:

1. Do adults learning Japanese rely on a default counter?

2. When pressed to provide a counter, what are the metacognitive processes at work to reach that counter?

CHAPTER 2

METHODOLOGY

In order to appropriately address the research questions and assess production as well as comprehension, the present study's methodology combines a quantitative and qualitative approach. Qualitative data were gathered by tabulating individuals' classifier suppliances, meanwhile, qualitative data involved coding explanations for the classifiers produced. Native speaker (NS) responses served as a baseline to compare non-native speaker (NNS) responses with.

Participants

Participants consisted of two groups: 48 native Japanese speakers who served as the reference group, and 41 NNSs (intermediate to advanced non-native Japanese speakers/learners and heritage speakers of Japanese) who self-reported English to be their dominant language. Among the NSs were 36 females and 12 males whose mean age altogether was approximately 34, meanwhile, in the experimental group, there were 12 females and 29 males (mean age = 31).[6] While Japanese proficiency level was not controlled for, they were selected for having working knowledge of the Japanese classifier system as was demonstrated by their responses to the elicitation instruments. That is, in order to be included in the study, participants' responses must have contained classifiers; participants who attempted to name the referent, for example, did not

[6] See Appendix A for participant information.

demonstrate the requisite knowledge of Japanese numeral classifiers and were excluded from analyses.[7] According to their linguistic profiles, the nature of exposure to Japanese included family, friends, self-study, media, and language courses.[8] The mean length of exposure to Japanese was approximately 13 years. Participants were recruited via the snowball effect; first, through the researcher's personal affiliations followed by their contacts. Social media played a large role in the recruitment process. Moreover, with the use of a web-based survey, subjects from all over the world were able to participate.

Elicitation Instruments

To investigate NNSs' production and comprehension of Japanese numeral classifiers, the participants took a 20-item web-based survey[9] consisting of two parts: (1) Classifier Fill-in and (2) Metacognitive Inquiry. Participants were asked to (1) fill in the blank with a single classifier that they would use for each image, and (2) explain their classifier choice. The Classifier Fill-in was designed to address the first research question regarding NNSs' reliance of a default counter. Taking a qualitative approach, the Metacognitive Inquiry was created to answer research question two by asking participants to explain their classifier choices. These two tasks were done in tandem with the presentation of each item. The survey was accessed via the internet through Qualtrics, and took approximately 15-20 minutes to complete.

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[7] In total, there were 112 respondents but 23 did not meet the criteria in order for their responses to be considered.

[8] See Appendix B for participants' nature of exposure to Japanese.

[9] See Appendix C for the URL.

Classifier Fill-in

Five counters from the inanimate hierarchy were investigated: *-tsu, -ko, -mai, -hon,* and *-dai.* These are among the first nine numeral classifiers that appear in Japanese children's L1 (Matsumoto, 1985; Sanches, 1977; Uchida & Imai, 1996; Yamamoto & Keil, 2000). The motivation for not including animate objects was because on a superficial level, animate versus inanimate would not be hard to discriminate. Moreover, on the basis that like children's L1 acquisition, L2 learners would also produce more general classifiers before specific ones (and thus, not have difficulty between high contrasting groups at the broadest level), concentrating this research within one hierarchical category was more revealing.

The survey's 20 inanimate items (see Table 1) consisted of a combination of images of both familiar and less familiar—or not as commonly quantified—objects.[10] The objects' names and descriptions were not provided because, as a reminder, quantifying an object in Japanese does not require knowing its name, simply its classification. The purpose of using known objects was to examine if familiarity (thus, frequency) played a role in counter production while the use of unfamiliar (but not novel) objects such as the quill pen or ambiguous kitchen gadget induced the participant to provide a counter without relying on previous exposure to the item. In other words, the presentation of a less frequently encountered object required participants to draw on what they observed as the given object's significant features, the result of which was the suppliance of a classifier that matched those qualities. In cases where the participant did

[10] These items were selected for displaying a range of semantic features that were relevant to the study. All images had been pilot tested.

not or could not refer to the referent's characteristics, it was expected that a default classifier was provided. This is where the Metacognitive Inquiry portion (*Why did you choose [the above] counter?)* supported part one, the Classifier Fill-in.

TABLE 1. List of Picture Stimuli

bicycle	dresser drawers	keys	sharpener
cell phones	egg carton	kitchen gadget	shoes
clock	eyelash curler	magazines	stamps
columns	headphones	pizza cutter	sushi
door	head massager	quill pen	towels

Taking Japanese linguistic features into consideration, a range of typed responses with the same phonological reading was accepted. Test-takers typed their responses in kanji, hiragana, katakana or romaji.[11] For example, 'one sheet of paper' can be orthographically expressed in the following forms: 1枚, 1まい, 1マイ (though unlikely as katakana is typically used for foreign-derived words), or 1-*mai.*[12] Accepting responses in all orthographies enabled answers to reflect the participants' intention, regardless of their NS or NNS background. To demonstrate this, an image of a cat

[11] The Japanese writing system utilizes kanji (Chinese characters) and two syllabaries, hiragana (used for words native to Japanese) and katakana (for loanwords). Romaji is also used to express Japanese in Latin script and often used prior to learning traditional Japanese orthography.

[12] The acceptable readings listed are all read [mai].

(something classified according to animacy which was not examined in this study) and its range of acceptable responses were provided at the onset.

The other linguistic factor concerned alternation in Japanese. Expressing quantities sometimes requires a change in phonological shape depending on both the counter and number. For example, one pencil is counted as *'i**pp**on'* but when there are two pencils, the quantity is expressed as *'ni**h**on'* and *'san**b**on'* for three pencils.[13] Thus, in the present study, counters such as -*hon, -pon* and -*bon* were counted as the same numeral classifier. To minimize any effect that alternations would have on test-takers, the directions explicitly stated that the survey was not concerned with a counter's correct morphophonemic changes, but rather, the participants' overall classifier choice. The cat was referred to again to illustrate this point as the typed classifier could be -*hiki*, -*piki* or -*biki* (or their hiragana and katakana equivalents) regardless of the number of cats depicted.

Such considerations regarding alternation in Japanese and the test's elicitation of written rather than oral responses should address a concern discussed by Yamamoto and Keil (2000). During their study on children's oral production of Japanese classifiers, they speculated that due to the added difficulty that comes with sound alternations among particular counters, classifier production may have been affected or even avoided. Thus, the present study had been designed to take into account potential issues that arise with oral production as well as alternations.

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[13] Note that as phonological changes, alternations cause only the syllabaries (hiragana and katakana) and romaji to be affected in the orthography; the kanji remain the same.

Metacognitive Inquiry

To address the second research question and examine the metacognitive processes involved, both groups were asked to explain how they reached each of their answers. Single word answers or short phrases sufficed. The earlier image of the cat and sample example answers (e.g., *small animal* or *don't know/remember specific counter*) were provided to demonstrate what was expected in this task. Members of the reference group were prompted with the additional instruction to explain their responses as if they were teaching classifiers to NNSs. The rationale for this was to encourage NSs to examine what features are associated with which classifiers because in the pilot study, the reference group's responses to the metacognitive inquiry occasionally did not draw upon objects' semantic features. In these instances, they generally named the object. Most likely, this was due to the fact that NSs do not consciously have to consider an object's underlying semantics, especially for familiar items. As for the experimental group, the pilot study revealed that reference to an object's features is automatized by NNSs. NNSs responses consistently contained mentions of size, shape, length, and dimension. Therefore, any prompting of NNS responses to refer to these characteristics was not only unnecessary, but would muddy the experimental group's qualitative data by directly asking them to consider these features.

