DYNAMIC INTERFACES IN

BEGINNING L2 MANDARIN CONSTRUCTION LEARNING:

A USAGE-BASED CORPUS INVESTIGATION OF

FREQUENCY DISTRIBUTION, COMMUNICATIVE FUNCTION, AND SALIENCE

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ABSTRACT

Constructionist research on L2 learning has focused on the degrees to which skewed frequency (Goldberg, Casenhiser & White, 2007; Casenhiser & Goldberg, 2005; Goldberg, Casenhiser, & Sethuraman 2004) in a person's linguistic environment can facilitate *entrenchment*, *schematization*, and *contingency learning* (Ellis, Römer, & O'Donnell, 2016; Ellis & Ferreira-Junior, 2009a; Ellis, 2002). Usage-based learner corpus studies by Eskildsen (2009, 2011, 2012, 2014, 2015, 2017), focusing on just one or two L2 learners in an ESL classroom, found evidence for (1) learning in the forms of entrenchment and schematization as evidence of developmental sequences (e.g. Bardovi-Harlig, 2002) within individual grammatical constructions, and (2) the learners' experiences with talk-in-interaction helped to provides some of the exemplars that drive fixed multi-word expressions (MWEs) toward schematic, end-state constructions. Meanwhile, Ellis & Ferreira-Junior (2009a) provide an account of contingency learning among adult immigrants to the UK by comparing their distributions of words across three grammatical constructions in both the learners' speech and the speech of native speakers. This study found similar distributions between native and non-native speakers. Gaps remain for Constructionist/Usage-based research to account for contingency learning in connection with observable experience in an L2 that is distant from English and during early stages.

Addressing these gaps, this dissertation study investigates contingency learning under conditions of heavily skewed input in L2 classrooms, i.e. institutional forms of social interaction (Heritage & Clayman, 2010). A learner corpus was created to follow ten beginning learners from the Mainland United States during an intensive Mandarin Chinese language camp in Hawai'i. The learners had minimal or no experience with Chinese learning prior to the start of camp. Instruction was organized around several types of pedagogy: the comprehension-in-interaction

oriented *Teaching Proficiency through Reading and Storytelling* (TPRS; Ray & Seely, [1997] 2015; Cahnmann-Taylor & Coda, 2018; Lichtman, 2013), peer-talk-in-interaction oriented *Task-Based Language Teaching* (TBLT; Long, 2015, 1985; Ellis, 2009), *Cold Character Reading* (CCR; Neubauer, 2018; Waltz, 2015), *Extensive Reading* (ER; Ro, 2017; Jeon & Day, 2016; Nation, 2015; Hitosugi & Day, 2004), and Chinese "scaffolded writing" (Waltz, 2015). Collostructional Analysis (Stefanowitsch, 2013; Stefanowitsch & Gries, 2003) is used to compare frequency distribution, collexeme strength, and contingency (measured with bi-directional Delta P) in five main corpora (capturing language that was heard, said, read, and written) with corresponding test corpora (freely written and spoken stories) across five recording periods. *Concreteness* (one form of *salience*; e.g. Crossley, Kyle, & Salsbury, 2016; Brysbaert, Warriner, & Kuperman, 2014) is considered as a factor that may complicate effects from frequency distribution. Finally, institutional interaction (Heritage & Clayman, 2010) is investigated in regards to how teachers and students use and re-use limited language for *talking their institution into being* (p. 20). Findings reveal how the participants used a single Chinese pattern as a resource to (a) acquire that Chinese pattern, and (b) co-construct institutional practices around story-building. These analyses illustrate how this institution-specific interaction resulted in highly skewed frequency. The collexeme analyses reveal a close match between frequency distribution in classroom experience and the learners' freely written and freely spoken stories in test corpora. These findings highlight an active role for contingency learning during early construction learning and language development, given the environments these particular learners experienced.

Keywords: Usage-based, Conversation Analysis, Mandarin Chinese, construction, corpus

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(adapted from Ro, 2017; Burch, 2014)

Conventions for the transcription of talk

. final intonation

? rising intonation

¿ slightly rising intonation

↑ pitch is higher relative to surrounding talk

↓ word abruptly falling intonation

wo:rd lengthening of the previous sound

= latching (no space between sound before and after)

[overlap

(0.7) pause timed in tenths of seconds

(.) micropause, shorter than 0.2 seconds

°word° speech which is quieter than the surrounding talk

WORD speech which is louder than the surrounding talk

.hh inbreath

Conventions for the transcription of embodied action

((events observed in the environment or embodied position or motion))

(("ethnographic interpretation of meaning in context observed"))

H hand(s)

F finger

R right

IF index finger

L left

GZ gaze

+ place where action begins, description of action

+ place where action begins in relation to talk (on talk line)

/ stroke or beat of gesture

--holding gesture or gaze in place

bold talk

talk translation

Conventions for the transcription of Chinese tones

1 high, level tone

2 mid to high, rising tone

3 low tone, can dip and then rise

4 high to mid or low, falling tone

CHAPTER I. INTRODUCTION

1.1. Rationale

Constructionist and Usage-based accounts of language development (Goldberg, 1995, 2006; Goldberg et al., 2007; Casenhiser & Goldberg, 2005; Goldberg, Casenhiser, & Sethuraman 2004; Tomasello, 1992, 2003; Ninio, 1988, 1999) seek to understand the extent to which domain-general (not language-specific) learning mechanisms can account for observable language-learning phenomena. Tomasello (2000) surveys a collection of usage-based studies that focus on the extent to which very young children (around age two) possess adult syntactic competence. That research questioned whether an innate grammar is needed to explain why children would produce utterances they could not have heard before, e.g. *allgone sticky* (reported in Braine, 1971). Measurements of production and comprehension revealed the children to only use creative utterances in very limited ways. These could be explained simply as the children substituting one word belonging to a broader category of words, e.g. [NOUN] for one another, as in *allgone juice*, *allgone paper*, and *allgone sticky* (most likely thought of by the child as a *sticky substance*). Tomasello (2000) argues that an innate grammar is not needed to explain these instances of early creativity because the children can simply use *general category-learning* mechanisms to learn categories of words and strings of word-categories (grammatical constructions) from exposure to input. Children in this example could have induced from prior input a partially fixed, partially open construction: [*allgone* + PHYSICAL OBJECT]. In Construction Grammar (Goldberg, 1995, 2006) *constructions* are form-meaning pairings of any length, with any number of "slots" in a fixed sequence, and with each slot existing at any level of openness (also called *abstraction* or *schematicity*). Constructions thought to be conventionalized through usage that is social and functional. For further illustration: [*all*], [*gone*], [*allgone*], and

[*sticky*] are examples of *lexical constructions* (also referred to as *lexical items* and *lexemes* in this study). That is, each is a form-meaning pairing for a *single word*. In contrast, [*allgone + sticky*], [*allgone + paper*], [*allgone* + THING], and [*allgone* + NOUN] are examples of *grammatical constructions*, whereby the second slot in each of the latter two constructions are more open to hosting a wider diversity of lexical constructions.[1]

Constructionist research has focused on the psychological reality of constructions among first (Bencini & Goldberg, 2000) and second (Gries & Wulff, 2005) language users, how constructions change throughout history (e.g. Bybee, 2006), and how constructions are learned, or at least are learnable, from experience, i.e. exposure to input (Boyd & Goldberg, 2009) and from various forms of social interaction (Ellis et al., 2016; Eskildsen, 2009, 2011, 2012, 2014, 2015, 2017). Constructionist research that focuses on how constructions are learned tends to fall into the research field known as Usage-based Linguistics (UBL; Tomasello, 2003), or Usage-based Language Learning (UBLL; Ellis, O'Donnell, & Römer, 2015).

Usage-based corpus studies of child L1 (Tomasello, 1992, 2003; Barlow & Kemmer, 2000; Ninio, 1999) and adult L2 (Eskildsen, 2009, 2011, 2012, 2014, 2015, 2017; Ellis & Ferreira-Junior, 2009a) construction learning have found evidence of an item-specific nature to language development. That is, the many constructions that make up a particular language have been found to be learned in "slow and piecemeal" fashion, in the sense that there are particular lexical items that a learner hears and reads in different degrees of frequency across different grammatical constructions, and these experiences gradually advance each construction from

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[1] Morphemes, like English [*-ed*] and Mandarin Chinese [*de* (genetive marker)] are also form-meaning parings, and so also count as constructions.

concrete toward schematic with every new exposure and every new set of words that occupy the

slots in that construction. This experience-driven process is illustrated in the example below:

Figure 1. Exemplars facilitating the entrenchment and schematization of the Verb-Object-Locative phrase (VOL) construction, adapted from Ellis and Ferreira-Junior (2009a)
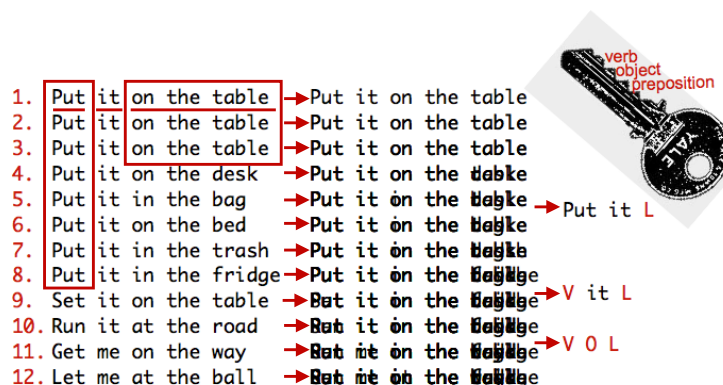
In the figure above, the English [VERB + OBJECT + LOCATIVE PHRASE] (VOL) construction is learned only after hearing and/or reading the first ten *exemplars*, i.e. examples of form, meaning, and contextualized use that are experienced in one's social environment.[2] To walk us through this process, first a person hears or reads *put it on the table* for the first time, and is left with a mental representation of the multi-word expression (MWE) [*put + it + on + the + table*]. He or she hears it two more times, and each time this fixed string of lexical items becomes further entrenched as an MWE. None of the slots have begun to *elaborate* into abstract categories because no *variation*s in words have yet been experienced. At this point in time we expect just one aspect of construction learning: *entrenchment*. However,

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[2] If observing naturalistic language use we should expect a person to be exposed to each of these twelve exemplars plus hundreds more over time, and all distributed between other grammatical constructions.

exposure to the fourth exemplar, *put it on the desk*, can lead to three aspects of construction

learning: mild entrenchment of a new MWE [*put + it + on + the + desk*], initial *schematization*

of the final lexical slot [*put + it + on + the* + TABLE/DESK],[3] and further entrenchment of this

particular *sequence of slots* (Ellis et al., 2016). At this point in time the four initial slots remain

fixed lexical items. Exposure to the fifth exemplar, *put it in the bag*, allows the hearer/reader to

schematize the final three slots into one general category, [put + it + LOCATIVE PHRASE].

With exposure to each exemplar we can expect entrenchment of the lexical material and of the

sequencing of slots for that construction, as well as schematization of each slot when alternative

lexical items are heard or read. Constructions are thus observed to follow *developmental*

sequences (Bardovi-Harlig, 2002) in learning. That is, each construction begins as fixed MWE,

but then one or more of its constituent slots elaborates into a more open, schematic category

(Boyd & Goldberg, 2009). The end-state of a construction's development is when it matches the

norms of speakers around the learner in terms of how open each slot is in regards to accepting

particular lexical items.[4]

Research by Eskildsen (2009, 2011, 2012, 2014, 2015, 2017) has demonstrated

entrenchment and schematization for particular grammatical constructions in ESL classroom

learner corpus studies. Another aspect of the process of construction learning that has not, to my

knowledge, been researched in classroom learner corpora is *contingency learning* (Ellis &

Ferreira-Junior, 2009a, 2009b). Contingency learning is operationalized here as the learning of

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[3] These are represented in capital letters here to represent their status as a category, however limited.

[4] Bardovi-Harlig (2002), among other Usage-based and Constructionist researchers, refers to this as the

"developmental sequence of formula > low-scope pattern > construction" (p. 189). As exemplars at any of these

three stages constitute form-meaning pairings, I will refer to all of them as *constructions*.

the relative frequencies of each lexical item that appears in distinct grammatical construction.[5]

For example, Ellis & Ferreira-Junior (2009a, 2009b) show how both native and non-native English speaker (NS and NNS, respectively) use *go* as the most frequent in the [VERB + LOCATIVE PHRASE] (VL) verb-argument construction (VAC). Both NS and NNS used *come* as the next most frequent verb in the same construction, and both groups used it less than half as frequently as *go*. Even less frequent for both groups of speakers in the same VL construction included *get*, *look*, and *live*. This illustrates a Zipfian distribution (Ellis, 2012; Zipf, 1935), which is also argued in Constructionist/Usage-based research to facilitate construction learning as learners attune to the most frequently occurring cues first. Meanwhile the top most frequent verb, *go*, was not found in other VACs, e.g. [VERB + OBJECT + LOCATIVE] (VOL) and [VERB + OBJECT + OBJECT] (VOO). That is, *go* was *distinctive* to the VL construction because it was found in VL frequently, but *not* found in the remaining two constructions. That NNS produced verbs and other words with nearly the same relative frequencies of distribution, as NS was evidence of contingency learning being at play in construction learning.

This leaves several gaps open to further research. These gaps include: (1) investigating the role of contingency learning during the very first hours of construction learning, (2) observing early construction learning of an L2 that is typologically distant from English, e.g. Mandarin Chinese, (3) observing the real social (spoken and textual) experiences that directly connect personal experience with the language learners produce (say and write). While investigating effects from frequency distribution, it will also be important to follow the consensus among Usage-based researchers, who argue that frequency does not explain all

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[5] In Constructionist/Usage-based accounts, contingency learning is argued to be instrumental for all levels of language, including phonology, morphology, orthographic recognition, and more (Ellis, 2002).

phenomena in learning. For example, Crossley, Kyle, and Salsbury (2016) demonstrated how lexical items that were rated by L1 English speakers to be *less salient* relative to other words ended up being learned later by L2 learners relative to lexical items rated to be *more salient*. Salience thus may interact with frequency, i.e. the *late-learnedness* of comparatively less salient lexical items could potentially be offset by increases in frequency of exposure.

Another gap to address is in discovering how this distribution is itself a product of social interaction. Constructionist and Usage-based researchers (e.g. Boyd & Goldberg, 2009; Ninio, 1999) have argued that in naturalistic interaction, the earliest and most frequently used verbs will be semantically general so they can serve more general functions. Semantically general words can be used across a greater variety of contexts in comparison with semantically specific words that are more limited in their applicability. Gaps remain for research to investigate how language is used to accomplish actions in interaction (Levinson, 2013; Heritage & Clayman, 2010), how actions in interaction result in *frequent* use and re-use of a particular language pattern, and how this relates to learning.

1.2. Objectives

The present study seeks to better understand the impacts of frequency of experience on language acquisition during the early stages of overall development, as well as the social origins of frequent usage, i.e. how frequency is a product social interaction. The present study's research questions build on the hypotheses in Ellis & Ferreira-Junior (2009a, 2009b) and further explore an interface with salience (operationalized here as concreteness) and social interaction. The research questions are formulated as follows:

RQ1: How strongly is contingency learning at play during the earliest stages of construction learning in a typologically distant L2?