Analysis

Analysis of the quantitative data first entailed coding the responses for consistency. As previously mentioned, a range of typed responses were accepted to take into account written Japanese orthographies as well as morphophonemic changes. To this effect, responses in hiragana, katakana, and kanji were converted into romaji (e.g., -まい, -マイ,

and -枚, respectively, became -*mai*). Meanwhile, and -*pon* and -*bon* were coded as -*hon*; the other classifiers under investigation do not undergo alternations. Thereafter, NS and NNS responses were tabulated in order to find participants' classifier ranges and the frequency with which each counter was used. The number of counter occurrences was totaled for each participant. These figures indicated that the most frequently occurring counters were *-tsu, -ko, -mai, -hon*, and -*dai*. This list of five counters is a reiteration of the pilot study's findings and coincides with L1 development wherein these are the first inanimate counters acquired by children (Matsumoto, 1985; Sanches, 1977; Uchida & Imai, 1996; Yamamoto & Keil, 2000). Furthermore, it supported the present research's rationale to focus on these classifiers among adults.

Listing the classifiers that emerged and recording the number of appearances that each made according to group allowed the researcher to determine which were the most frequently used. A cross-comparison of the two groups' classifier suppliance revealed not only the extent to which the experimental group's responses were native-like, but the accessibility (or inaccessibility) of particular counters. To do this, for each of the five classifiers investigated, NS and NNS responses were compared by employing Mann-Whitney U tests. These findings offered the statistically-grounded answers to the first research question regarding a default counter which will be discussed in the Results section.

To analyze data from the metacognitive inquiry, qualitative data were organized according to semantic features that participants found salient and/or pertinent to their suppliance of accompanying counters. A rough coding schema based on the pilot study was adopted. Answers from the experimental group fell into five categories, each corresponding with one of the five numeral classifiers investigated. The classifiers along with their associative key words/phrases from sample responses taken from the pilot study are as follows:

-*tsu*: do not know specific, normal, universal, standard, general use

-*ko*: small, round

-*mai*: flat, thin, slim, slender, skinny

-*hon*: long, cylindrical

-*dai*: equipment, device

For the present study, the same range of counters as well as explanations for their uses emerged. Analyzing the qualitative data in this manner helped to address the second research question regarding the metacognitive processes involved in numeral classification by revealing different degrees of semantic salience from a L2 learner perspective. Moreover, it offered qualitative data to support one counter emerging as the default counter.

CHAPTER 3

RESULTS

Results will be discussed in terms of the elicitation instruments starting with the Classifier Fill-in, followed by the Metacognitive Inquiry. This way, the qualitative data will help to explain the statistical findings.

Classifier Fill-in

As previously mentioned, analysis of the quantitative data first required tabulating NS and NNS responses to find the frequency with which the investigated classifiers were used. Table 2 shows the total appearances of each counter and the number of suppliances by group. For example, NSs were responsible for 161 of the 393—or 41%—of the total -*tsu* appearances. Immediately below each figure is a percentage representing a typical NS/NNSs' use of the counter on the 20-item survey. For example, on average, NSs responded with -*tsu* for 17% of their 20 answers.

TABLE 2. Classifier Suppliance by Group

		-*tsu* (393)	-*ko* (296)	-*mai* (223)	-*hon* (195)	-*dai* (193)
NS	# of suppliances	161 (41%)	209 (71%)	126 (57%)	97 (50%)	125 (65%)
	% of responses	17%	22%	13%	10%	13%
NNS	# of suppliances	232 (59%)	87 (29%)	97 (43%)	98 (50%)	68 (35%)
	% of responses	28%	11%	12%	12%	8%

Note the contrast in use of -*tsu* and -*ko* among NSs versus NNSs. On average, native Japanese speakers used the shape-specific -*ko* more often than the most general inanimate counter -*tsu* whereas NSs' responses reflect the inverse pattern as can be seen in Figure 3. These figures hint at -*tsu* as a default counter for the experimental group. Results from statistical tests ultimately support this notion.

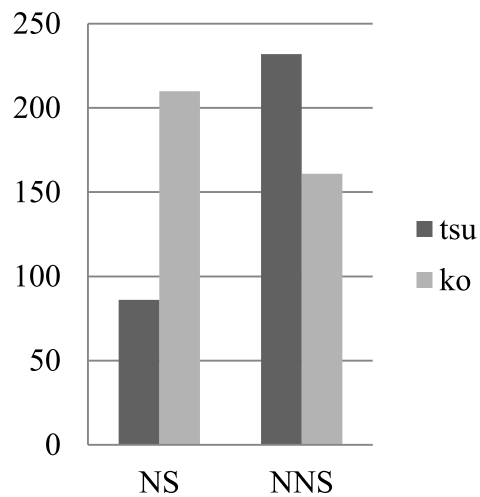

FIGURE 3. NSs' and NNSs' inverse patterns in use of -*ko* and -*tsu*.

Because the data were not normally distributed, non-parametric tests were conducted in order to cross-compare the two groups' classifier suppliances. A series of Mann-Whitney U tests compared NSs ($N = 48$) and NNSs ($N = 41$) and found significant differences between the two groups with regard to (1) the counter for small round objects -*ko* and the most general inanimate counter -*tsu*,

-*ko:* NS ($Md = 4$), NNS ($Md = 1$), $U = 660.50$, $Z = -2.70$, p (2-tailed) = .007, r = .95, power = .99

-tsu: NS (*Md* = 2), NNS (*Md* = 6), *U* = 637.50, *Z* = -2.88, *p* (2-tailed) = .004, *r* = 1.05, power = .99

and (2) the function counter *-dai,*

NS (*Md* = 2), NNS (*Md* = 1), *U* = 628, *Z* = -2.98, *p* (2-tailed) = .003, *r* = .66, power=.85

These results point to discrepancies between what the two groups considered to be more appropriate general and/or default counters in addition to the applicability of *-dai*, a counter associated with the least accessible semantic qualities according to the NCAH. In fact, *-dai* and/or its associative attributes appeared so inaccessible that there was not a single case found among 13 of the 41 NNSs.[14] Meanwhile, the counters of shape, *-mai* and *-hon*, did not reach statistical significant difference,

-mai: NS (*Md* = 3), NNS (*Md* = 3), *U* = 884, *Z* = -.865, *p* (2-tailed) = .387, *r* = 0, power = .07

-hon: NS (*Md* = 2), NNS (*Md* = 2), *U* = 875, *Z* = -.916, *p* (2-tailed) = .360, *r* = 0, power = .05

The comparable frequency with which *-mai* and *-hon* were used by both groups for objects that were thin and flat or long and skinny, respectively, suggests that features of shape are accessible regardless of participants' group membership. Table 4 illustrates NSs' and NNSs' near parallel suppliances for items that garnered *-mai* (stamps, towels) and *-hon* (quill pen, columns).

From here, analysis of the Metacognitive Inquiry can shed some light on the statistical findings discussed thus far.

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[14] There were only two NSs without a single *-dai* suppliance.