RQ1a: Are the frequency distributions in early experience Zipfian (allowing learners to attend to and learn the most frequent lexical items first)?

RQ1b: Does learner use match the relative frequencies in their past experience?

RQ1c: Do these matching frequencies reflect orders of acquisition, i.e. are the first-learned lexical constructions in each grammatical construction those that appeared more frequently in that grammatical construction in prior experience?

RQ1d: Will the first-learned lexical constructions in each grammatical construction be those that are more distinctively associated with that grammatical construction in prior experience?

RQ2: To what degree might the salience of individual lexical items interact with frequency, i.e. does lower-rated *concreteness* of meaning necessitate greater frequency of exposure, whereas higher-rated concreteness allows for learning from less frequent exposure?

RQ3: How is the statistical skewing of language-in-use accomplished in the present data's social interaction?

1.3. Organization of the dissertation

Chapter I (this chapter) has introduced the rationale and objectives of this dissertation study. Chapter II will offer a more comprehensive explanation of the present study's theoretical background, referring to studies more specialized toward the methods needed to answer the above research questions. Chapter III describes the methods and data for analysis in the following two chapters. The data comes from is a new multimedia learner corpus, subdivided

into five recording periods (RPs), and capturing ten beginning learners in an L2 Mandarin Chinese summer camp during their first weeks of classroom learning. Chapter IV will investigate contingency learning via frequency distribution across three grammatical constructions using Collostructional Analysis (Ellis & Ferreira-Junior, 2009a; Stefanowitsch & Gries, 2003). This will include measures of distinctiveness via collostructional strength and bi-directional Delta P. Chapter IV ends with a brief investigation of *concreteness* (Brysbaert, et al., 2014) as a potential limitation on frequency effects. Chapter V utilizes an institutional CA framework (Heritage & Clayman, 2010) to analyze interaction in which the participants conduct their talk around the frequent use and re-use of a particular Chinese language pattern. Appendix A provides the camp schedule, including annotations marking the start of each RP, and when free-writing and free-speaking samples were collected for each test corpus (TC). Appendix B provides text versions of the stories that the students co-created with their teacher in Chinese during the six classes of the first two RPs. Appendix C provides writing practice samples from three of the participating students during RP1 and RP2 for reference to their abilities at the start of the camp. Appendix D provides 'traceback' data as additional evidence of the source material of the first two TC writing samples of the same three students'. Finally, Appendix E provides the three students' writing samples from TC5, after the final day of formal instruction at the camp.

CHAPTER II. THEORHETICAL BACKGROUND

2.1. Constructions as categories of language

Construction Grammar (Goldberg, 1995; 2006) and constructionist research on language acquisition posit that any language, e.g. Mandarin Chinese, Mainstream American English, Central Alaskan Yup'ik, comes in into mental representation from social experience in the form of many tens of thousands of hierarchically organized grammatical *constructions* (Ellis et al., 2016, p. 26). In Construction Grammar, a construction is defined as a form-meaning pairing of any length that is not defined purely by any one of its component parts. Words and grammatical constructions occupy the same psychological "space"--a word is a shorter, concrete construction, e.g. [book] or [bellybutton], relative to a grammatical construction, e.g. [VERB OBJECT LOCATIVE] or [PROCESS REFERENT LOCATIVE].

Evidence of the psychological reality of constructions as general categories (Rosch, [1978], 1999; Lakoff, 1987) has been shown in first language (Bencini & Goldberg, 2000) and second language (Gries & Wulff, 2005) research. Bencini & Goldberg (2000) asked L1 English speaking university students to sort sixteen cards, each with one sentence printed on it as represented below:

Figure 2. Sentences on cards used in sorting task, in Bencini & Goldberg (2000)

	Construction			
Verb	Transitive	Ditransitive	Caused motion	Resultative
Throw	Anita threw the hammer.	Chris threw Linda the pencil.	Pat threw the keys onto the roof.	Lyn threw the box apart.
Get	Michelle got the book.	Beth got Liz an invitation.	Laura got the ball into the net.	Dana got the mattress inflated.
Slice	Barbara sliced the bread.	Jennifer sliced Terry an apple.	Meg sliced the ham onto the plate.	Nancy sliced the tire open.
Take	Audrey took the watch.	Paula took Sue a message.	Kim took the rose into the house.	Rachel took the wall down.

The sentence on each card had one of four verbs (*throw, slice, get, take*) in one of four constructions (*transitive* [Verb Object]*, ditransitive* [VOO]*, caused motion* [VOL]*, resultative* [VOR]*)*. Participants were asked to sort the cards into individual stacks based on similarity of meaning. Results revealed that participants sorted the sentences based on whole constructions about as often as they sorted based on individual verb meanings. To help us understand this, a glance at all four ditransitive sentences reveals that each of the four different verbs are forced to take on the meaning *cause someone to receive something* from the context of the sentence. This equivalence in status for verbs and grammatical constructions to deriving meaning was less in balance for advanced L2 English speakers in a separate study by Gries and Wulff (2005). Contrary to expectations, L1 and advanced speakers of German showed a stronger preference for sorting meaning by grammatical construction than by specific verbs. A priming study in the same research report found advanced foreign language learners of English to be strongly primed by ditransitive constructions to fill in structurally ditransitive endings, and by prepositional dative constructions to fill in prepositional dative constructions. The authors conclude: "That is to say, even though the foreign language learners do of course have much less input in the language in which they were tested here, they still exhibit a behavior that is very much in line with what we know about native speakers" (p. 186). After demonstrating the psychological reality of constructions as categories of language, the next step for researchers has been to show how constructions are learned using the same cognitive machinery responsible for learn other perceptual categories.

2.2. Token frequency, frequency distribution, skewed input, and category learning

The Constructionist/Usage-based explanation for construction learning is based on general learning mechanisms that are also responsible for learning any other kind of category from everyday experience. To begin understanding how this happens, Ninio (1999) found naturally occurring social interaction between adult and child speakers of Hebrew to result in unequal frequencies of particular words in different constructions, i.e. they distribute in *Zipfian* fashion (Ellis, 2012; Zipf, 1935). As discussed in the previous section with regards to Figure 1, the continued exposure to spoken and written exemplars has been thought to allow a learner's implicit learning mechanisms to first get a "fix" on the most frequently recurring parts of each new exemplar in experience (Boyd & Goldberg, 2009). One mechanism argued to be instrumental in learning constructions is *contingency learning*, that is, the learning of the relative probabilities that an outcome will occur when given a cue (Ellis & Ferreira-Junior, 2009a). This means that over time, not only should a learner of a language have a sense of what words sound acceptable in a certain slot of a particular construction, but they should also be able to judge which words sound more likely than others to occur in that slot based on experience hearing and reading other users of the same language around them.

Laboratory-based training experiments (Goldberg et al., 2007; Casenhiser & Goldberg, 2005; Goldberg et al. 2004) have demonstrated that a construction's feature, i.e. a particular lexical item, can be learned as the prototype, i.e. the most representative member for that construction, if it is (1) experienced early in a set of exemplars, (2) experienced frequently relative to other exemplars, the latter constituting *skewed* frequency. The effects of input on learning from skewed, or low-variance, frequency distribution was investigated experimentally by Goldberg et al., (2004). In that study, the researchers played a series of videos for adults

(Casenhiser and Goldberg, 2005, replicated the experiment for children ages 5-7). The videos

displayed puppets *appearing* in various manners--from off screen, from under a hat, etc.--while a

voice described the action depicted in just one sentence. Each sentence contained a novel verb

and was formulated in a novel word order. The following table from Casenhiser and Goldberg

(2005; p. 503) illustrates the study's overall design:

Figure 3. Training stimuli (Casenhiser & Goldberg, 2005)

Scene displayed on video	BALANCED FREQUENCY (2 *moopo*; 2 *vako*; 2 *suto*; 1 *keebo*; 1 *fego*)	SKEWED FREQUENCY (4 *moopo*; 1 *vako*; 1 *suto*; 1 *keebo*; 1 *fego*)
The rabbit appears on a hat.	*The rabbit the hat moopoed.*	*The rabbit the hat moopoed.*
The monster wiggles out from under a cloth.	*The monster the cloth keeboed.*	*The monster the cloth keeboed.*
The frog drops down onto box.	*The frog the box vakoed.*	*The frog the box moopoed.*
The king drops down into a chair.	*The king the chair vakoed.*	*The king the chair vakoed.*
The sun rises into the sky.	*The sun the sky fegoed.*	*The sun the sky fegoed.*
The queen rolls onto the stage.	*The queen the stage sutoed.*	*The queen the stage sutoed.*
The bug appears onto a table.	*The bug the table moopoed.*	*The bug the table moopoed.*
The ball rolls into the room.	*The ball the room sutoed.*	*The ball the room moopoed.*

Participants were then tested in a forced-choice comprehension task in which they heard a

sentence with an unfamiliar novel verb (not heard before) while watching a split TV screen

showing two new scenes simultaneously. The participant had to physically touch the side of the

screen to which they interpreted the sentence to be referring. Results confirmed a significant and

positive effect from skewed frequency distribution compared to balanced frequency conditions.

Year & Gordon (2009) were unable to replicate similarly positive outcomes from skewed

input in their own study of EFL classrooms in rural Korea. The authors cite as reasons for this,

including that the most frequent exemplars were presented later rather than earlier. Another

limitation they cite, which happens to be relevant to the present study, is the lack of control by

the teacher to maintain the focus of the thirty two students present in the class. The authors

conclude, "Although we acknowledge the utility of laboratory-based research during which more

focused training methods can be employed, such methods have their own problems of ecological validity, and we suggest that classroom-based research can be a useful method to investigate the effects of skewed input on construction learning. This is especially true in the present case, in which the classroom is in fact the context in which most information about the English language is acquired" (p. 412). The benefits of classroom settings for research on Construction learning will be revisited shortly.

Ellis & Ferreira-Junior (2009a, 2009b) investigated several of these facets in ESL data in the European Science Foundation (ESF) corpus (Dietrich, Klein, & Noyau, 1995). Their research looked at seven ESL learners living in Britain, whose native languages were Italian (n = 4) or Punjabi (n = 3). These two studies found evidence for the following hypotheses: (1) the frequency distribution for the types occupying the verb island of each VAC will be Zipfian; (2) the first-learned verbs in each construction will have appeared more frequently in that construction in the input; (3) the language produced by the learners will match the relative input frequencies in language used by people around them, i.e. learner use *follows* input frequencies in terms of orders of acquisition over time; (5) the first-learned verbs in each construction are more distinctively associated with that construction in the input. Among the more striking findings in their analysis was the similarity of relative distributions of verbs in the three English verb-argument constructions, shown in the following figure.

Figure 4. Zipfian type-token frequency distributions (in Ellis & Ferreira-Junior, 2009a)
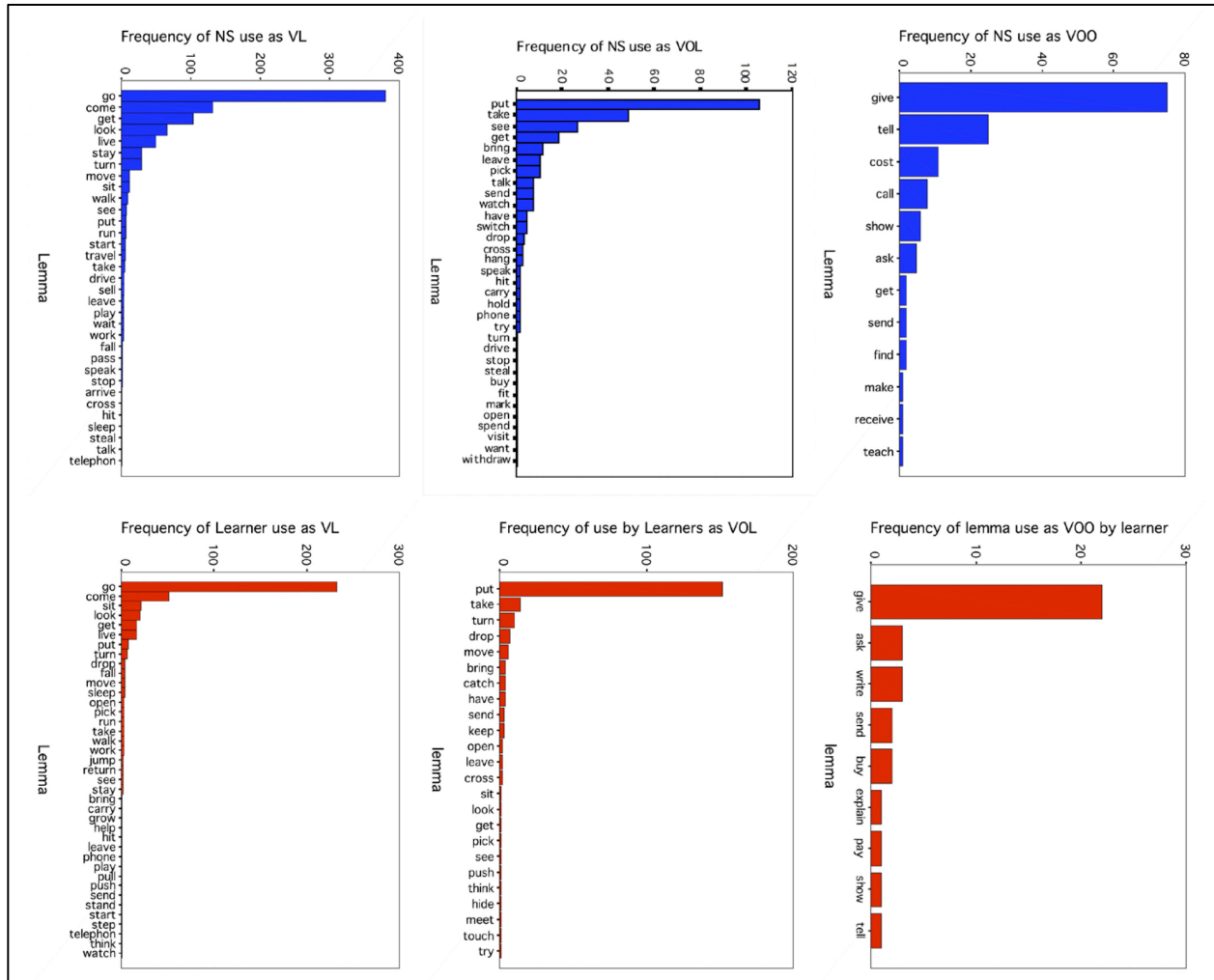
These distributions reveal how Zipfian distributions in experience do not simply help a category become more schematic to the point where all lexical material can freely associate with a particular construction. Rather, the Zipfian distribution provides a model of the Zipfian distribution itself, influencing the learner to learn the relative frequencies for their own use. This could be likened to a novel kind of cookie cutter that does not simply shape dough into cookies, but shapes the dough into another *cookie cutters*; the learner's construction exhibits the same frequency skewing that helped them learn the construction to begin with.

2.3. Limits to frequency effects: Concreteness as one form of salience

In UBL research, as well as in general SLA research, language development has been found to not be explainable solely in terms of frequency. That is, some linguistic patterns appear to be learnable from only minimal exposure to a pattern (e.g. Bardovi-Harlig, 2000). One recent factor investigated in UBL research in in Crossley, Kyle, and Salsbury (2016), is *salience*, operationalized in part as *concreteness*. Concreteness is further specified in Brysbaert, Warriner, and Kuperman (2013): "Concreteness evaluates the degree to which the concept denoted by a word refers to a perceptible entity....concrete words are easier to remember than abstract words, because they activate perceptual memory codes in addition to verbal codes" (p. 1).

In an effort to observe correlations between high word salience and earliness of production, Crossley, Kyle, and Salsbury (2016) collected an original corpus consisting of interviews between L2 English learners (n = 6) and L1 English-speaking interlocutors (n = 13). Recordings documented 30 to 45 minutes of discussion per meeting, and recorded meetings were distributed across roughly two-week intervals over a 1-year period. This study confirmed salience (concreteness in addition to other operationalizations of salience) to be highly predictive of word learning in L2 English. The present study as well will look at concreteness listings in Brysbaert et al. (2013) in an attempt to tease apart why some of the lexical items and tracer constructions were low in frequency but were produced by learners, and why other patterns were experienced in moderate frequency, but never produced by the learners.

2.4. Frequency is "gated" by social interaction

Constructionist accounts of language acquisition are "usage-based" in the sense of viewing a person's linguistic environment--the source of data for language learning--to be both

the instrument and the product of social interaction (Eskildsen's 2009, 2011, 2014, 2015, 2017; Kim, 2017; Ellis et al., 2016). In particular, an understanding of how language is used in interaction in communicative language classrooms (VanPatten, 2017) where the pedagogical designs are relevant to Constructionist research merits investigation. Such research could help illuminate the sequences of actions in interaction that result in the frequency distributions that better facilitate construction learning.

Research settings themselves are of interest to usage-based researchers. Laboratories can be controlled to a point where it becomes difficult to infer whether the results would generalize to more ecologically valid settings (Year & Gordon, 2009). Naturalistic settings have the benefit of showing how learning happens when no intervention is made (e.g. Kim, 2017; Kasper & Burch, 2016). A middle ground can be found in language classrooms, where a variety of already existing pedagogical approaches, e.g. task-based, comprehension-based provide options for researching a variety of research interests.

Eskildsen's (2009, 2011, 2012, 2014, 2015, 2017) classroom-based learner corpus studies of Carlos and Valerio (both L1 Spanish) looked at entrenchment and schematization of constructional slots over time. For example, Eskildsen (2009) showed how *can*-constructions produced by one learner, Carlos, started with fixed words, and over time contained a larger variety of words. After substituting a relatively wide variety of words into *can*-constructions, by the end of the recording period Carlos had settled on substituting in a small selection of words.

Additionally, foreign language classrooms, i.e. classrooms in which the language that is taught and learned is not the language used by the community of speakers in the social environs outside where the classroom is set (e.g. English in a school in rural Korea in Year & Gordon, 2009), can also help a researcher more fully account for the experiences of the learners. The

present study further seeks to understand at a more fundamental level how the classroom

conversation is conducted in such a way that particular linguistic patterns are integral to both

learning and to the institutional identities of the participants. That is, this study seeks to better

understand how language, frequency of use, and learning institution are mutually constitutive.

Institutional CA (Heritage & Clayman, 2010) looks at how participants "talk social

institutions into being." This particular analysis will be relevant when we look at a type of class

setting in Chapter V in which the teacher and students use a single linguistic pattern to

collaborate a story--a routine task in that particular classroom. The analysis will show how the

participants co-construct their institution for learning in and through the target language. That

particular pedagogical format stands in contrast to the following example in Heritage & Clayman

(2010) of a rather old-fashioned format for classroom interaction:

Extract 1. Teacher student interaction in Heritage & Clayman (2010, p. 27)

```
(9)  [Gypsyman:3]
 1  Tea:        Okay (.) now then (.) has anyone anything to say (.)
 2              what d'you think this poem's all about?
 3              (2.9)
 4  Tea:        Miss O'Neil?
 5  Stu:        The uh:m gypsyman they want him to stay one more day
 6              longer.
 7  Tea:        The gypsyman they want him to stay one day longer,
 8              (.) Don't be afraid of making a mistake, if you've
 9              got any thoughts you put your hand up.=No-one's
10              gonna laugh at ya.=I shall be very grateful for
11              anything you have to say. Miss O'Neil said it's a
12              poem about a gypsyman (.) an' somebody wants him to
13       →      stay. (0.3) Any other ideas.=She's not right.
14              (3.1)
15  Tea:    →   That's the answer I expected but she's not right.
16              (0.9)
17  Tea:        Kate my love what are your thoughts?
18              (4.3)
19  Tea:        Mister Williams?
20              (2.5)
```

The authors highlight the ways in which teacher's evaluations on lines 13 and 15 of the student's response on lines 5 and 6 "instantiates social relationships in the classroom....the teacher's questions do not embody a K- [less-knowledgeable] position; rather they embody the kind of K+ [more knowledgeable] position that entitles the teacher to evaluate the correctness or otherwise of the students' responses" (p. 28). The authors contrast this question-answer-evaluation (Q-A-E) sequence with a Q-A-Oh sequence shown in normal conversational data, commenting: "...the 'oh' retroactively confirms that the previous question was a 'real' question offered by a relatively uninformed questioner. In the Q-A-E sequence, the evaluation confirms the epistemic supremacy of the questioner, and the question was designed to test the answerer. Thus we can see that the Q-A-E sequence *constitutes* a pedagogic context" (p. 28).

One final point to be made here on the theoretical background for this study is the treatment of learning as a social activity. CA-SLA researchers often only count instances in which a person visibly orients to something, e.g. a word or linguistic pattern, as an object for learning. Such selectivity in the present study would rule out the main type of interaction-for-learning the teachers and students are engaged in: comprehension-oriented tasks. Many of the teachers' pedagogical designs simply required students to attend to the meaning of her Chinese questions and to keep track of the imagery of the unfolding stories as the class created them by answering the teacher's questions. As we will see in the transcriptions from video data, the teacher often praised students for speaking in Chinese when it was of their own free will, but these instances were rare as the teacher tended to hold the floor and ask the questions.

Experimental evidence for learning without awareness was shown in Williams (2005). In that study, participants were trained in learning the following determiners, but were only told the meanings differed in terms of *near* and *far*:

Figure 5. Training stimuli (Williams, 2005)

Living		Nonliving	
Near	Far	Near	Far
gi dog	ul dog	ro sofa	ne sofa
gi mouse	ul mouse	ro cup	ne cup
gi cow	ul cow	ro television	ne television
gi cat	ul cat	ro book	ne book
gi flies	ul flies	ro cushions	ne cushions
gi snakes	ul snakes	ro plates	ne plates
gi pigs	ul pigs	ro boxes	ne boxes
gi bears	ul bears	ro pictures	ne pictures
gi lion(s)	*(ul lion/s)*	ro table(s)	*(ne table/s)*
gi bird(s)	*(ul bird/s)*	ro vase(s)	*(ne vase/s)*
(gi monkey/s)	ul monkey(s)	*(ro stool/s)*	ne stool(s)
(gi bee/s)	ul bee(s)	*(ro clock/s)*	ne clock(s)

Note. Items in italics and parentheses were not presented during training but were with-held for testing generalization ability. Items used for the test of memory for trained items are underlined.

Out of forty one participants, after testing was completed, eight participants claimed to have figured out the extra animacy (living/non-living) meaning, affecting the distribution of use. The remaining thirty-three participants were found to be unaware of the extra animacy rule during both training and testing. Findings indicate, "these unaware participants were able to select the correct determiner-noun combination at significantly above-chance levels" (p. 287). The present study takes this along with consideration of the child language studies reported by Tomasello (2003). Children in those studies are found to engage in joint attention, but this is often simply done by attending to the meaning of the caregiver, i.e. comprehending and ascribing actions.

CHAPTER III. METHODS AND DATA

3.1. Study design

In this section, each of the research questions as stated at the end of Chapter I will be addressed in turn here with a description of the methods designed to answer each question.

RQ1: How strongly is contingency learning at play during the earliest stages of construction learning in a typologically distant L2? This over-arching question will be the focus of Chapter IV. The question itself is subdivided into the following four (1a-1d) sub-questions. RQ1a: Are the frequency distributions in early experience Zipfian (allowing learners to attend to and learn the most frequent lexical items first)? RQ1b: Does learner use match the relative frequencies in their past experience? RQ1c: Do these matching frequencies reflect orders of acquisition, i.e. are the first-learned lexical constructions in each grammatical construction those that appeared more frequently in that grammatical construction in prior experience? These first three sub-questions will be analyzed by comparing the token frequencies of the lexical items found in each of three grammatical constructions in the main corpus (MC) and test corpus (TC) in each of five recording periods (RPs), totaling thirty frequency lists (3 CxNs x (5 MCs + 5 TCs) = 30 figures) for comparison of output with prior experience (language that was heard, read, spoken, and written).

RQ1d: Will the first-learned lexical constructions in each grammatical construction be those that are more distinctively associated with that grammatical construction in prior experience? This section will focus on just the first three RPs by using three measures of distinctiveness, namely *collostruction strength*, *contingency* as measured in Delta P (grammatical construction cues lexeme), and *contingency* as measured in Delta P (lexeme cues grammatical construction). Ellis & Ferreira-Junior (2009a) describe a lexical construction, i.e. a word, or

lexeme, that shares a significant association due to frequent prior co-occurrence with a particular grammatical construction as being a *collexeme* of that grammatical construction. The association is measured in the log to the base of 10 of the p-value of the Fisher Yates exact text. The script quantifies the association strength between each lexical construction and the grammatical construction it occurs in. The script calculates a p-value for each lexeme with each grammatical construction and performs a log transformation that results in highly positive and highly negative values that indicate a large degree of attraction and repulsion respectively. Zero (0) indicates random co-occurrence. An absolute p_{log} value of 1.3 or higher corresponds to a probability of error of 5% or less.

To measure contingency, i.e. the distinctness of pairings between particular lexemes with grammatical constructions, Delta P values are compared. Delta P (ΔP) measures the probability of an *outcome,* e.g. a person encounters a lexical construction, when a *cue* event occurs, P(O|C), e.g. in the context of a certain grammatical construction, minus the outcome in the absence of the cue, P(O|-C). When the probability of an outcome has the same likelihood with or without the cue, P(O|C) = P(O|-C), then $\Delta P = 0$; there is no covariation between the two events. When the presence of the cue strongly increases the likelihood of the outcome, ΔP approaches 1.0. Conversely, when the presence of the cue strongly decreases the likelihood of the outcome, ΔP approaches 1.0. For our purposes, we are concerned with six broadly defined possibilities for the relationships between lexical constructions and the grammatical constructions they occupy:

1. A grammatical construction strongly cues a lexical item (ΔP CxN > lexeme ≈ 1)

2. A grammatical construction does not strongly cue a lexical item (ΔP lexeme > CxN ≈ 0)

3. A grammatical construction strongly cues the absense of a lexical item (ΔP lexeme > CxN ≈ -1)

4. a lexical item strongly cues a grammatical construction (ΔP lexeme > CxN $\approx$ 1)

5. A lexical item does not strongly cue a grammatical construction (ΔP lexeme > CxN $\approx$ 0)

6. A lexical item strongly cue the absence of a grammatical construction (ΔP lexeme > CxN $\approx$ -1)

RQ2: To what degree might the salience of individual lexical items interact with frequency, i.e. does lower-rated *concreteness* of meaning necessitate greater frequency of exposure, whereas higher-rated concreteness allows for learning from less frequent exposure?

RQ3: How is the statistical skewing of language-in-use accomplished in the present data's social interaction? This analysis will draw from Drew & Heritage (2010) with a focus on three key properties of institutional talk (summarized in Kasper & Wagner, 2014): goal-orientation, special constraints on allowable contributions, and institution-specific inferential frameworks.

3.2. A new multimedia learner corpus

3.2.1. Setting

An intensive Chinese language summer camp was hosted in the United States in Summer 2016, running from July 11 through July 29[6]. The camp hosted experienced lead instructors who were experienced in a variety of teaching methodologies and underlying philosophies of language learning. The theme of the camp was "Taste of Aloha," entailing the learning and practice of Chinese around the functional usage of (1) stating likes and dislikes about foods and beverages, (2) performing greetings, self introductions, and farewells, and (3) talking about Hawaii, the location of their camp. As a rule, metalinguistic grammar rules, i.e. telling students "this is a

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[6] The present study's learner corpus only looks at July 11 - July 27 as the fifth and final test corpus was collected on July 27.

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noun," "this is an object," "this is an attributive phrase," we not part of the learning experience. However, teachers did use English to point out linguistic form on occasions when doing so helped clarified the meaning of a phrase or utterance for students, i.e. telling students "this little *guo* part makes the sentence means we've *been there done that,*" or "this side part of the Chinese character is a woman, and you'll see that in more characters related to women." The lead instructors around Task-based Language Teaching (TBLT) and Teaching Proficiency through Reading and Storytelling (TPRS) designed two main curriculum strands. The full camp schedule is provided in Appendix A.

In order to ensure that the present learner corpus was *representative* (McEnery & Hardie, 2011), care was taken to make sure that video recording and transcriptions accounted for all of the primary language classroom environments: TBLT, TPRS, Media Lab blogs, CCR, Reading Room, student-written stories. In contrast to many corpus studies, the present study aimed not at sampling equivalent *intervals* over time (c.f. Tomasello & Stahl, 2004), but to *maximally* capture as much linguistic and social experience as possible in this short time at camp. Toward this aim, some learning settings are more represented than others (see table below).

3.2.2. Participants

All participants signed IRB-approved consent and assent forms. The participants initialed their consent and assent forms to approve three options for sharing: (a) "Reed can view & listen to your recordings, and publish information from it in his research," (b) "Your recordings can be played in classrooms, at academic lectures, and at conferences," (c) "Your recordings can be shared in research databases, for other researchers to use." Lead instructors sorted the camp's twenty one students into two learning tracks by rough teacher judgments on whether or not the

students (a) had near-zero ability in any aspects of Chinese (so put in the beginning track), or (b) were better suited to attend the "studied up to one year of Chinese" track. Ten students in the beginning track were selected for inclusion in the present corpus. Appendix A only represents the schedule for the beginning track students. The participants chose their own names for the research study: *Grayson* (age 12), *Troy Bolton* (age 13), John (age 15), twin sisters *Vanessa* and *Veronica* (age 15), *Abigail* (age 15), *Ethan* (age 15), *Salena* (age 15), *Lydia* (age 16), and *Sovanna*, or *Sovi* (age 18). Grayson had attended more than one Chinese summer program in prior summers, but lead instructors at the present camp assessed his proficiency to be best suited for the beginning track. Vanessa and Veronica were adopted from East China (a region within PR China) at age 15 months, and were raised in a monolingual English household in the Midwestern United States. Sovi could say some words in Vietnamese as a heritage language in her home. Considering the learners' abilities to use (understand and/or produce) the language in the data analyzed here, the present study views all ten learners as true beginners--including Grayson--of Mandarin Chinese at the start of the present learner corpus.