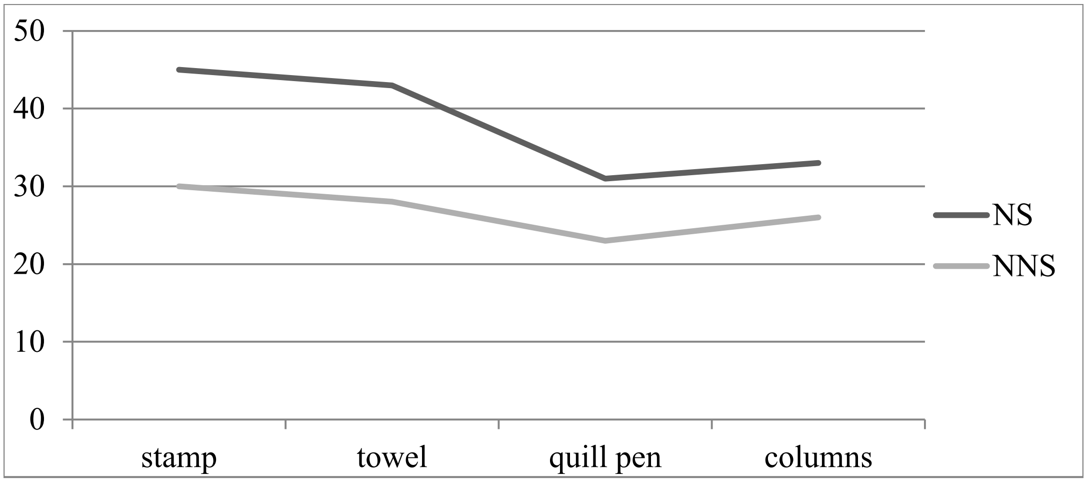

FIGURE 4. Similar patterns in use of shape-specific counters.

Metacognitive Inquiry

To analyze data from the metacognitive inquiry, qualitative data were coded according to semantic features that participants found salient and/or pertinent to their suppliance of accompanying counters. Explanations for supplying the five numeral classifiers were grouped based on the coding schema that was developed in the pilot study. Each classifier will be presented along with its co-occurring rationale. While not all Metacognitive Inquiry responses are listed verbatim, the following explanations are summarized to reflect themes throughout the responses. Where more than one theme appears, as is the case with -*tsu*, the explanations are grouped.

The General -*ko* and Even More General -*tsu*

The numerous explanations found for the use of -*tsu* illustrate this classifier's multipurpose nature (see Table 3). The experimental group reported -*tsu* as their general purpose counter for its applicability to objects that are ambiguous, seemingly random, or generally, for virtually any item. In addition, many NNS explicitly stated that it was their go-to counter. That is, in times of memory lapse or lack of a specific counter, they resorted to -*tsu*. It was also called upon when the referent seemed unclassifiable according to its semantics (typically those of shape[15]); as such, their instinct led them to supply the most general inanimate counter.

TABLE 3. NNSs' Rationale for -*tsu* Suppliances

-*tsu*	
General Purpose Counter	Default / Go-to Counter
• unknown objects	• don't know proper counter
• random / miscellaneous objects	• don't remember
• used for things / objects	• don't know what else to use
• basic / generic counter; can be used for almost anything	• no defined shape; neither cylindrical nor flat
	• instinct

Interestingly, rationale behind the use of -*ko* (see Table 4) had a combination of specificity as well as -*tsu*-like responses. Some NNSs noted that these objects were small while others relied on what they felt was a sufficiently general counter. Note that where similar explanations are found for -*tsu* and -*ko* suppliances, by and large, they did not correspond with individual participants. In other words, a NNS would not refer to both -*tsu* and -*ko* as their general purpose and/or default counter; thus, while the same

[15] Several participants noted that these objects displayed neither cylindrical nor flat features, or specifically referred to the inapplicability of -*hon* and -*mai*.

explanations for two distinct numeral classifiers were found in the qualitative data, they were supplied by different participants. Furthermore, while both *-tsu* and *-ko* had

TABLE 4. NNSs' Rationale for *-ko* Suppliances

-ko		
Small Objects	General Purpose Counter	Default / Go-to Counter
• round • holdable • small and solid	• generic, common counter • random, unfamiliar item	• specific counter unavailable • nothing else works • *-tsu* seems strange

suppliances associated with default-like responses (which in the pilot study, were virtually exclusive to *-tsu*[16]), *-tsu* not only had the greatest frequency, but was the one untethered to specific semantic features. NNSs used *-tsu* for what they deemed as general, everyday or even miscellaneous objects such as the egg carton, but even for less frequently encountered items like the head massager. In instances where participants were not able to remember or be able to supply a more specific counter, *-tsu* was generally supplied. There were also mentions of its use related to what NNSs instinctually felt was right, as well as explicit statements of it being their "go-to counter." The amount of variation that was found with the suppliance of *-tsu* was not found with

[16] While this finding seems to conflict the results from the pilot study, it does not challenge them because of the inherent overlap between the most general inanimate counter *-tsu* and the more specific *-ko*. In fact, in both studies, some NSs used *-tsu* with the same motives as NNSs and acknowledged that both *-tsu* and *-ko* would suffice.

any other counter. Its seemingly multipurpose quality without being specific lends support that for L2 learners of Japanese, there is a default counter—-*tsu.*

The fact that on occasion, similar explanations were found across -*tsu* and -*ko* is not problematic because the use of -*ko* had the addition of specific reasons. That is, size and shape were prominent characteristics that NNSs associated with the use of -*ko* which were qualities unattributed to -*tsu* suppliances. The quantitative analysis of the Classifier Fill-in revealed that the NNSs opted for -*tsu* more than -*ko* and to follow up, findings from the Metacognitive Inquiry show that when -*ko* was provided, NNSs mentioned that the objects[17] were "small," "round," and "holdable." Such specific descriptions were typical of -*ko* suppliances. Thus, the wide range with which -*tsu* is applied in addition to the lack of noteworthy attributes specified by it distinguish -*tsu* from -*ko.*

<u>Classifiers of Shape: -*hon* and -*mai*</u>

Across both groups, there was a considerable amount of unanimity with regard to what features -*hon* and -*mai* specified. In fact, the items that received the shape-specific counters garnered the least varied responses.

Starting with -*hon*, the objects that received this counter included the columns with 26 NNSs agreeing on the application of -*hon*, and the quill pen at 23 suppliances. Subjects cited these items' long and cylindrical features which were very much in line with NSs who referenced their length and stick-like attributes. Where NNS responses began to deviate from one another were with items that could partially be characterized as long and/or cylindrical. For example, the ambiguous kitchen gadget and pizza cutter were classified with -*hon*, likely for their cylindrical handles. Though not thoroughly

[17] Pieces of sushi, for example, were associated with all of these descriptions.

long and narrow, these features were salient enough for some of the L2 learners to draw upon. Table 5 lists the explanations accompanying -*hon* suppliances.

TABLE 5. NNSs' Rationale for -*hon* Suppliances

-*hon*
• long • cylindrical • narrow • tall • pole / pen / tree-like

Like -*hon*, there was a considerable amount of agreement across both groups with what semantic features -*mai* specifies. Participants' use of -*mai* consistently correlated with two-dimensional features for objects such as stamps and towels (see Table 6). In fact, thin and flat objects garnered the least varied descriptions from the experimental group. The stamps received the most with 30 -*mai* responses, followed by towels with 28 suppliances.[18]

It is worth mentioning that while magazines require the more specific function counter for bound objects -*satsu*, nine NNSs' application of -*mai* and their explanations reflect the very semantic features that -*mai* specifies—flat and thin. As such, while their quantifier selection is not correct when compared to the reference group, shape seems to

[18] Other items that received -*mai* included the door (13) and magazines (10).

be a salient feature, even with objects that can hardly be considered less familiar. Rarely were there deviations from these classifiers and their corresponding attributes which point to the salience of shape and—less explicitly—dimension. The same, however, cannot be said for -*dai*.

TABLE 6. NNSs' Rationale for -*mai* Suppliances

-*mai*
• thin • flat • square • sheet / paper-like

In the NNS data, the function counter -*dai* appeared for the bicycle (26 times), cell phones (9), pencil sharpener (9), clock (5), head massager (5), and key (2); however, the explanations surrounding its suppliance were not as neatly categorized by similar semantic features as was evident with the shape-specific counters -*hon* and -*mai.* For this classifier, Table 7 organizes NNSs' rationale according to the three objects it was assigned to most so that the perceived semantic disparity can be made clear.

The bicycle consistently drew explanations surrounding it being a vehicle or "mode of transport" from both NSs and NNSs. Meanwhile, according to the Metacognitive Inquiry data, the cell phones and pencil sharpener seemed more semantically similar to each other.[19] In fact, out of those 26 participants who responded with -*dai* for the bicycle, only 11 extended this function counter to the cell phones and pencil sharpener. This indicates that 15 participants were unable to extend the semantic features specified by -*dai* beyond its association with vehicle-like objects.

TABLE 7. NNSs' Rationale for -*dai* Suppliances by Item

-dai		
Bicycle	Cell Phones	Pencil Sharpener
• transportation • car-like • machine, mechanical	• machine, mechanical • electronic device • computer-like	• machine, mechanical

NSs generally agreed that quantifying the cell phone demanded -*dai,* and the nine from the experimental group that shared this view reasoned that they were machines or electronic devices. Those who drew on the comparison to electronics appeared to know that they called for the function counter -*dai*. The pencil sharpener (not the small handheld kind but the type with a crank) also received nine NNS suppliances[20] because they were seen as mechanical objects. As previously mentioned, not a single case of -*dai* appeared for 13 individuals in the experimental group which suggests that only two-thirds

[19] Interestingly, there were only six cases of NNSs providing -*dai* for both the cell phones and pencil sharpener.

[20] Six of these suppliances corresponded with the same individuals who supplied it for cell phones.

of the L2 learners had -*dai* in their classifier range. -*Dai's* application to seemingly semantically unrelated objects may be a cause for its inaccessibility, or at least, a source of confusion regarding what range of semantic features it specifies.

CHAPTER 4

DISCUSSION

<u>A Penchant for -*tsu* in SLA</u>

The combination of the Classifier Fill-in with Metacognitive Inquiry illustrates NNSs' strong reliance on -*tsu* for its lack of clear association with any semantic features, and therefore, overall applicability. While there were some NNSs who referred to the slightly more specific -*ko* as their default counter, quantitative data still point to NNSs' overwhelming preference for the most general inanimate counter. Interestingly, the patterns with which -*tsu* and -*ko* were used by the two groups were flipped versions of each other; whereas learners of Japanese relied on -*tsu* for the majority of their responses followed by -*ko*, native Japanese speakers opted for -*ko* the most, and secondly, -*tsu.* Figure 3 highlighted this contrast between the two groups with NSs being responsible for nearly three quarters (71%) of the shape-specific -*ko* appearances, while the bulk of -*tsu* responses (59%) were supplied by their non-native speaking counterparts. Table 8 further illustrates this reversed pattern with -*tsu* to -*ko* ratios according to group. That is, for native Japanese speakers, for every three times -*tsu* appeared, there were four -*ko*. In contrast, L2 learners counted objects as -*tsu* eight times for every three -*ko* classifications.

TABLE 8. Ratio of *-tsu* to *-ko* by Group

	-tsu : -ko
NS	3 : 4
NNS	8 : 3

Explanations for classifier suppliances support the findings from the pilot study in which the thought pattern between the two groups differed with regard to applying *-tsu* or *-ko*: Whereas NNSs default to *-tsu* in scenarios of being unsure, not knowing/remembering, or there not being a more specific counter, NSs take the extra step of looking to size to determine if *-tsu* or *-ko* is appropriate; if the referent is small, *-ko* is applied, otherwise *-tsu* is deemed appropriate. The following diagram depicts how the thought processes between native and non-native Japanese speakers differ when it comes to using these two counters.

NS: no specific counter → size ↗ small → *-ko*; ↘ large → *-tsu*

NNS: no specific counter / don't know or cannot recall → *-tsu*

FIGURE 5. Comparison of NSs' and NNSs' use of *-tsu* and *-ko*.

As shown in Figure 5, there are bound to be cases of overlap; thus, NNSs' use of *-tsu* is not an inaccurate one. Overlooking size, however, leads to its overgeneralization and an over-reliance on it and may prevent more specific counters from being learned and used. This may be a cause for the high frequency with which *-tsu* appeared among the NNS data.

Another factor affecting the motivation to acquire more specific classifiers is its overall communicative utility. Matsumoto (1985) refers to classifiers as "communicatively marginal" linguistic items (p. 80). According to Downing (1984), numeral classifiers' function is not to provide information about a referent's semantic attributes or even to identify the referent itself, but rather, to passively recognize its membership in a particular semantic category. Thus, defaulting to the most general inanimate counter does not result in miscommunication, simply a lack of specificity that is largely unnecessary. After all, inherently lacking in numeral classification is specificity. Because expressions of quantity replace the referent's name with a morpheme that specifies universal semantic features, context enables mutual understanding among the interlocutors to the extent that a general counter could suffice.[21]

Like children acquiring Japanese as their L1, for L2 learners of Japanese who recognize the need for this morpheme, the most general counter can serve as a placeholder until a more specific one becomes acquired (if at all). Hansen and Chen (2001) outlined the three stages of numeral classifier acquisition in SLA starting with a naked number, followed by recognition that counters accompany quantity expressions which results in an overextension of general counters, and lastly, the employment of a greater range of more specific counters. While the results from the present study do not conflict with this pattern of development, they suggest a comfortable lingering at the

[21] When specificity is called upon, the referent (e.g., paper) would be included in the quantity expression such that '2-*mai*' (or two 2D-like items) could take one of the following forms: (1) 2-*mai*-no kami; (2) 2-*mai* kami; (3) kami-o 2-*mai*; (4) kami 2-*mai.*

second stage for an undetermined amount of time, even for advanced speakers of the language. This may correspond with the acquisition of a few specific counters, but a general complacency with having established a default counter. Children, on the other hand, are expected to become competent native speakers by their language community (Hansen & Chen, 2001; Matsumoto, 1985). Perhaps, this is one area that differentiates between FLA and SLA and can be better understood from examining the performance of adult native speakers of Japanese.