3.2.3. Corpus metadata

To video record classroom interaction, three HD video cameras and one Zoom H4n Handy audio recorder were placed in the TPRS classroom to record three angles of the room: (1) from behind the students as they viewed the teacher, the white board, and most of the word wall around the white board; (2) from the teacher's left side, in the corner of the room to view the students faces and teacher's side (having the teacher in two videos also helped time-sync videos from different angles when needed), and (3) a sport-designed fisheye-lens camera on a back ceiling corner to record the entire room in case any action happened outside the range of the other two cameras.

Camera (1) was moved to the back of the room during TPRS reading (CCR) each day because the students turned their desks 90 degrees toward their right to face the projector screen, and this way the camera would continue to capture what students saw while reading. Two more cameras were placed in the TBLT room next door, to record (1) from the back of the room to capture the teacher, the front projector screen, and the side white board, and (2) from the front of the room to capture the students faces as they faced toward the front of the room. Both cameras (1) and (2) in the TBLT room were able to capture most of the peer interaction when students walked around to survey/interview each other, or sat in dyadic or triadic grouping during peer interaction.

Video and texts were transcribed using Chinese characters from Chinese utterances, and in English for any English utterances or sounds. Files were done in CHAT format for automatic analysis for CLAN (MacWhinney, 2000). Chinese was parsed with a single space between multi-character words if the participants treated them as words--e.g. the teachers glossed *xihuan* as "likes" and so no space was used between 喜 (*xi*) and 欢 （*huan*）--and single character particles if the participants treated them as separable (e.g. the teachers glossed 的 *de* on an individual word poster as "the thing that is/'s" so 的 (*de*) had a single space before and after it. The CHAT files were organized in to a single learner corpus as follows:

Table 1. Corpus files organized by video recordings and transcribed images of texts used in learning (read or written).

Dates (days) included in corpus	2016 July 11 - 15, 18 - 22, 25 - 27
	(Mon-Fri, Mon-Fri, Mon-Wed, weekends excluded)
CHAT files from video (total)	n = 43 (including the following)
TPRS Li./Sp. class	n = 12 CHAT files
total video time	10h 45m 14s
TBLT Li./Sp. class	n = 12 CHAT files
total video time	10h 37m 18s
TPRS Reading Class	n = 10 CHAT files
total video time	6h 23m 55s
Reading Room (TBLT room)	n = 8 CHAT files
total video time	2h 42m 27s
Dyadic story telling assmt.	n = 1 CHAT file
total video time	1h14m43s
Video time (total)	31h 43m 37s
CHAT files from student writing	n = 25 CHAT files
Writing time total	16h 36m
CHAT files from texts	
On classroom/hallway walls	n = 9 CHAT files
In students hands	n = 4 CHAT files
CHAT from researcher notes	n = 10

CHAT files from reading tests	n = 6
TOTAL CHAT files for CLAN	n = 97
TOTAL time accounted in files	48h 19m 37s

The Reading Room (RR) files (n = 8) total two less than the TRPS Reading files because (1) there was no RR meeting on the first day of camp, though there was a TPRS Reading lesson that day, and (2) a July 21 RR video was too noisy to transcribe. RR videos were transcribed up until the students ended choral reading and began reading with teachers because these videos were also too noisy to transcribe.

According to the official camp schedule (see Appendix A), the total class hours at the camp in which the students are estimated to have been using (hearing, speaking, reading, or writing) Chinese add up to 93h 42m. The video transcribed and included the present study's learner corpus that represent the main language classes each day (not including cultural activities, martial arts practice, meals, time between classes, etc.), forms 33.88% (31.7/93.7) of the total Chinese language time at camp. The additional texts transcribed and included account for 17.61% of the total language time (16.5h/93.7h). Together, these CHAT files are estimated to account for 51.49% of the learners' total Chinese language experiences.

The files were sub-dived into five recording periods (RPs), similar to Eskildsen's (2017) subdivision of the MAELC corpus (Reder et al, 2003). Each RP represents all of the classroom video recordings and texts (*main corpora*; MC) up to the start of a five-minute timed writing sample as the *test corpora* (TC1, TC2, TC3), the start of dyadic (pairs of students) spoken story creation (TC4), and a one-hour timed written story, written in Chinese characters using the vocabulary list in Appendix E (see also the TC5 writing samples by three of the learners in the same appendix). Aside from the provided vocabulary list, the students had no help in matching

the Chinese pinyin or characters to English glosses, and no help in stringing the words together into sentences. The times and dates represented by each MC and TC are presented in the following table:

Table 2. Corpus files by recording period (RP), main corpus (MC), and test corpus (TC).

	MC dates	MC time	TC date	TC format
RP1	July 11, 12, 13 (1h)	8h 33m 23s	July 13, end of 1st h	5 min. individual story free-write (write pinyin, no help)
RP2	July 13, 14, 15, 18 (1h)	11h 41m 57s	July 18, end of 1st h	5 min. individual story free-write (write pinyin, see Appendix A)
RP3	July 18, 19, 20, 21 (1h)	11h 16m 0s	July 21, end of 1st h	5 min. individual story free-write (write pinyin, no help)
RP4	July 21, 22	7h 5m 19s	July 22, evening	6-8 min. dyadic story free-tell (speak Chinese)
RP5	July 22 (1h), 25, 26	8h 42m 58s	July 27	1 hr. individual story free-write (Appendix E list provided)

It should be noted that the average time (with standard deviation) of the five RPs is 9 hours 51 minutes (1 hour 57 minutes). RP2 and RP3 lie at least 1 hour above this average while RP1, RP4, and RP5 are at least an hour below it. This is not problematic for the present study's research goals as the aim here is not to capture samples at representative intervals, but to maximally capture *everything* the learners experienced. One reason for this imbalance stems from one of the primary objectives being to minimize interruptions to the teachers and students at the camp. This meant that the writing and speaking samples, represented in each TC, took place only when the

teachers gave the go-ahead, and cut their teaching short to allow for the students to write or speak. It was not the teacher's nor the student's goals to ensure a balanced corpus for research, so we should be grateful that these five test corpora were allowed to be collected at all. Removing files from the corpus would increase balance, but doing so also runs the risk of missing out on *rare* phenomena (see Tomasello & Stahl, 2004 for discussion). Additionally, removing files for the sake of balancing the corpus would necessarily mean losing *total* counts of the language experienced in the main classes. Tracking the total number of times a phenomena happened can better allow for a linguistic pattern to serve as a reliable "tracer" element, or learning object.

3.3. Tracer elements: *xiang* 'feels like', *yao* 'wants', and *xihuan* 'likes' constructions

Collostructional Analysis (Stefanowitsch & Gries, 2003; Stefanowitsch, 2013) will be performed on three Chinese grammatical constructions that each has a fixed lexeme in their first lexical slot. The three constructions used in the present analyses to serve as tracer elements are:

[*xiang* 'feel(s) like' (+ *gen* 'with') (+ REFERENT) + PROCESS (+ REFERENT)],

[*yao* 'want(s)' (+ *gen* 'with') (+ REFERENT) + PROCESS (+ REFERENT)], and

[*xihuan* 'like(s)' (+ *gen* 'with') (+ REFERENT) + PROCESS (+ REFERENT)]

For purposes of brevity these will be referred as the *xiang* 'feels like' construction, the *yao* 'wants' construction, and the *xihuan* 'likes' construction. These three constructions were chosen from the learner corpus for the present analysis because they were found to be of a generally robust quantity across the ten learners' writing sample in TC5. Thus they were found to be successfully learned by the learners as a group by the end of the camp and corpus. These three constructions also allow for analyses similar to those in Ellis & Ferreira-Junior (2009a, 2009b). The main difference here is that for a typical advanced or native speakers of Mandarin Chinese, a process

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word (e.g. *chi* 'eat', *kan* 'watch', *qu* 'go') that that sounds felicitous in the PROCESS slot in one of these constructions can fit just as well in the same slot of either of the remaining two constructions. For example, to a non-beginning speaker *xiang chi* 'feels like eating' works just as well as *yao chi* 'wants to eat' and *xihuan chi* 'likes to eat'.[7] In contrast to Ellis and Ferreira-Junior (2009a, 2009b), the present analysis is not interested in the distinctiveness of lexemes in particular grammatical constructions as an *end state*, e.g. *go* being distinctly associated the VL construction but disallowed in VOL and VOO. Instead the present study is interested in constraints on creativity during the first days of learning as evidence of the same contingency learning mechanisms being at play as in that those previous studies. This will be investigated by comparing the ten learners' language use in writing and speaking samples for five test corpora (TCs) in comparison with five main corpora (MCs) that were transcribed from video and texts documenting the learners' social experiences prior to production for each TC.

The corpus CHAT files grouped for each RP were run once through the FREQ program in CLAN (MacWhinney, 2000) to generate a full list of all words. These were sorted in Excel to separate all Chinese words, either in pinyin or characters, away from English and other non-Chinese words and sounds. All non-Chinese items were pasted into a .cut file and included in a fresh FREQ run in CLAN, so only Chinese words were listed and counted. The three tracer constructions were hand counted in Excel by searching all CHAT files for three Chinese words (parenthetical information excluded): "*想*" (*xiang* 'feels like'), "*喜欢*" (*xihuan* 'likes'), "*要*" (*yao* 'wants'), then by pasting results in Excel in chronological order (by file), and tagging

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[7] This is based on introspective judgements as an advanced non-native speaker.

each instance noted. The total token count of Chinese words and the three tracer constructions are presented in the following table:

Table 3. Chinese lexeme tokens in each MC

	lexemes	totals
MC1	14862	
MC2	26788	41650
MC3	22786	64436
MC4	11355	75791
MC5	15956	91747

CHAPTER IV. FREQUENCY DISTRIBUTION AND CONTINGENCY LEARNING

This chapter focuses on answering RQ1 (a, b, c, and d) and RQ2. These research questions were stated at the end of Chapter I, as well as at the beginning of Chapter III along with descriptions of the methods and data that will be used in this chapter. In brief, Collostructional Analysis (Stefanowitsch & Gries, 2003; Stefanowitsch, 2013) will be performed on three Chinese grammatical constructions that each has a fixed lexeme in their first lexical slot. The three constructions used in the present analyses to serve as tracer elements are:

[*xiang* 'feel(s) like' (+ *gen* 'with') (+ REFERENT) + PROCESS (+ REFERENT)],

[*yao* 'want(s)' (+ *gen* 'with') (+ REFERENT) + PROCESS (+ REFERENT)], and

[*xihuan* 'like(s)' (+ *gen* 'with') (+ REFERENT) + PROCESS (+ REFERENT)]

For purposes of brevity these will be referred as the *xiang* 'feels like' construction, the *yao* 'wants' construction, and the *xihuan* 'likes' construction. These three constructions were chosen from the learner corpus for the present analysis because they were found to be of a generally robust quantity across the ten learners' writing sample in TC5. Thus they were found to be successfully learned by the students as a group by the end of the camp and corpus. These three constructions also allow for analyses similar to those in Ellis & Ferreira-Junior (2009a, 2009b). The main difference here is that for a typical advanced or native speakers of Mandarin Chinese, a process word (e.g. *chi* 'eat', *kan* 'watch', *qu* 'go') that that sounds felicitous in the PROCESS slot in one of these constructions can fit just as well in the same slot of either of the remaining two constructions. For example, to a non-beginning speaker *xiang chi* 'feels like eating' works just as well as *yao chi* 'wants to eat' and *xihuan chi* 'likes to eat'.[8] In contrast to Ellis and Ferreira-Junior (2009a, 2009b), the present analysis is not interested in the distinctiveness of lexemes in

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[8] This is based on introspective judgements as an advanced non-native speaker.

particular grammatical constructions as an *end state*, e.g. *go* being distinctly associated the VL construction but disallowed in VOL and VOO. Instead the present study is interested in constraints on creativity during the first days of learning as evidence of the same contingency learning mechanisms being at play as in that those previous studies. This will be looked at by comparing the ten learners' language use in writing and speaking samples for five test corpora (TCs) in comparison with five main corpora (MCs) that were transcribed from video and texts, documenting the learners' social experiences prior to production for each TC.

4.1. Collostructional Analysis

4.1.1. Frequency distribution: Lemma types and tokens across three constructions

The analysis in this sub-section is aimed at answering RQ1a, RQ1b, and RQ1c by looking at the distribution lexical items across the three grammatical constructions in all five recording periods. Following RQ1d will be investigated by looking at collostructional strength, measuring the strength of association between each lexical item and the each grammatical construction, as well as Delta P, measuring how strongly each lexical item predicts the occurrence of a particular grammatical construction, and the other direction, i.e. how strongly each grammatical construction predicts each lexical item. These three measures of distinctiveness of association will look only at the MCs and TCs of the first three RPs as the research interest here is in *first-learned* lexical items, following Ellis & Ferreira-Junior (2009a).

RP1

In the first recording period (RP1), we find heavy skewing in MC1 toward *chi* 'eat' in the *xiang* 'feels like' construction. The pattern *xiang chi* 'feels like eating' was experienced over two hundred fifty times in the first two days of camp, plus the first class hour of the third day.

Thirteen other combinations for these three constructions were also experienced in the same RP, but the effect on TC1 is a dominant use of *xiang chi* 'feels like eating', with only two examples that differ. These are *yao chi* 'want to eat' and *yao ku* 'want to cry', both produced by the same learner, Troy Bolton (see the following table, below).