Native-Like Specificity

As discussed above, NSs aim to be specific when possible. This quest for specificity led the reference group to consistently produce a handful of counters that were often absent from the NNS data. These included -*soku*, -*satsu*, and -*pakku* and were applied to the socks, magazines, and egg carton, respectively. For NSs, knowledge that these objects demand specific counters trumps the need to draw on their semantic features. Their responses to the Metacognitive Inquiry suggest that they are cognizant of the features they specify, particularly with -*soku* and *satsu.* According to their answers, -*soku* is typically used for footwear while -*satsu* (technically, a function counter) is applied to bound objects such books. For the egg carton, -*pakku* was predominantly used. Among the three more specific classifiers being discussed, -*pakku* was the least known by the experimental group. Interestingly, this appears to be a newer addition to the Japanese numeral classifier system that was adopted from the English ‘pack.’ Many of the Japanese participants entered this response in katakana, the syllabary used for foreign-derived lexicon. Given the newness of this counter—as was expressed by several NSs—L2 learners would not likely encounter it without the appropriate input. The amount of and quality of input is an important distinction between FLA and SLA that enables (or inhibits) specificity.

Earlier, for NSs, size was seen to be a final determinant before applying *-tsu* or *-ko* to an object whose specific counter was unavailable to them. This demonstrated NSs' avoidance of the most general inanimate counter, *-tsu* (at least when compared to NNSs). This consideration for a final criterion seems applicable for L2 learners, and yet, they appear unable to do so. Perhaps size is too subjective. It requires a reference point that L2 learners are not privy to. The results from the Metacognitive Inquiry data showed numerous accounts of participants making comparisons when possible for the shape-specific counters *-hon* and *-mai*, and even the function counter *-dai*. For shape (see Tables 5 and 6), NNSs remarked that the objects that received *-hon* were "pole," "pen," and "tree-like," while *-mai* classifications were "sheet" or "paper-like." For those comfortable enough to produce *-dai*, they compared these objects to vehicles as well as computers (refer to Table 7). Thus, NNSs' understanding of the numeral classifier system largely relies on exemplar-based learning. Table 4, however, shows that *-ko* did not receive any exemplars. The closest was with one individual from the experimental group that consistently described *-ko*'s use for "holdable" objects. The difficulty with size as a semantic specification is that it co-exists with other semantic features thereby presenting a potential dilemma: In what order does one apply semantic qualities? Because size is not only subjective and it does not have a clear reference point while coinciding with other characteristics, being as general as possible appears to be a way of hedging one's classifier use. At the same time, it also clearly divides NNSs from NSs.

Shape Bias

One feature that is not as subjective as size is shape. Shape has shown to be cross-linguistically salient in both FLA and SLA. Among NNSs of Korean, Lee (2006) found *cang*, the classifier for thin and flat objects, to be retained the longest alongside the human classifier *myeng* (as has been established, human animacy is the most accessible according to the NCAH). Hansen and Chen's (2001) study on Japanese learners and attriters echo these results showing that -*hon*, -*mai*, and -*ko* appear relatively early in acquisition and are retained longer than other classifiers. In an examination of entity construal by English, Japanese, and Mandarin speakers, Li et al. (2009) found that more shape-based—rather than substance-based[22]—categorizations were made. In FLA, Yamamoto and Keil (2000) and Matsumoto (1985) reported that children had strong categorical ability when it came to shape, and specifically when it came to the production of -*mai* and -*hon*. In fact, shape appeared to be so salient of a feature that even when children were presented with less familiar items in Matsumoto's research, they categorized them according to shape, regardless of the language's convention (e.g., -*mai* for a cassette tape when the language unintuitively calls for -*hon* given the tape's length when it is unrolled). A similar shape bias was found in the present study involving L2 learners. Even in cases that demanded a non-shape counter, NNSs referred to 1D and 2D attributes as was made evident with the magazines. As briefly mentioned earlier, bound objects require -*satsu*, a type of function counter, and yet NNSs found the thin and flat qualities of the magazines more salient.

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[22] Reference to an object's substance was found only once with the keys. The NNS cited the keys "metal" properties as a reason for classifying it with -*dai*.

Results from this study show that members of both groups consistently drew upon how thin/flat or long/cylindrical objects were. These findings support the notion of a shape bias. Evident with -*mai* and -*hon*, participants found shape to be the most salient characteristic which likely contributed to the Mann-Whitney U tests yielding no statistical significant differences between NSs and NNSs. When shape counters were not provided, the Metacognitive Inquiry still revealed a shape bias. The qualitative data indicate that many participants first look to shape. As seen in Table 3 outlining NNSs' rationale of -*tsu* suppliances, several L2 learners defaulted to -*tsu* only after ruling out 1D and 2D-like features. For these individuals, these objects (e.g., eyelash curler, pizza cutter) were not saliently defined by their shape, and as such, they resorted to the most general counter. Regardless of their final answer, however, shape was the first line of approach to classification.

The Difficulty with Function

In contrast to the semantic salience of shape, recall that according to the NCAH, function is the least accessible feature. One explanation for its inaccessibility can be found in the seemingly unrelated semantics subsumed by -*dai*, and subsequently, an inclination to latch onto one salient commonality while unconsciously disregarding other semantics specified. As a result, aptly using -*dai* for less transparently functional objects requires rote memorization, often at the expense of understanding its classification.

Dissimilar Semantic Features

Results from the quantitative data indicate that for many NNSs, the counter -*dai* is not in their classifier range. Of the individuals who had it in their repertoire of classifiers, less than half had the semantic awareness to apply it to other objects that called for it.

The qualitative data reveal potential reasons for its inaccessibility which all revolve around it being decoupled from a clear group of similar semantic features.

According to the reference group, -*dai* was necessary to classify the bicycle, and was highly appropriate for the cell phones and pencil sharpener. If NNSs responded with -*dai* at all, it was at very least to categorize the bicycle. NNSs remarked that it was because the bicycle was vehicle-like, implying that they were aware of -*dai*'s application to vehicles. This comparison to another mode of transport, however, cannot be made with the cell phones nor the pencil sharpener which share greater semantic similarity and may be a reason for -*dai*'s decline in use (see Figure 6).

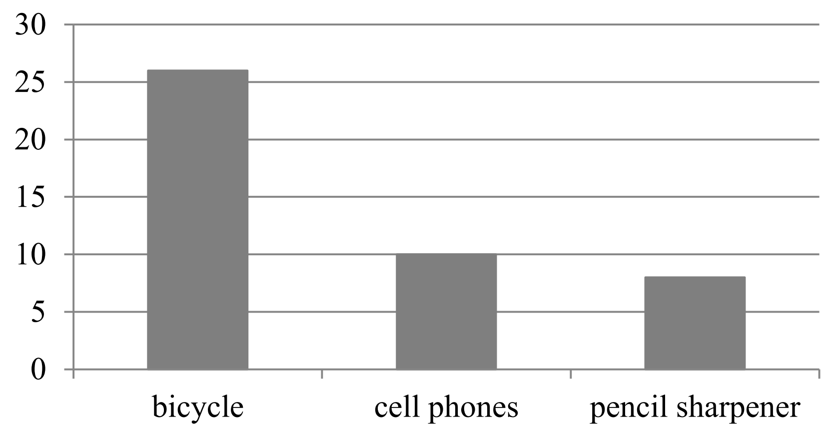

FIGURE 6. NNSs' decrease in production of -*dai.*

Adult's conceptual categorization of vehicles onto -*dai* reveals an attempt to find natural classifications and is quite similar to that of children's search for convention. Matsumoto (1985) found that children overextended its use to boats and airplanes even though nothing in their linguistic input would infer such because adult native speakers use -*soo* and -*ki*, respectively, for those objects. Furthermore, like the NNSs in this study, children also struggled to use -*dai* for non-vehicle machines. Matsumoto cites Clark (1976) and explains that because movement is such a salient feature for children (p. 83), it becomes a natural means of categorizing objects under -*dai*. Extending this reasoning to L2 learners, because of -*dai*'s association with non-vehicles is less transparent, it is reasonable to think that transportation is mis-mapped as a semantic property that can be classified by -*dai*. As such, many NNSs' use of -*dai* remains restricted to a vehicle-like category.

<u>Function and Frequency</u>

As has been reiterated throughout this study and others in FLA (Matsumoto, 1985; Yamamoto & Keil, 2000) and SLA (Hansen & Chen, 2001; Lee, 2006), functionality often lacks the transparency required to successfully acquire their associative classifiers. Prior research has alluded to frequent input being able to affect accessibility, and in effect, move classifiers of function up the NCAH. Hansen and Chen explained that their subjects were able to change the markedness of the function counters -*dai* and -*satsu* because of their regular contact with bicycles and religious books. While this seems plausible, frequency effects were not accounted for in the interpretation of their results. That is, did their correct use of these function counters reflect an underlying awareness of the semantics they specify, or regular exposure to those items? Results from the present study suggest the latter. Correct suppliances of -*dai* did not always correlate with appropriate semantic descriptions. Moreover, if NNSs had acquired an understanding of the qualities specified by -*dai*, its application to other functional items would be expected.

As previously discussed, the cell phones and pencil sharpener received far fewer -*dai* responses from NNSs pointing to the difficulty with the function counter and exactly what—even if disjointed—semantic features it specifies. Figure 6 illustrated this decline in use of -*dai* for objects of function. Instead, NNSs generally defaulted to -*tsu.* This implies that the accurate suppliance of -*dai* for bicycles that Hansen and Chen (2001) found may not signal the accessibility of function. The same line of reasoning can be used with regard to the counter for bound objects, -*satsu.* Hansen and Chen found that their participants' daily encounters with religious books led to more correct counter suppliances for books, but that may have been due to frequency and not an increase in semantic salience. After all, participants from this study rarely provided -*satsu* for magazines. Although magazines are not likely to be considered unfamiliar objects, participants clearly looked to semantics when they responded with -*mai* because their explanations were that the items were flat and paper-like. Frequency seemed to have been conveniently ruled out and shape, yet again, seemed to be the most salient feature. The present study's findings support the NCAH by demonstrating that function is the most inaccessible feature, and further suggests that frequency—at least with objects that are semantically opaque—may not affect accessibility.

Grouping Heritage Speakers with L2 Learners

The experimental group consisted of 19 heritage speakers and 22 adult learners of Japanese. Additional analyses were conducted in order to determine if grouping heritage speakers with L2 learners was appropriate. In general, statistical analyses aligned heritage speakers (N=19) with neither the L2 group (N=22) nor reference group (N=48); however, qualitative data clearly indicate that their production and understanding of the

Japanese numeral classifier system is nonnative-like. Their suppliance of and rationale for -*tsu* and -*ko* exemplify this best. Results from the qualitative data directly point to heritage speakers and L2 learners relying on two default counters—-*tsu* and -*ko*. Although both were used as default counters for a small group of L2 learners and heritage speakers alike, -*tsu* clearly remained at the forefront of their minds when it came to objects that they could not remember something more specific for, were unfamiliar with, or had no idea what to provide. It appears that learners and heritage speakers of Japanese alike default to the most semantically all-encompassing classifier -*tsu*.

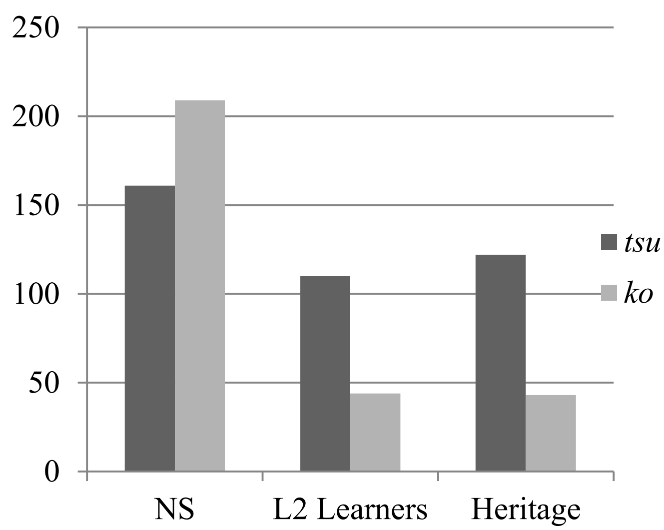

FIGURE 7. Heritage speakers' nonnative-like use of -*tsu* and -*ko*.

While statistical tests did not reveal any significant difference among the three groups' usage of the two classifiers, it is interesting to note the same inverse pattern seen earlier which helped to distinguish NSs from NNSs (see Figure 7). That is, the highest occurring counter for NSs was -*ko*, followed by -*tsu*; meanwhile, the pattern for both L2 learners and heritage speakers is the reverse. In fact, their rates of suppliance virtually mirror each other. These frequencies[23] in addition to the qualitative results strongly suggest that in terms of a default counter, despite the early age of exposure to Japanese, the heritage speakers in this experiment are indistinguishable from advanced learners of the language.

Overall, quantitatively and qualitatively, heritage speakers' comprehension and production of Japanese numeral classifiers appeared in line with that of L2 learners. Not only did the same default counter emerge, but their map of counters and the semantic features specified by them almost all but match up. Yet again, shape appeared to be the most salient feature, meanwhile, function the least. Inaccessibility—perhaps due to the loss of input and regular use—led to a reliance on the most general inanimate counter. Despite the early age and greater amount of exposure to the language via family and language maintenance programs, the heritage speakers were nonnative-like which suggests that conceptual development in Japanese was either incomplete, or had been attrited. In FLA, children develop the semantic concepts of shape, size, dimension, etc. It is possible that the heritage speakers in this study never completed their development in Japanese by the time that English was introduced. This could be an indication of a shift to the dominant language wherein a map of the semantic concepts is not necessary. That is, as a non-classifier language, English does not demand that the semantic concepts be mapped. As a result, for English speakers, these concepts remain unbound to an implicational scale. Whereas children in FLA are still developing these concepts, adults in SLA are tasked with a two-fold problem—recognizing that there are relationships

[23] See Appendix C for frequency of classifier suppliances by all three groups.

between these semantic categories that require mapping and then mapping them, followed by learning how to interpret that map. While the heritage speakers in this study would have fallen under the FLA group in their youth, as adults, they have had to reconstruct and learn to read a map in what is now their non-dominant language just like L2 learners.