Figure 6. Frequency of lexical items (lemma) appearing in each of three constructions in MC1 and TC1
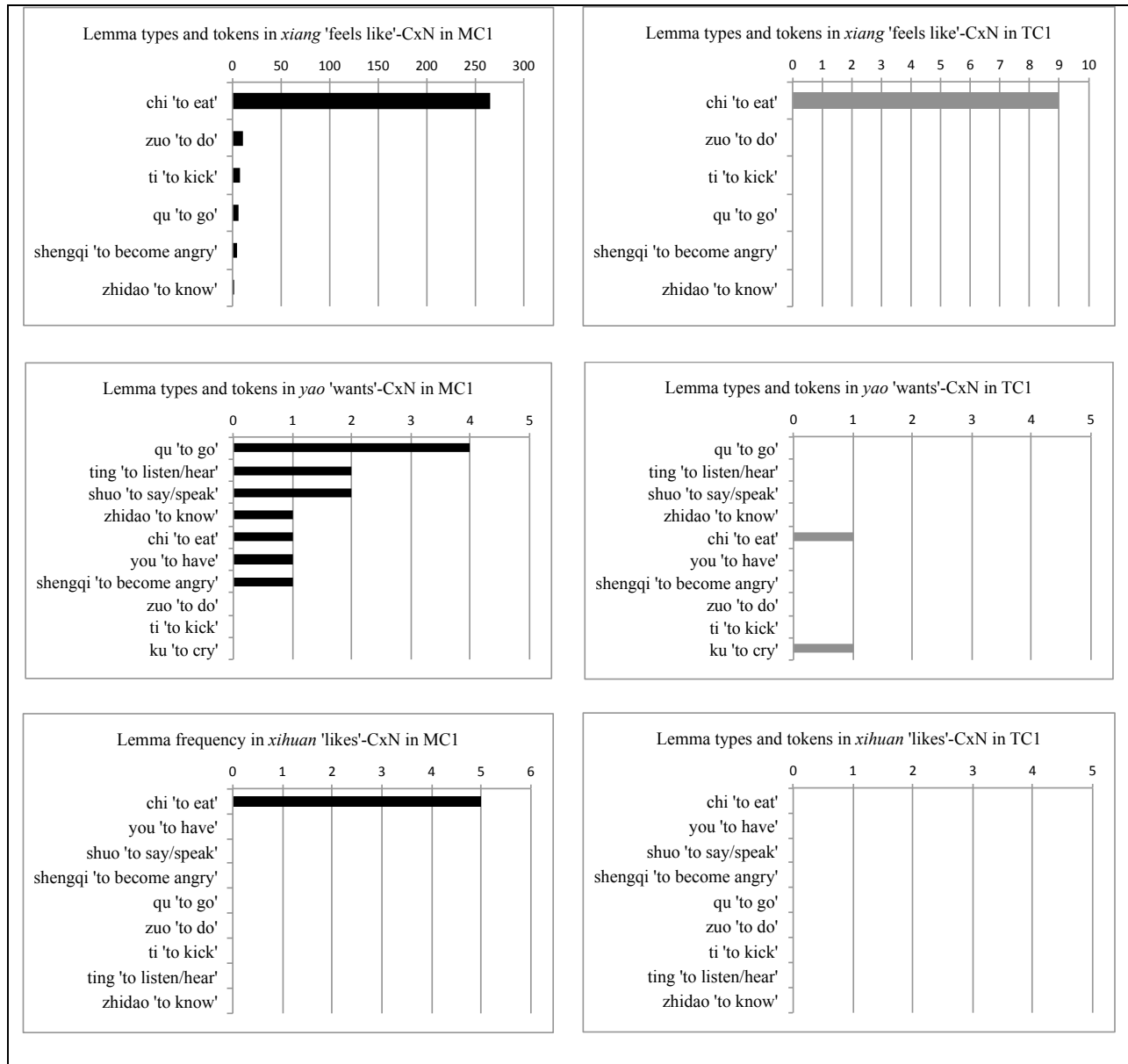
The following table represents the same distribution of lexemes in grammatical constructions by individual learner. Two phenomena are notable: (1) five out of the ten participants used the *xiang* 'feels like' construction, and (2) Troy Bolton used it more than any of the other participants, and he used two *yao* 'wants' constructions. This points to Troy Bolton's having more schematic representation of these two grammatical constructions as well as with the lexical material that can fill them.

Table 4. Lexeme-construction pairings produced by each learner in TC1

Participant	[*xiang* 'feels like' + PROCESS]	[*yao* 'wants' + PROCESS]	[*xihuan* 'likes' + PROCESS]
Sovi	*xiang chi* 'feels like eating'	-	-
Lydia	*xiang chi* 'feels like eating'	-	-
John	-	-	-
Troy Bolton	*xiang chi* 'feels like eating' x3	*yao chi* 'wants to eat', *yao bu ku le* 'wants to not cry'	-
Vanessa	-	-	-
Veronica	*xiang chi* 'feels like eating' x2	-	-
Abigail	*xiang chi* 'feels like eating' x2	-	-
Ethan	-	-	-
Salena	-	-	-
Grayson	-	-	-

In the next RP, we investigate what happens when frequency distribution changes in favor of the *xihuan* 'likes' construction.

RP2

In MC1-2, we find a greater balance of lexemes in the *yao* 'wants' construction, but all of low token frequency (ten tokens or less). This appears to have no effect on learner production in TC2. The *xiang chi* 'feels like eating' pattern continues to be used far more frequently than other *xiang* 'feels like' constructional patterns, and it is used five times in TC2. The major change that shows effects on TC2 is the high token frequencies of *xihuan chi* 'likes to eat' and *xihuan kan* 'likes to see/watch'.

Figure 7. Frequency of lexical items (lemma) appearing in each of three constructions in MC1-2 and TC2 (continued on next page)

Lemma types and tokens in *yao* 'wants'-CxN in MC1-2

zuo 'to do'	
qu 'to go'	
kan 'to see/watch'	
chi 'to eat'	
ting 'to listen/hear'	
outu 'to vomit'	
shuo 'to say/speak'	
zhuan 'to turn'	
kaishi 'to start'	
zhidao 'to know'	
ku 'to cry'	
you 'to have'	
shengqi 'to become angry'	
mai 'to buy'	

Lemma types and tokens in *yao* 'wants'-CxN in TC2

Lemma types and tokens in *xihuan* 'likes'-CxN in MC1-2

Lemma types and tokens in *xihuan* 'likes'-CxN in TC2

The change in distribution of construction usage by each individual learner is represented in the following table. Notable is that Sovi, Lydia, Troy Bolton, Veronica, and Abigail were the five participants who produced *xiang* 'feels like' constructions in TC1, whereas Vanessa and Grayson had not produced any of these three constructions in TC1. In TC2, however, Sovi, Lydia, and Veronica "move on" to using the new construction of high token frequency: *xihuan* 'likes' constructions. Vanessa and Grayson appear to be latecomers to using any of these three constructions, and they pick up with xiang 'feels like' constructions. John appears to jump in

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here, as he had not produced any of the three constructions in TC1, but uses three *xihuan* 'likes' constructions in TC2.

Table 5. Lexeme-construction pairings produced by each learner in TC2

Participant	[*xiang* 'feels like' + PROCESS]	[*yao* 'wants' + PROCESS]	[*xihuan* 'likes' + PROCESS]
Sovi	-	-	*xihuan chi* 'likes to eat', *xihuan kan* 'likes to see/watch'
Lydia	-	-	*xihuan chi* 'likes to eat'
John	-	-	*xihuan chi* 'likes to eat' X3
Troy Bolton	*xiang chi* 'feels like eating' X2	-	-
Vanessa	*xiang chi* 'feels like eating'	-	-
Veronica	-	-	*xihuan chi* 'likes to eat', *xihuan* 'likes' *gen* 'with' REF *chi* 'eat'
Abigail	-	-	-
Ethan	-	-	-
Salena	-	-	-
Grayson	*xiang chi* 'feels like eating' X2	-	-

In the next RP, we begin to see a greater balance of lexemes and grammatical constructions across MC1-3, and how this reflects in TC3.

RP3

In MC1-3, we see a near-total suspension of new *xiang* 'feels like' constructions from RP2. Some new words were used in this construction, but only in very low token counts. This is also reflected in TC3 in a sharp drop-off in learner usage of *xiang* 'feels like' constructions. In the usage of *yao* 'wants' constructions in MC1-3 we find a very typical Zipfian distribution of lexemes--each roughly half as frequent as the next more frequent lexeme. TC3 shows a scattering of lexemes in this construction, but a notable lack of the one most frequent pattern in prior experience for this construction, namely *yao xi* 'wants to wash'. We do see a sharp up-spike in usage of *xihuan chi* 'like(s) to eat' as it was at the start of this RP that the TBLT classes had students asking each other *ni zui xihuan chi shenme shuiguo* 'what fruit do you like to eat most'. The *xihuan* 'likes' construction appears in TC3 three uses of *xihuan chi* 'likes to eat'.

Figure 8. Frequency of lexical items (lemma) appearing in each of three constructions in MC1-3 and TC3 (continued on next page)

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Lemma types and tokens in *yao* 'wants'-CxN in MC1-3

Lemma types and tokens in *yao* 'wants'-CxN in TC3

Lemma types and tokens in *xihuan* 'likes'-CxN in MC1-3

Lemma types and tokens in *xihuan* 'likes'-CxN in TC3
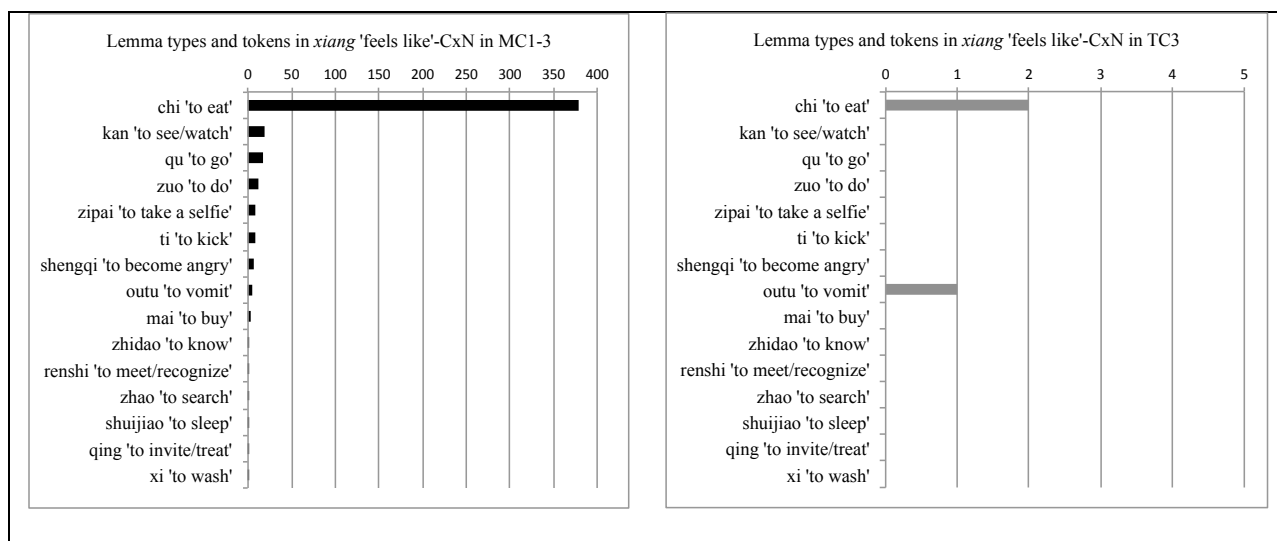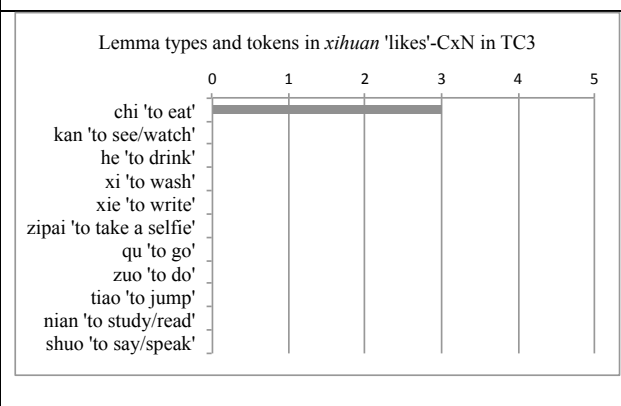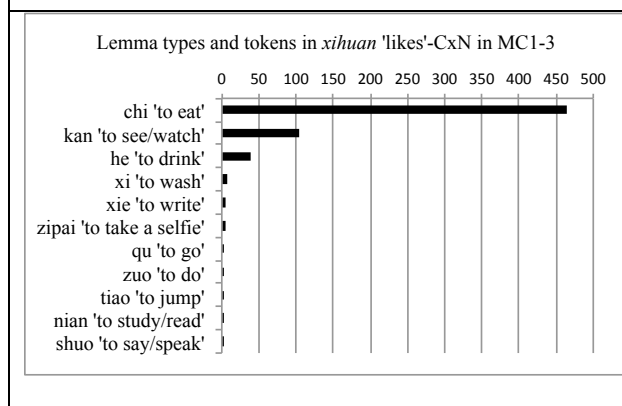
In the following table, again we find Sovi, Lydia, and Veronica progressing to the *yao* 'wants' constructions. Vanessa "caught up" as well but has skipped over usage of the *xihuan* 'likes' construction. Writing by John, Ethan, and Grayson are off our radar in the present analysis for TC3 because they did not use any of the three tracer constructions.

Table 6. Lexeme-construction pairings produced by each learner in TC3

Participant	[*xiang* 'feels like' + PROCESS]	[*yao* 'wants' + PROCESS]	[*xihuan* 'likes' + PROCESS]
Sovi	-	*yao qu* 'wants to go'	-
Lydia	-	*yao chi* 'wants to eat'	-
John	-	-	-
Troy Bolton	*xiang outu* 'feels like vomiting'	-	-
Vanessa	*xiang chi* 'feels like eating'	*yao kan* 'wants to see'	-
Veronica	-	*yao mai* 'wants to buy', (yao *xihuan chi* 'wants/likes to eat')	*xihuan chi* 'likes to eat'
Abigail	*xiang chi* 'feels like eating'	-	*xihuan chi* 'likes to eat'
Ethan	-	-	-
Salena	-	-	*xihuan chi* 'likes to eat'
Grayson	-	-	-

In the next RP, we continue to see a continued progression toward more balanced frequency distribution, particularly within *yao* 'wants' constructions.

RP4

In MC1-4 We find a much more evenly distributed set of lexemes in the *yao* 'wants' construction, but only two counts of *yao zipai* 'wants to take (a) selfie(s)'. The *xihuan chi* 'like(s) to eat' and *xihuan kan* 'like(s) to see/watch' patterns match across MC1-4 and TC4. The *xiang chi* 'feels like eating' and *xiang qu* 'feels like going' patterns are a close match, with a notable absence of *xiang kan* 'feels like seeing/watching' in TC4.