Map, Refine, Repeat

Whether it is FLA or SLA, semantic concepts must be mapped. This map undergoes countless iterations of refinement with the end goal of being able to operate under the conventions of that language. As seen in both children and adults acquiring Japanese, exemplar-based learning plays a role in the map-and-refine process. Matsumoto (1985) documented children's tendency to find natural classifications, as was the case with the classifier *-dai* for objects of movement. Though nothing in their input would lead them to group boats and airplanes with cars (because native-speaking adults use different classifiers for them), it was evident that children creatively classified objects in their search for convention. Similarly, L2 speakers of Japanese in this study made comparisons between the test items and referents for which they knew the classifications. For example, NNSs reasoned that their *-hon* classification for the columns was motivated by their likeness to a tree, or *-mai* for towels for being sheet-like. By drawing on comparisons, learners establish prototypes that help to expand and give detail to their semantic maps. For children, who are still developing cognitively, there is a heavy reliance on exposure to the language. According to Matsumoto (1985), as children's conceptual development progresses and mis-mappings are corrected, children refine their schema. In this manner, children tweak their understanding of the classifier system such that the less transparent classifications (e.g., -*hon* for cassette tape) are learned in order to fit the conventions of Japanese. The vast majority of adult learners, however, cannot rely on natural exposure. As such, the role of frequency is maximized in SLA contexts because the semantic rules dictating numeral classifiers are so difficult to grasp. Moreover, for adult language learners, exposure to the target language no longer coincides with conceptual development; consequently, explicit learning strategies are recruited. This was evident in some of the NSSs' responses to the Metacognitive Inquiry. For example, the counter for shoes is -*soku*. One NNS reported using a pneumonic device to remember it—"[-*soku*] sounds like sock"—to illustrate their method of remembering the specific classifier that is used for footwear. Thus, while children map and refine that map through input, adults must draw on their declarative knowledge.

CHAPTER 5

CONCLUSION

Acquiring and applying the semantic rules that dictate Japanese numeral classifiers is challenging for NNSs of the language. As the quantitative and qualitative data from this study suggest, when it comes to inanimate objects, Japanese language learners can and do default to the most general counter -*tsu*. It functions as a multipurpose morpheme that can be used in times of memory lapse, uncertainty, lack of a known specific counter, or when no apparent significant features exist. When noteworthy characteristics are drawn upon, they tend to be related to shape, which makes the counters -*mai* and -*hon* more readily available in NNSs' classifier range. Given -*mai* and -*hon*'s clear associations with flat and cylindrical shapes, NNSs seem more comfortable applying them to unfamiliar or rarely encountered items. Function, however, was not as easily discernable which led to a reliance on the default counter.

Redefining the Use of -*ko*

While the results from this study present a strong portrait of -*tsu* being the go-to NNS counter, it is important to recognize its acceptability according to native speakers of Japanese. One of the potential limitations of this study is that even though the survey's directions explicitly instructed that only one classifier be provided per item, some participants (the majority of which were NSs) responded with multiple. This was most often the case where they felt either -*tsu* or -*ko* could be appropriate. As an improvement upon the pilot study (where this was also the case), only the first entry was recorded. I believe that whereas the pilot study took all suppliances into account, the present study's modification helped to reveal the significant difference between the two groups with respect to their -*tsu* answers. However, it is important to note that many NSs deemed both to be acceptable without any clear ranking between which of the two they would instinctually use first.

According to how NSs use -*ko*, classifying -*ko* as a shape-specific counter seems not only restrictive, but misleading. As it stands, on the Japanese numeral classifier system, -*ko* is on the same tier as -*hon* and -*mai* with each specifying 3D, 1D, and 2D-like features, respectively. Shape has shown to be a salient feature, but only when round objects were excluded. When it came to -*ko*, statistical significant differences were revealed between NSs and NNSs indicating that this particular shape-specific counter is treated somewhat differently. Members of the reference group expressed that there was interchangeability between -*tsu* and -*ko* which supports the notion of -*ko* becoming a more general inanimate counter. In their FLA studies, Matsumoto (1985) and Yamamoto and Keil (2000) reported a similar flexibility with -*ko*. Their adult native speakers of Japanese, whose answers served as baseline responses, noted that -*ko* was often acceptable as a general inanimate counter. Thus, children's linguistic input reinforces the generalizability of -*ko*. This may explain the early emergence of both -*tsu* and -*ko* in children's acquisition of numeral classifiers, and specifically, children's overextension of -*ko*. That is, their adult-like use of -*ko* does not take place until an undetermined age (refer to Figure 2). Given the present study's findings in the qualitative data, adult-like usage entails recognizing that -*ko* not only specifies roundness, but can and is applied to objects that are "holdable" and relatively small in size. Children are eventually socialized into learning and applying this caveat; L2 learners, however, without the appropriate exposure to the language, are less likely to be given -*ko*'s placement in the Japanese numeral classifier system—under shape.

With the additional coverage of size reported by native speakers (Matsumoto, 1985; Yamamoto & Keil, 2000), -*ko* has been unofficially promoted to a more general counter, and yet, the structure of the Japanese numeral classifier system does not reflect this. According to Figure 1, -*ko* can be used for solid 3D objects. There is no reference to size nor is it positioned alongside -*tsu* (or at least, with some reference to -*tsu* such that if an object is not small, it would be classified as -*tsu*). Figure 8 is an attempt at modifying the hierarchical organization of inanimate objects. Note that above the shape-specific counters, -*ko*'s placement is next to -*tsu* with the additional consideration to size.

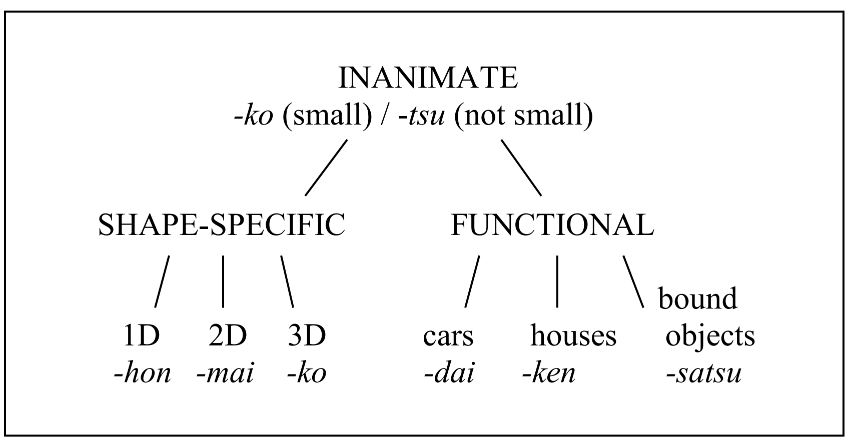

FIGURE 8. Modified version of the simplified Japanese numeral classifier system to reflect -*ko*'s generalizability.

Limitations and Future Research

While results indicate that even advanced learners of Japanese have difficulty attaining native-like proficiency in numeral classification, some areas call for closer investigation to better understand the findings presented in the current study. These areas include improving statistical powers to determine if, indeed, there were no significant differences between NSs and NNSs with regard to classifiers of shape, as well as gathering more information about participants' linguistic backgrounds.

Classifiers of Shape: Low Power

The statistical analyses revealed no significant difference between NSs and NNSs with respect to the shape classifiers -*mai* (p = .387) and -*hon* (p = .360), however, this could be due to a small difference that went undetected. The low powers achieved by -*mai* (.07) and -*hon* (.05) imply that a larger sample size was needed in order to determine if, in fact, there was no significant difference. Without a sufficient number of participants, it is possible that a small significant difference was overlooked. As such, investigating classifiers of shape demand a larger participant pool.