Figure 9. Frequency of lexical items (lemma) appearing in each of three constructions in MC1-4 and TC4 (continued on next page)

Lemma types and tokens in *yao* 'wants'-CxN in MC1-4

Lemma types and tokens in *yao* 'wants'-CxN in TC4

Lemma types and tokens in *xihuan* 'likes'-CxN in MC1-4

Lemma types and tokens in *xihuan* 'likes'-CxN in TC4
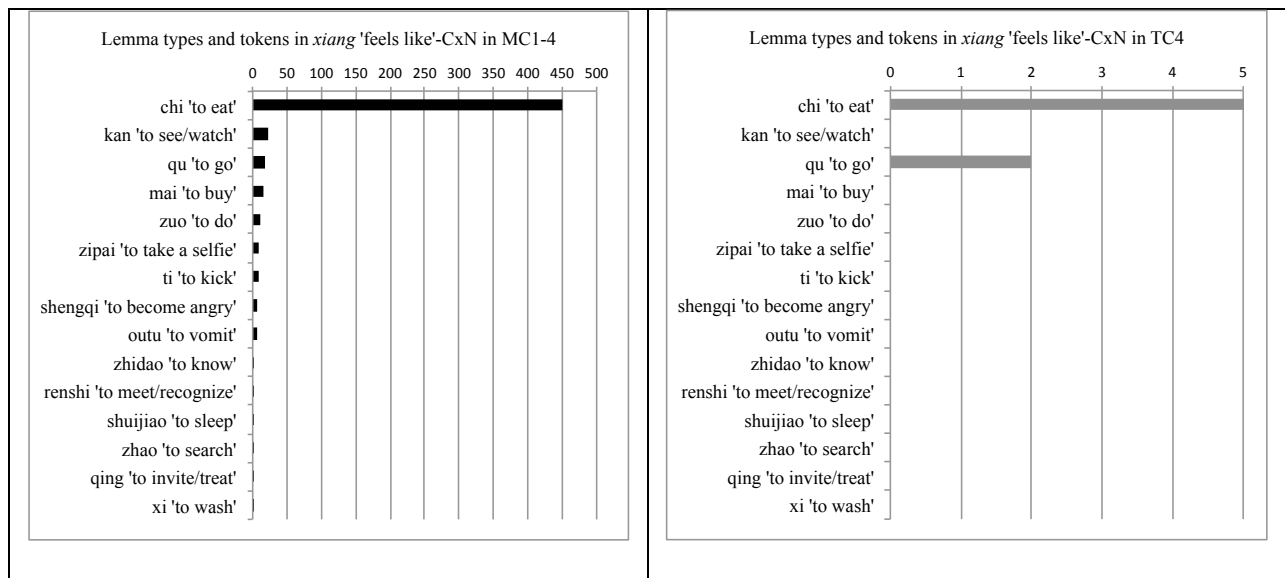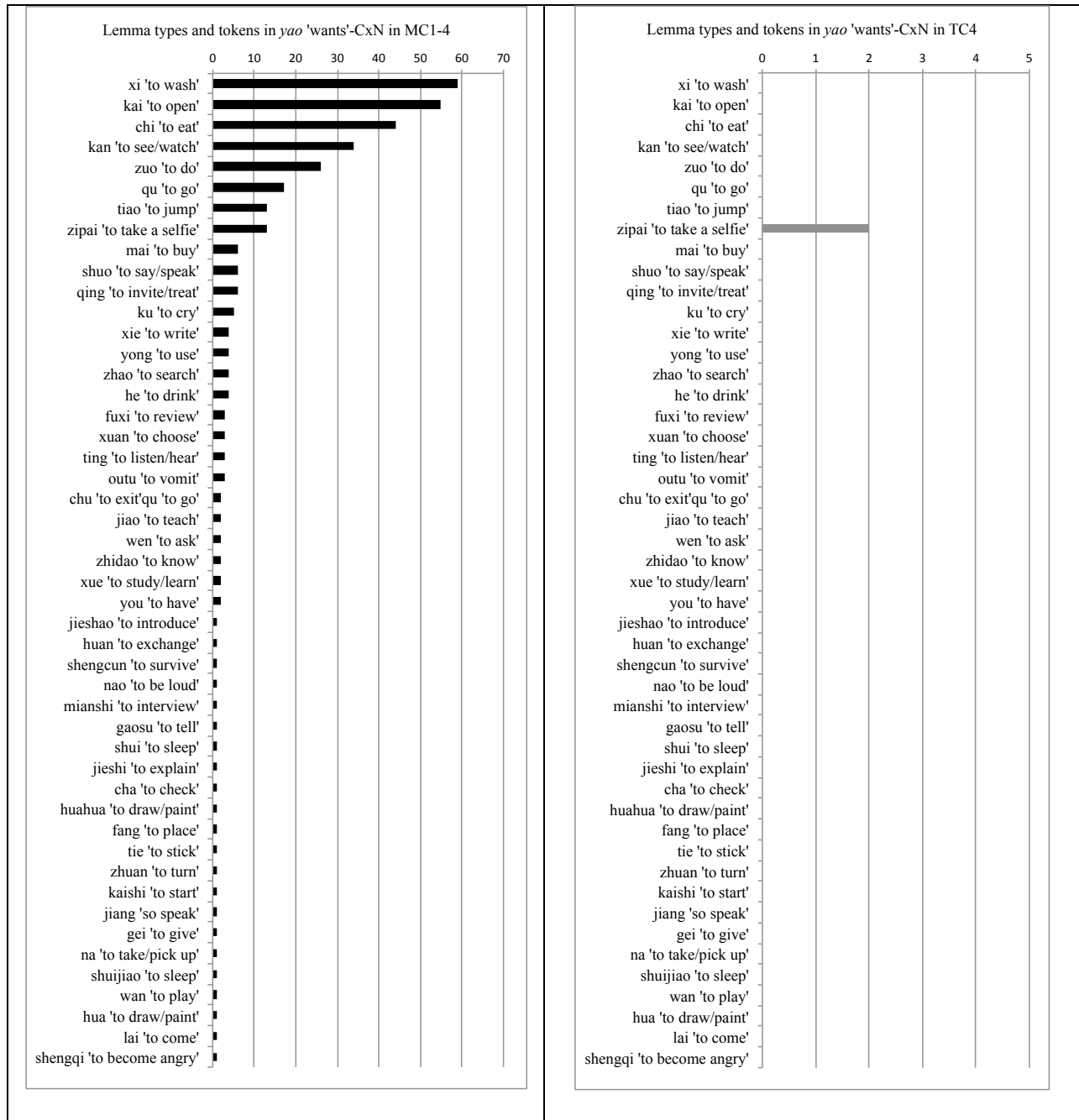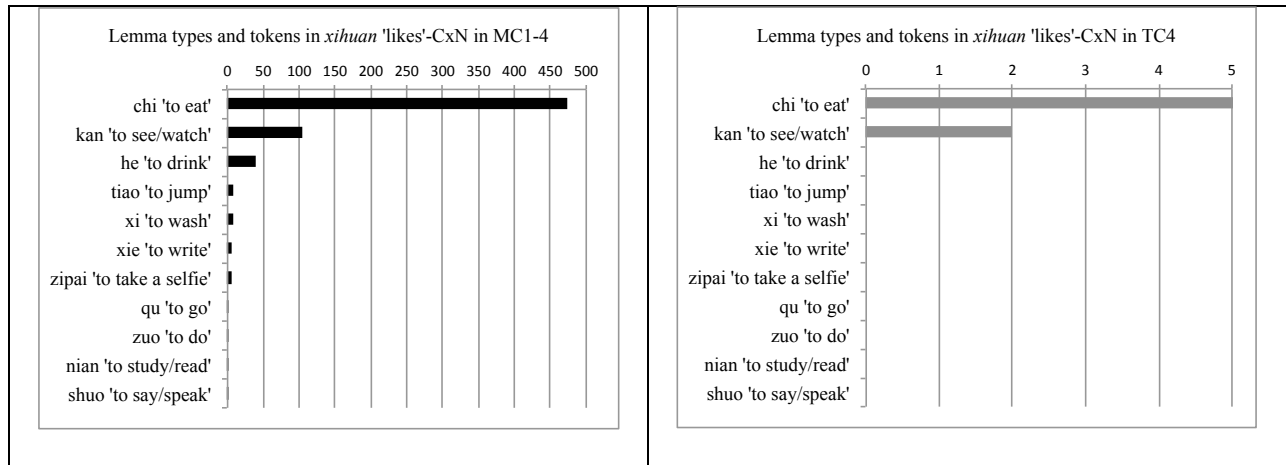
In the following table, we find Sovi, Lydia, Vanessa, Veronica, and Abigail more heavily into the newer pattern territory, i.e. *xihuan* 'likes' and *yao* 'wants' constructions. Troy Bolton uses the early experienced *xiang* 'feels like' pattern, but with the addition of *xiang qu* 'feels like going', indicating higher schematization in the second slot for that construction. Ethan and Grayson return--Ethan for the first time with these three constructions--sticking with *xiang* 'feels like' constructions.

Table 7. Lexeme-construction pairings produced by each learner in TC4

Participant	[*xiang* 'feels like' + PROCESS]	[*yao* 'wants' + PROCESS]	[*xihuan* 'likes' + PROCESS]
Sovi	*xiang chi* 'feels like eating' X3, *xiang qu* 'feels like going'	-	*xihuan chi* 'likes to eat' X4
Lydia	-	*yao zipai* 'wants to take selfies' X2	-
John	-	-	-
Troy Bolton	(you) *xiang chi* 'feels like eating', *xiang chi* 'feels like eating' X4, *xiang qu* 'feels like going'	-	-
Vanessa	-	-	*xihuan kan* 'likes to see/watch' X2
Veronica	-	-	*xihuan chi* 'likes to eat'
Abigail	-	-	*xihuan chi* 'likes to eat'
Ethan	*xiang qu* 'feels like going'	-	-
Salena	-	-	-
Grayson	*xiang chi* 'feels like eating'	-	-

In the next RP, we find *chi* 'eat' finally showing up in *yao* 'wants' constructions.

RP5

This final RP finds the beginnings of more balanced usage of lexemes, notably the top three most frequent in *xiang* 'feels like' constructions in MC1-5, in TC5. The two *xiang outu* 'feels like vomiting' patterns will be discussed later in this chapter, in regards to salience. It is interesting that in MC1-5, *yao xi* 'wants to wash' shows up one time in TC5, and *yao kai* 'wants to hold (a party)' does is not used at all in TC5, yet these were the two most frequent in prior experience. One notable difference is that neither of these patterns reached triple digit (100+) token frequency as *xiang chi* 'feels like eating' and *xihuan chi* 'likes to eat' did. This could point to a minimum token frequency needed in experience before early learners to begin to possess a strong enough mental representation to use it as a resource in production. However, we find a new high frequency in the use of *chi* 'eat' in *yao* 'wants' constructions. This could indicate that the *xiang* 'feels like' and *xihuan* 'likes' constructions previously provided fertile environments for the learning of *chi* 'eat' and its potential for positioning in constructions that are similar in form, i.e. [PROCESS (+ UTTERANCE) + PROCESS (+UTTERANCE)]. At this point, chi 'eat' has been experienced so frequently that it appears to have become *autonomous* (Bybee, 2006), and free to move about to other constructions where it has been experienced less frequently. This will be further discussed at the end of this chapter.

Figure 10. Frequency of lexical items (lemma) appearing in each of three constructions in MC1-5 and TC5 (continued on next page)

Lemma types and tokens in *xiang* 'feels like'-CxN in MC1-5

Lemma types and tokens in *xiang* 'feels like'-CxN in TC5

Lemma types and tokens in *yao* 'wants'-CxN in MC1-5

Lemma frequency in yao 'wants'-CxN in TC5

xi 'to wash'
kai 'to open'
chi 'to eat'
kan 'to see/watch'
qu 'to go'
zuo 'to do'
mai 'to sell'
mai 'to buy'
zipai 'to take a selfie'
xie 'to write'
tiao 'to jump'
shuo 'to say/speak'
ku 'to cry'
wen 'to ask'
qing 'to invite/treat'
he 'to drink'
fuxi 'to review'
xuan 'to choose'
yong 'to use'
gei 'to give'
zhao 'to search'
zuo 'to sit'
xue 'to study/learn'
you 'to have'
chu 'to exit'qu 'to go'
wan 'to play'
outu 'to vomit'
zhidao 'to know'
ting 'to listen/hear'
tiyan 'to experience'
jizhu 'to memorize'
jiao 'to teach'
chu 'to exit'
kaishi 'to start'
jieshao 'to introduce'
pa 'to fear'
ban 'to make up'
huan 'to exchange'
shengcun 'to survive'
nao 'to be loud'
mianshi 'to interview'
gaosu 'to tell'
shui 'to sleep'
lianxi 'to practice'
jieshi 'to explain'
cha 'to check'
huahua 'to draw/paint'
pinchang 'to taste'
fang 'to place'
tie 'to stick'
zhuan 'to turn'
zhuyi 'to notice'
huida 'to answer'
pai 'to order/line up'
zou 'to walk/go'
jiang 'so speak'
hui 'to know how to do'
na 'to take/pick up'
shuijiao 'to sleep'
hua 'to draw/paint'
qi 'to rise'
lai 'to come'
jiao 'to call/be named
shengqi 'to become angry'

| Lemma types and tokens in *xihuan* 'likes'-CxN in MC1-5 | Lemma types and tokens in *xihuan* 'likes'-CxN in TC5 |

In the following table, we find a fairly productive and distributed use xiang 'feels like' constructions across nine of the ten participants. It is important to note that the conditions in this writing sample were different from the other TCs, including more time, and a list of pinyin and Chinese characters for reference (see Appendix E). The participants still had to choose lexical items they understood from this list and order them into sentences via hand writing (a slow process compared to writing in Roman letters) without help from English glossing, and without help with grammatical ordering. Sovi, Troy Bolton, Vanessa, Ethan and Grayson have progressed on to inserting *outu* 'vomit', *qu* 'go', *and* kan 'see/watch' into xiang 'feels like' constructions. One might assume that the printed list of lexical material allowed them to freely insert items into any construction, except that we do not see this greater freedom in the contexts of *yao* 'wants' and *xihuan* 'likes'. The only lexical item that the majority of participants use freely across all three constructions is *chi* 'eat', while *kan* 'see' comes in second by appearing three times in *xiang* 'feels like' and three times again in xihuan 'likes' constructions. The second slot in the *yao* 'wants' construction remains heavily constrained despite the learners more freely choosing lexical items from the list for *xiang* 'feels like' and *xihuan* 'likes' constructions.

Table 8. Lexeme-construction pairings produced by each learners in TC5

Participant	[*xiang* 'feels like' + PROCESS]	[*yao* 'wants' + PROCESS]	[*xihuan* 'likes' + PROCESS]
Sovi	*xiang chi* 'feels like eating', *xiang outu* 'feels like vomiting'	*yao chi* 'wants to eat' X4	-
Lydia	*xiang chi* 'feels like eating' X3	*yao chi* 'wants to eat'	*xihuan chi* 'likes to eat' X2
John	*xiang chi* 'feels like eating'	*yao zipai* 'wants to take selfies', (*yao shi* 'wants to be')	-
Troy Bolton	*xiang qu* 'feels like going'	-	*xihuan chi* 'likes to eat'
Vanessa	*xiang qu* 'feels like going', *xiang ni qu* 'want you to go'	-	*xihuan chi* 'likes to eat', *xihuan kan* 'likes to see/watch'
Veronica	*xiang chi* 'feels like eating',	-	*xihuan kan* 'likes to see/watch'
Abigail	-	-	*xihuan chi* 'likes to eat' X2
Ethan	*xiang qu* 'feels like going', *xiang chi* 'feels like eating' X2, *xiang kan* 'feels like seeing/watching' X2	*yao chi* 'wants to eat'	-
Salena	*xiang chi* 'feels like eating' X3	-	-
Grayson	*xiang kan* 'feels like seeing/watching', *xiang chi* 'feels like eating'	-	-

The following section investigates more specific measures of distinctiveness of association between each lexical item and the grammatical construction they were used, or not used, in.

4.1.2. Collostructional strength

The methods and rationale for measuring collostruction strength (Ellis & Ferreira-Junior, 2009a; Stefanowitsch & Gries, 2003; Stefanowitsch, 2013) are described in more detail in Chapter III. I will summarize this in brief before displaying the results, below. In the present research framework, a lexical construction, i.e. a word, or *lexeme*, that shares a significant association with a particular grammatical construction is identified as being a collexeme of that grammatical construction. The association is measured in the log to the base of 10 of the p-value of the Fisher Yates exact text. All calculations were performed in the R script Coll.analysis 3.2a (Gries, 2007) using token counts of relevant lexemes from each MC and TC in the present learner corpus. The script quantifies the association strength between each lexical construction and the grammatical construction it occurs in. The script calculates a p-value for each lexeme with each grammatical construction and performs a log transformation that results in highly positive and highly negative values that indicate a large degree of attraction and repulsion respectively. Zero (0) indicates random co-occurrence. An absolute p_{log} value of 1.3 or higher corresponds to a probability of error of 5% or less.