Unforced Responses

One area that could not be circumvented was forcing participants to respond in order to advance through the survey. While this was the intention so that a default counter would emerge, IRB guidelines expressed that participants need not respond to items that they wished not to. Unfortunately, this left gaps in the data where individuals' default classifier could have been supplied. Nonetheless, a default classifier for the experimental group was realized and results from the Metacognitive Inquiry supported this finding. However, the issue of not forcing responses affected the researcher's ability to gather more data about participants' linguistic backgrounds.

Heritage speakers and their exposure to Japanese. Participation required subjects to be native speakers of either English or Japanese. Upon consenting to participation in the web-based survey, all potential participants were directed to answer which they were native speakers of. Depending on their response, participants were placed on different tracks. After both groups answered questions regarding gender and age, NS were presented with instructions to completing the survey while NNS were asked several more linguistic profile questions. Because of the survey's reliance on self-reporting, it is possible that individuals who considered themselves to be native speakers of Japanese because they grew up with the language as their mother tongue but are now English dominant (i.e. heritage speakers), reported that they were native Japanese speakers. Consequently, they would not have been prompted to respond to more questions regarding their language background. Moreover, it is quite possible that their classifier suppliance and explanations for them would not be native-like. I suspect this to be the case with a few members of the NS group who lacked the more specific classifiers that were widely agreed upon by other NSs.[24]

Unfortunately, because responses were unforced, not all participants shared details about the length or nature of Japanese study, and in general, more should have been asked to the heritage speakers.[25] For example, did both parents speak the language

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[24] For example, shoes and magazines had minimal deviations from -*soku* and -*satsu*, respectively.

[25] See Appendix E for information on heritage speakers' exposure to Japanese.

natively? After all, Chin (2007) outlined the differing family tapes based on parents' native languages and what they spoke to the child, all with potentially different outcomes for a child's degree of bilingualism. Secondly, what generation of Japanese was the participant? This would have been crucial information to gather considering that Myers-Scotton (2005) points out that there are language shifts that take place across each generation—within three generations, it is not unlikely that a family's native tongue struggles to survive given that the youngest generation might only be able to passively understand the language. Information regarding what generation of Japanese participants were would have added to this study's understanding of the input quantity and quality, especially given the grouping of heritage speakers into the experimental group. Additionally, when were the classifiers acquired? Claiming that nonnative-like responses are indicative of attrition assumes that at some point the heritage speakers had acquired them. However, they might have had to learn them as L2 often learners do—with explicit learning strategies.

Future research should take into consideration how heritage speakers are grouped. Placing heritage speakers in the experimental group could have presumably raised problems given the nature and amount of exposure to Japanese they received, in addition to the age at which they were exposed to the target language. Asking background questions including participants' generation of Japanese and their parents' proficiency in the language would offer more information about their quality and quantity of linguistic input, and perhaps, view heritage speakers as a distinct group from L2 learners.

Knowledge of classifier languages. Another area that was not appropriately addressed was participants' experience with other classifier languages. Participants were asked to list what other languages they had spoken or studied. These languages included other classifier languages such as Chinese and Korean. In the context of numeral classifiers and their semantics, it would be interesting to see if there is an advantage that comes with knowing another classifier language. Future research should consider conducting a simple linear regression to determine if familiarity with other classifier languages is a predictor of successful acquisition of another language's classifier system. Such results could begin to tell the story of some type of reshuffling of semantic concepts that takes place depending on the language. In other words, whereas learners of classifier languages are still constructing a semantic map, those with a framework in place may simply need to re-map the existing concepts.

General Conclusion

Findings from this study offer valuable feedback for language instructors and language learners alike. They stress the importance of semantics and demonstrate the need for explicit instruction. As previously mentioned, in a SLA context, calling upon explicit learning strategies is imperative. One strategy is to familiarize oneself with the numeral classifier system. This could put a spotlight on semantic categories that are less transparent, and perhaps help to unpack higher levels of classifications to reveal more specific ones. By highlighting the role of semantics, an entirely new perspective on the language can be gained. More specific counters can be learned and more native-likeness achieved.

In terms of research, this study has shown the importance of making a distinction between production and comprehension. Other SLA studies have concentrated on production, and at times, have conflated correct classifier use with successful acquisition of the semantics specified by it. Given the present study's results that are evidentiary of a mismatch between performance and competence, it is important to first examine comprehension, but also to consider how comprehension is assessed.

In summary, in terms of numeral classifiers, general classifiers are the most widely produced morphemes by L2 learners because of the semantic range that they encompass. Features of shape are the most salient, and perhaps because of this, non-native speakers seem confident with their application (even when incorrect according to native speakers of the language). Meanwhile, more specific counters are difficult to produce. While it is possible for adult learners and speakers of Japanese to produce specific counters in a native-like fashion, the metacognitive processes involved suggest that frequency plays a larger role than semantic accessibility, especially when it comes to functionality. When frequency does not offer any support, the default counter emerges. Thus, non-native speakers' semantic map appears rudimentary—and maybe even comfortably stagnant—by staying at the highest levels of the numeral classifier system.

APPENDICES

APPENDIX A

PARTICIPANT INFORMATION

Breakdown of Participant Information

	N	**Females**	**Males**	**Mean Age**	**Mean Length of Exposure**
NS	48	36	12	34	N/A
NNS	41	12	29	31	13 years

APPENDIX B

NON-NATIVE SPEAKERS' LINGUISTIC PROFILES

Nature of Exposure to Japanese Language
(Participants were encouraged to select all that applied)

HS/College Courses	**Friends**	**Family**	**Self-Study**	**Other***
28	22	19	23	18

*Participants were asked to specify their response. See below for a list of typed explanations for Other.

Other Exposure to Japanese Language
Trips to Japan
Study abroad
Language maintenance classes (Saturday school)
Living and/or working in Japan
Private classes
Media (e.g. anime)

APPENDIX C

WEB-BASED SURVEY

Link to Access Consent to Participation & Elicitation Instruments

https://qtrial2014.az1.qualtrics.com/SE/?SID=SV_cY2bRmXIPTTZ0jP

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APPENDIX D

FREQUENCIES OF CLASSIFIER SUPPLIANCES

Comparison of Heritage Speakers to NS & NNS

		-tsu (393)	*-ko* (296)	*-mai* (223)	*-hon* (195)	*-dai* (193)
NS	# of suppliances	161 (42%)	209 (71%)	126 (57%)	97 (50%)	125 (65%)
	% of responses	17%	22%	13%	10%	13%
NNS	# of suppliances	110 (28%)	44 (15%)	61 (27%)	67 (34%)	47 (24%)
	% of responses	26%	10%	13%	15%	9%
Heritage	# of suppliances	122 (31%)	43 (14%)	36 (16%)	31 (16%)	21 (11%)
	% of responses	31%	10%	10%	8%	6%

APPENDIX E

HERITAGE SPEAKERS: LENGTH AND NATURE OF EXPOSURE TO JAPANESE

Heritage Speaker Information

Years of Exposure	Details
32	Primarily English spoken at home; Japanese language classes 1x/week
32	
26	6 years conversational + academic fluency; regular contact/exposure to Japanese since childhood
31	
26	
15	
23	
13	
31	Simultaneous bilingual
18	
12	
4	
49	
5	On and off
16	During K-12, Japanese language classes 1x/wk; 2 years in college; 9 months living in Japan
5	
10	6 years private school; 3 years high school; 1 year college
30	
5	

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