RP1

In RP1 we find *chi* 'eat' to be very strongly associated with the *xiang* 'feels like' construction. This means *chi* was used in the construction a significant amount of times relative to the number of times chi 'eat' was used outside xiang 'feels like' constructions. This lexical item is thus *distinctly* associated with *xiang* 'feels like' constructions. We see this reflected in TC1 as well. The lack of *ti* 'kick' and *zuo* 'do' inside *xiang* 'feels like' constructions in TC1 should be unsurprising due to their very low token frequencies of occurrence in MC1. The appearance of the single *yao bu ku le* 'wants to not cry' may be more of a mystery due to its complete absence in

MC1, but since Troy Bolton produced it along with *yao chi* 'wants to eat', we might interpret this finding as Troy Bolton having a more schematized second slot in the *yao* 'wants' construction, and an individual choice to exploit that slot for creative use, meeting the linguistic demands for the meaning in that particular part of the story he intended to tell.

Table 9. Collostructional Strength (Fisher-Yates exact p_{log}, one-tailed), lexemes in constructions (continued on next page)

MC1, *xiang* 'feels like'-CxN		TC1, *xiang* 'feels like'-CxN	
chi 'to eat'	266.119	*chi* 'to eat'	9.086
ti 'to kick'	10.722		
zuo 'to do'	9.300		
zhidao 'to know'	0.867		
qu 'to go'	0.773		
shengqi 'to become angry'	0.430		
*you 'to have'	6.903		
*shuo 'to say/speak'	2.144		
*ting 'to listen/hear'	0.076		

MC1, *yao* 'wants'-CxN		TC1, *yao* 'wants'-CxN	
ting 'to listen/hear'	2.099	*ku* 'to cry'	1.038
zhidao 'to know'	0.945	*chi* 'to eat'	0.733
qu 'to go'	0.433		
*chi 'to eat'	5.725		

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you 'to have'	4.533
shengqi 'to become angry'	0.816
shuo 'to say/speak'	0.633
zuo 'to do'	0.325
ti 'to kick'	0.105

MC1, *xihuan* 'likes'-CxN		TC1, *xihuan* 'likes'-CxN
chi 'to eat'	3.481	(zero found)
you 'to have'	0.238	
shuo 'to say/speak'	0.074	
shengqi 'to become *angry'	0.061	
qu 'to go'	0.057	
zuo 'to do'	0.014	
ti 'to kick'	0.004	
ting 'to listen/hear'	0.003	
zhidao 'to know'	0.002	

repulsion relationship; Collostruction Strength(CS)>3 => p<0.001; CS>2 => p<0.01;

CS>1.30103 => p<0.05.

RP2

In this RP, *xiang chi* 'feels like eating' is similarly associated across both MC1-2 and TC2. Although kan 'see' is weakly repelled from xiang 'feels like' constructions in TC2, yet weakly attracted in MC1-2, both have an collostruction strength below 1.30103 (p > 0.05), and

so are not statistically significant. In the *xihuan* 'likes' construction, *chi* 'eat' and *kan* 'see/watch' are similarly associated across MC1-2 and TC2.

Table 10. Collostructional Strength (Fisher-Yates exact p_{log}, one-tailed), lexemes in constructions (continued on next page)

MC1-2, *xiang* 'feels like'-CxN		TC2, *xiang* 'feels like'-CxN	
chi 'to eat'	Inf	*chi* 'to eat'	5.664
ti 'to kick'	13.029	**kan* 'to see/watch'	0.005
qu 'to go'	7.611		
zuo 'to do'	5.786		
zipai 'to take a selfie'	2.746		
shengqi 'to become angry'	1.359		
zhidao 'to know'	0.967		
kan 'to see/watch'	0.902		
shuijiao 'to sleep'	0.651		
mai 'to buy'	0.424		
*you 'to have'	3.467		
*shuo 'to say/speak'	1.086		
*qing 'to invite/treat'	1.011		
*outu 'to vomit'	0.323		
*ku 'to cry'	0.245		
*ting 'to listen/hear'	0.219		
*nian 'to study/read'	0.071		

*kaishi 'to start'	0.058
*zhuan 'to turn'	0.026

MC1-2, *yao* 'wants'-CxN		TC2, *yao* 'wants'-CxN	
zuo 'to do'	6.033	(zero found)	
qu 'to go'	3.813		
ting 'to listen/hear'	2.202		
outu 'to vomit'	1.743		
zhuan 'to turn'	1.360		
kaishi 'to start'	1.020		
kan 'to see/watch'	0.492		
zhidao 'to know'	0.461		
ku 'to cry'	0.461		
shuo 'to say/speak'	0.254		
chi 'to eat'	2.054		
you 'to have'	1.754		
qing 'to invite/treat'	1.283		
zipai 'to take a selfie'	0.568		
shengqi 'to become angry'	0.520		
mai 'to buy'	0.295		
shuijiao 'to sleep'	0.082		
nian 'to study/read'	0.053		
ti 'to kick'	0.048		

MC1-2, *xihuan* 'likes'-CxN		TC2, *xihuan* 'likes'-CxN	
chi 'to eat'	99.913	*chi* 'to eat'	3.981
kan 'to see/watch'	48.013	*kan* 'to see/watch'	1.409
nian 'to study/read'	0.918		
*you 'to have'	2.734		
*qing 'to invite/treat'	1.347		
*shengqi 'to become **angry*	1.112		
*shuo 'to say/speak'	0.856		
*mai 'to buy'	0.759		
*qu 'to go'	0.543		
*outu 'to vomit'	0.254		
*zuo 'to do'	0.225		
*zipai 'to take a selfie'	0.219		
*zhidao 'to know'	0.193		
*ku 'to cry'	0.193		
*ting 'to listen/hear'	0.173		
*shuijiao 'to sleep'	0.086		
*ti 'to kick'	0.051		
*kaishi 'to start'	0.046		
*zhuan 'to turn'	0.020		

*repulsion relationship; Collostruction Strength(CS)>3 => p<0.001; CS>2 => p<0.01;

CS>1.30103 => p<0.05.

RP3

In RP3, the *xiang* 'feels like' construction only shows significant strengths of association across MC1-3 and TC3 for *chi* 'eat' and *outu* 'vomit'. Notable in the *yao* 'wants' construction in MC1-3 is its statistically significant *repulsion* relationship with *chi* 'eat'. This particular lexical item appears to be so strongly and distinctly associated with *xiang* 'feels like' in MC1-3 that we should expect a similar repelling relationship between *xiang* 'feels like' and *chi* 'eat' in TC3. Instead we find four single use lexical items, one per individual learner, which is hardly robust enough to reach any conclusions grounded in statistical significance. In RP3, the *xiang* 'feels like' construction is significantly associated with *chi* 'eat'.

Table 11. Collostructional Strength (Fisher-Yates exact p_{log}, one-tailed), lexemes in constructions (continued on next page)

MC1-3, *xiang* 'feels like'-CxN		TC3, *xiang* 'feels like'-CxN	
chi 'to eat'	Inf	*chi* 'to eat'	2.273
ti 'to kick'	14.206	*outu* 'to vomit'	1.584
qu 'to go'	6.779		
zuo 'to do'	6.319		
zipai 'to take a selfie'	4.464		
outu 'to vomit'	3.273		
kan 'to see/watch'	3.078		
shengqi 'to become angry'	2.066		
renshi 'to meet/recognize'	1.979		
zhidao 'to know'	1.220		

zhao 'to search'	0.925
shuijiao 'to sleep'	0.721
mai 'to buy'	0.385
*you 'to have'	2.456
*shuo 'to say/speak'	1.460
*qing 'to invite/treat'	0.900
*xi 'to wash'	0.547
*xue 'to study/learn'	0.312
*ku 'to cry'	0.270
*he 'to drink'	0.252
*lai 'to come'	0.206
*xie 'to write'	0.183
*yong 'to use'	0.165
*ting 'to listen/hear'	0.156
*wen 'to ask'	0.124
*wan 'to play'	0.101
*gei 'to give'	0.069
*nian 'to study/read'	0.050
*kaishi 'to start'	0.041
*tiao 'to jump'	0.037
*zhuan 'to turn'	0.018
*tie 'to stick'	0.018
*fang 'to place'	0.018

huahua 'to draw/paint'	0.014
cha 'to check'	0.014
jiao 'to teach'	0.014
fuxi 'to review'	0.014
jieshi 'to explain'	0.009
shui 'to sleep'	0.009
gaosu 'to tell'	0.009
chuqu 'to go out'	0.009
mianshi 'to interview'	0.005
huan 'to exchange'	0.005
jieshao 'to introduce'	0.005

MC1-3, *yao* 'wants'-CxN		TC3, *yao* 'wants'-CxN	
xi 'to wash'	57.408	*kan* 'to see/watch'	1.408
zuo 'to do'	9.686	*mai* 'to buy'	0.947
kan 'to see/watch'	7.500	*qu* 'to go'	0.669
fuxi 'to review'	5.866	*chi* 'to eat'	0.496
chuqu 'to go out'	3.910		
jiao 'to teach'	3.436		
ku 'to cry'	3.295		
xie 'to write'	3.000		
he 'to drink'	2.485		
ting 'to listen/hear'	2.200		
zhao 'to search'	2.123		

qu 'to go'	1.962
jieshao 'to introduce'	1.955
huan 'to exchange'	1.955
mianshi 'to interview'	1.955
gaosu 'to tell'	1.656
shui 'to sleep'	1.656
jieshi 'to explain'	1.656
zipai 'to take a selfie'	1.567
cha 'to check'	1.483
huahua 'to draw/paint'	1.483
outu 'to vomit'	1.481
wen 'to ask'	1.444
fang 'to place'	1.360
tie 'to stick'	1.360
zhuan 'to turn'	1.360
yong 'to use'	1.219
kaishi 'to start'	1.020
mai 'to buy'	0.989
gei 'to give'	0.812
shuijiao 'to sleep'	0.699
wan 'to play'	0.662
shuo 'to say/speak'	0.554
zhidao 'to know'	0.461

lai 'to come'	0.404
xue 'to study/learn'	0.274
*you 'to have'	1.751
*chi 'to eat'	1.524
*qing 'to invite/treat'	0.570
*shengqi 'to become *angry'*	0.520
*nian 'to study/read'	0.053
*ti 'to kick'	0.048
*tiao 'to jump'	0.039
*renshi 'to meet/recognize'	0.005

MC1-3, *xihuan* 'likes'-CxN   TC3, *xihuan* 'likes'-CxN

chi 'to eat'	Inf		*chi* 'to eat'	2.122
kan 'to see/watch'	54.401			
he 'to drink'	54.256			
xie 'to write'	3.056			
tiao 'to jump'	0.852			
zipai 'to take a selfie'	0.808			
xi 'to wash'	0.783			
nian 'to study/read'	0.726			
*you 'to have'	4.411			
*qing 'to invite/treat'	2.813			
*mai 'to buy'	1.829			

shengqi 'to become angry'	1.796
shuo 'to say/speak'	1.770
qu 'to go'	1.598
xue 'to study/learn'	0.560
outu 'to vomit'	0.518
ku 'to cry'	0.486
zuo 'to do'	0.458
lai 'to come'	0.370
zhidao 'to know'	0.313
yong 'to use'	0.296
ting 'to listen/hear'	0.280
wen 'to ask'	0.222
wan 'to play'	0.181
shuijiao 'to sleep'	0.165
gei 'to give'	0.123
zhao 'to search'	0.099
ti 'to kick'	0.082
kaishi 'to start'	0.074
zhuan 'to turn'	0.033
tie 'to stick'	0.033
fang 'to place'	0.033
huahua 'to draw/paint'	0.025
cha 'to check'	0.025
jiao 'to teach'	0.025

fuxi 'to review'	0.025
jieshi 'to explain'	0.016
shui 'to sleep'	0.016
gaosu 'to tell'	0.016
chuqu 'to go out'	0.016
mianshi 'to interview'	0.008
renshi 'to meet/recognize'	0.008
huan 'to exchange'	0.008
jieshao 'to introduce'	0.008

*repulsion relationship; Collostruction Strength(CS)>3 => p<0.001; CS>2 => p<0.01;
CS>1.30103 => p<0.05.*

The next measure, *contingency*, Delta P describes how strongly each construction predicts the co-presence of each lexical item, and, in a separate analysis, how strongly each lexical item predicts the co-presence of each construction.

4.1.3. Contingency: Measures of distinctive association in two directions

Delta P (ΔP) measures the probability of an *outcome,* e.g. a person encounters a lexical construction, when a *cue* event occurs (P(O|C), e.g. in the context of a certain grammatical construction, minus the outcome in the absence of the cue (P(O|-C)). When the probability of an outcome has the same likelihood with or without the cue (P(O|C) = P(O|-C)), then ΔP = 0; there is no covariation between the two events. When the presence of the cue strongly increases the likelihood of the outcome, ΔP approaches 1.0. Conversely, when the presence of the cue strongly decreases the likelihood of the outcome, ΔP approaches 1.0. For our purposes, we are concerned

with six broadly defined possibilities for the relationships between lexical constructions and the grammatical constructions they occupy:

7. a grammatical construction strongly cues a lexical item (ΔP CxN > lexeme ≈ 1)

8. a grammatical construction does not strongly cue a lexical item (ΔP lexeme > CxN ≈ 0)

9. a grammatical construction strongly cues the absence of a lexical item (ΔP lexeme > CxN ≈ -1)

10. a lexical item strongly cues a grammatical construction (ΔP lexeme > CxN ≈ 1)

11. a lexical item does not strongly cue a grammatical construction (ΔP lexeme > CxN ≈ 0)

12. a lexical item strongly cue the absence of a grammatical construction (ΔP lexeme > CxN ≈ -1)

The goal here is to look for similarities in Delta P measures for both the learners' test corpora (TC)--representing what they wrote at the end of each of the first three recording periods (RPs)-- as well as the three main corpora (MC) that capture their prior experience with the language leading up to each TC. Similar measures between MC and TC within each RP are taken to be indicative of contingency learning. That is, the process of schematization of a particular slot in a construction does not just simply allow an increasing variety of lexical items, but, more specifically, the *relative frequencies* of each lexical item as encountered in that slot in prior experience leads to the learning of similar relative frequencies for the learner as well.

Delta P (construction cues lexeme)

RP1

In RP1 we find *xiang* 'feels like' to strongly cue *chi* 'eat' in both MC1 and TC1. Despite Troy Bolton's single use of *yao bu ku le* 'wants to not cry', the *yao* 'wants' construction shows a slight negative cueing toward for *ku* 'cry'.

Table 12. Contingency (Delta P, grammatical construction cues lexeme), (continued on next page)

MC1, *xiang* 'feels like'-CxN		TC1, *xiang* 'feels like'-CxN	
chi 'to eat'	0.592	*chi* 'to eat'	0.709
zuo 'to do'	0.024		
ti 'to kick'	0.019		
qu 'to go'	0.005		
zhidao 'to know'	0.002		
shengqi 'to become angry'	0.002		
ting 'to listen/hear'	0.000		
shuo 'to say/speak'	-0.012		
you 'to have'	-0.037		

MC1, *yao* 'wants'-CxN		TC1, *yao* 'wants'-CxN	
ting 'to listen/hear'	0.005	*ku* 'to cry'	0.305
zhidao 'to know'	0.003	*chi* 'to eat'	0.270
qu 'to go'	0.003		

ti 'to kick'	-0.001		
zuo 'to do'	-0.002		
shuo 'to say/speak'	-0.006		
shengqi 'to become angry'	-0.007		
you 'to have'	-0.034		
chi 'to eat'	-0.042		

MC1, *xihuan* 'likes'-CxN		TC1, *xihuan* 'likes'-CxN	
chi 'to eat'	0.290	(zero found)	
ting 'to listen/hear'	0.000		
zhidao 'to know'	0.000		
ti 'to kick'	-0.001		
zuo 'to do'	-0.002		
shengqi 'to become angry'	-0.009		
qu 'to go'	-0.009		
shuo 'to say/speak'	-0.011		
you 'to have'	-0.036		

RP2

In MC1-2 the *xiang* 'feels like' construction strongly cues *chi* 'eat' in both MC1-2 and TC2. Less strongly in both MC1-2 and TC2, *xihuan* 'likes' cues *chi* 'eat' and *kan* 'see/watch'.

Table 13. Contingency (Delta P, grammatical construction cues lexeme), (continued on next page)

MC1-2, *xiang* 'feels like'-CxN		TC2, *xiang* 'feels like'-CxN	
chi 'to eat'	0.568	*chi* 'to eat'	0.933
qu 'to go'	0.023	*kan* 'to see/watch'	-0.002
zuo 'to do'	0.015		
ti 'to kick'	0.013		
zipai 'to take a selfie'	0.009		
shengqi 'to become angry'	0.006		
kan 'to see/watch'	0.006		
zhidao 'to know'	0.002		
shuijiao 'to sleep'	0.001		
mai 'to buy'	0.001		
nian 'to study/read'	0.000		
kaishi 'to start'	0.000		
zhuan 'to turn'	0.000		
outu 'to vomit'	-0.001		
ku 'to cry'	-0.001		

ting 'to listen/hear'	-0.001		
shuo 'to say/speak'	-0.004		
qing 'to invite/treat'	-0.005		
you 'to have'	-0.013		

MC1-2, *yao* 'wants'-CxN		TC2, *yao* 'wants'-CxN	
zuo 'to do'	0.019	(zero found)	
qu 'to go'	0.017		
ting 'to listen/hear'	0.006		
outu 'to vomit'	0.005		
kan 'to see/watch'	0.003		
zhuan 'to turn'	0.002		
kaishi 'to start'	0.002		
zhidao 'to know'	0.001		
ku 'to cry'	0.001		
shuo 'to say/speak'	0.000		
shuijiao 'to sleep'	0.000		
nian 'to study/read'	0.000		
ti 'to kick'	0.000		
mai 'to buy'	-0.001		
zipai 'to take a selfie'	-0.003		
shengqi 'to become angry'	-0.003		
qing 'to invite/treat'	-0.006		

you 'to have'	-0.011			
chi 'to eat'	-0.018			

MC1-2, *xihuan* 'likes'-CxN		TC2, *xihuan* 'likes'-CxN	
chi 'to eat'	0.265	*chi* 'to eat'	0.347
kan 'to see/watch'	0.126	*kan* 'to see/watch'	0.059
nian 'to study/read'	0.002		
shuijiao 'to sleep'	0.000		
ti 'to kick'	0.000		
kaishi 'to start'	0.000		
zhuan 'to turn'	0.000		
outu 'to vomit'	-0.001		
zuo 'to do'	-0.001		
zipai 'to take a selfie'	-0.001		
zhidao 'to know'	-0.001		
ku 'to cry'	-0.001		
ting 'to listen/hear'	-0.001		
qu 'to go'	-0.003		
shuo 'to say/speak'	-0.004		
mai 'to buy'	-0.004		
shengqi 'to become angry'	-0.005		
qing 'to invite/treat'	-0.006		
you 'to have'	-0.013		

RP3

In RP3, the *xiang* 'feels like' construction cues *chi* 'eat' fairly strongly in both MC1-3 and TC3. The four lexical items used in *yao* 'wants' constructions were only weakly cued by that construction in both MC1-3 and TC3. The *xihuan* 'likes' construction cues *chi* 'eat' in both MC1-3 and TC3, but not very strongly in both corpora.

Table 14. Contingency (Delta P, grammatical construction cues lexeme), (continued on next page)

MC1-3, *xiang* 'feels like'-CxN		TC3, *xiang* 'feels like'-CxN	
chi 'to eat'	0.538	*chi* 'to eat'	0.472
qu 'to go'	0.021	*outu* 'to vomit'	0.245
kan 'to see/watch'	0.016		
zuo 'to do'	0.015		
ti 'to kick'	0.012		
zipai 'to take a selfie'	0.011		
shengqi 'to become angry'	0.007		
outu 'to vomit'	0.006		
zhidao 'to know'	0.002		
renshi 'to meet/recognize'	0.001		
zhao 'to search'	0.001		
shuijiao 'to sleep'	0.001		
mai 'to buy'	0.001		

wen 'to ask'	0.000
wan 'to play'	0.000
gei 'to give'	0.000
nian 'to study/read'	0.000
kaishi 'to start'	0.000
tiao 'to jump'	0.000
zhuan 'to turn'	0.000
tie 'to stick'	0.000
fang 'to place'	0.000
huahua 'to draw/paint'	0.000
cha 'to check'	0.000
jiao 'to teach'	0.000
fuxi 'to review'	0.000
jieshi 'to explain'	0.000
shui 'to sleep'	0.000
gaosu 'to tell'	0.000
chuqu 'to go out'	0.000
mianshi 'to interview'	0.000
huan 'to exchange'	0.000
jieshao 'to introduce'	0.000
xue 'to study/learn'	-0.001
ku 'to cry'	-0.001
he 'to drink'	-0.001
lai 'to come'	-0.001

xie 'to write'	-0.001		
yong 'to use'	-0.001		
ting 'to listen/hear'	-0.001		
xi 'to wash'	-0.002		
qing 'to invite/treat'	-0.004		
shuo 'to say/speak'	-0.005		
you 'to have'	-0.008		
MC1-3, *yao* 'wants'-CxN		TC3, *yao* 'wants'-CxN	
xi 'to wash'	0.077	*kan* 'to see/watch'	0.082
kan 'to see/watch'	0.029	*mai* 'to buy'	0.075
zuo 'to do'	0.020	*qu* 'to go'	0.065
qu 'to go'	0.008	*chi* 'to eat'	0.053
ku 'to cry'	0.006		
xie 'to write'	0.005		
he 'to drink'	0.005		
zipai 'to take a selfie'	0.005		
fuxi 'to review'	0.004		
ting 'to listen/hear'	0.004		
mai 'to buy'	0.004		
chuqu 'to go out'	0.003		
jiao 'to teach'	0.003		
zhao 'to search'	0.003		
outu 'to vomit'	0.003		

wen 'to ask'	0.002
yong 'to use'	0.002
shuo 'to say/speak'	0.002
jieshao 'to introduce'	0.001
huan 'to exchange'	0.001
mianshi 'to interview'	0.001
gaosu 'to tell'	0.001
shui 'to sleep'	0.001
jieshi 'to explain'	0.001
cha 'to check'	0.001
huahua 'to draw/paint'	0.001
fang 'to place'	0.001
tie 'to stick'	0.001
zhuan 'to turn'	0.001
kaishi 'to start'	0.001
gei 'to give'	0.001
shuijiao 'to sleep'	0.001
wan 'to play'	0.001
zhidao 'to know'	0.001
lai 'to come'	0.001
xue 'to study/learn'	0.000
nian 'to study/read'	0.000
ti 'to kick'	0.000

tiao 'to jump'	0.000
renshi 'to meet/recognize'	0.000
shengqi 'to become angry'	-0.002
qing 'to invite/treat'	-0.003
you 'to have'	-0.007
chi 'to eat'	-0.012

MC1-3, *xihuan* 'likes'-CxN		TC3, *xihuan* 'likes'-CxN	
chi 'to eat'	0.364	*chi* 'to eat'	0.187
kan 'to see/watch'	0.075		
he 'to drink'	0.032		
xie 'to write'	0.004		
zipai 'to take a selfie'	0.002		
xi 'to wash'	0.002		
tiao 'to jump'	0.001		
nian 'to study/read'	0.001		
wen 'to ask'	0.000		
wan 'to play'	0.000		
shuijiao 'to sleep'	0.000		
gei 'to give'	0.000		
zhao 'to search'	0.000		
ti 'to kick'	0.000		
kaishi 'to start'	0.000		

zhuan 'to turn'	0.000
tie 'to stick'	0.000
fang 'to place'	0.000
huahua 'to draw/paint'	0.000
cha 'to check'	0.000
jiao 'to teach'	0.000
fuxi 'to review'	0.000
jieshi 'to explain'	0.000
shui 'to sleep'	0.000
gaosu 'to tell'	0.000
chuqu 'to go out'	0.000
mianshi 'to interview'	0.000
renshi 'to meet/recognize'	0.000
huan 'to exchange'	0.000
jieshao 'to introduce'	0.000
xue 'to study/learn'	-0.001
outu 'to vomit'	-0.001
ku 'to cry'	-0.001
zuo 'to do'	-0.001
lai 'to come'	-0.001
zhidao 'to know'	-0.001
yong 'to use'	-0.001
ting 'to listen/hear'	-0.001

shengqi 'to become angry'	-0.003
mai 'to buy'	-0.004
shuo 'to say/speak'	-0.004
qu 'to go'	-0.004
qing 'to invite/treat'	-0.005
you 'to have'	-0.008

Delta P (lexeme cues construction)

The analyses in this section follow the same principles as in the previous section, but in reverse. That is, we are interested here how strongly each lexical item predict the co-presence of each grammatical construction. Ellis & Ferreira-Junior (2009a) report: "When a construction cues a particular word, that word occurs very often in that construction and...it tends to be very generic. When a word cues a particular construction, it may be a lower frequency word, quite specific in its action semantics and thus very selective of that construction (e.g. *fell*, *turn*, and *stay* for VL, *mark*, *hang*, and *drop* for VOL)" (p. 203). The following Delta P analyses resulted in similar findings.

RP1

In MC1, *ti* 'kick' predicts (cues) the xiang 'feels like' construction much more strongly than *chi* 'eat', even though *chi* 'eat is found to be the earliest used, and the most distinctively associated with xiang 'feels like' according to the previous measures above, i.e. collostructional strength and Delta P (construction -> lexeme). The *yao* 'wants' constructions are also a poor match here between MC1 and TC1. Positive Delta P ratings in these cases are often due to sparse

uses of a particular lexical item that happen to have mostly occurred inside a particular construction. For example, *ti* 'kick' was used only ten times in MC1, but eight of those instances were inside the *xiang* 'feels like' construction (not shown in tables). Based on this experience, when given *ti* 'kick' as a cue, a hearer should most likely expect it to be in the xiang 'feels like' construction. But if given the *xiang* 'construction' as the cue, other lexical items that occurred more frequently in *xiang* 'feels like' in total *and* relative to their occurrence outside of xiang 'feels like' would be expected before *ti* 'kick'.

Table 15. Contingency (Delta P, lexeme cues grammatical construction), (continued on next page)

MC1, *xiang* 'feels like'-CxN		TC1, *xiang* 'feels like'-CxN	
ti 'to kick'	0.772	*chi* 'to eat'	0.382
chi 'to eat'	0.396		
zuo 'to do'	0.327		
zhidao 'to know'	0.171		
qu 'to go'	0.018		
shengqi 'to become angry'	0.007		
ting 'to listen/hear'	-0.029		
shuo 'to say/speak'	-0.029		
you 'to have'	-0.030		

MC1, *yao* 'wants'-CxN		TC1, *yao* 'wants'-CxN	
ting 'to listen/hear'	0.310	*ku* 'to cry'	0.085
zhidao 'to know'	0.176	*chi* 'to eat'	0.037
qu 'to go'	0.007		
shuo 'to say/speak'	-0.012		
shengqi 'to become angry'	-0.017		
you 'to have'	-0.023		
chi 'to eat'	-0.023		
ti 'to kick'	-0.024		
zuo 'to do'	-0.024		

MC1, *xihuan* 'likes'-CxN		TC1, *xihuan* 'likes'-CxN	
chi 'to eat'	0.007	(zero found)	
ting 'to listen/hear'	-0.001		
zhidao 'to know'	-0.001		
ti 'to kick'	-0.001		
zuo 'to do'	-0.001		
shengqi 'to become angry'	-0.001		
qu 'to go'	-0.001		
shuo 'to say/speak'	-0.001		
you 'to have'	-0.001		

RP2

In MC1-2 *ti* 'kick' is again found to most strongly predict the co-presence of the *xiang* 'feels like' construction. The lexical item *zhuan* 'turn' was found only four times in MC1-2, and one of those instances was found in the *yao* 'wants' construction (not shown in tables). This 25% presence of zhuan 'turn' in the *yao* 'wants' construction is far higher than any of the remaining lexical items in that list, helping contribute to *zhuan* 'turn' earning the top rank in that list despite it's very low token frequency. Unexpectedly, *kan* 'see/watch' and *chi* 'eat' match very well in the xihuan 'likes' construction across MC1-2 and TC2. Four lexical items, *zipai* 'take selfies', *nian* 'read', *qu* 'go', and *zuo* 'do' appeared only once in *xihuan* 'likes' constructions in MC1-2 and the remaining lexical items did not appear at all in that construction.

Table 16. Contingency (Delta P, lexeme cues grammatical construction), (continued on next page)

MC1-2, *xiang* 'feels like'-CxN		TC2, *xiang* 'feels like'-CxN	
ti 'to kick'	0.785	*chi* 'to eat'	0.147
chi 'to eat'	0.299	*kan* 'to see/watch'	-0.011
zuo 'to do'	0.078		
qu 'to go'	0.065		
zipai 'to take a selfie'	0.045		
shuijiao 'to sleep'	0.044		
zhidao 'to know'	0.038		
shengqi 'to become angry'	0.017		

kan 'to see/watch'	0.007
mai 'to buy'	0.005
qing 'to invite/treat'	-0.011
nian 'to study/read'	-0.015
kaishi 'to start'	-0.015
zhuan 'to turn'	-0.015
outu 'to vomit'	-0.015
ku 'to cry'	-0.015
ting 'to listen/hear'	-0.015
shuo 'to say/speak'	-0.015
you 'to have'	-0.015

MC1-2, *yao* 'wants'-CxN		TC2, *yao* 'wants'-CxN
zhuan 'to turn'	0.239	(zero found)
kaishi 'to start'	0.1	
ting 'to listen/hear'	0.077	
zuo 'to do'	0.073	
outu 'to vomit'	0.049	
qu 'to go'	0.036	
zhidao 'to know'	0.015	
ku 'to cry'	0.015	
kan 'to see/watch'	0.003	
shuo 'to say/speak'	0.001	

mai 'to buy'	-0.004
shengqi 'to become angry'	-0.007
chi 'to eat'	-0.007
you 'to have'	-0.009
shuijiao 'to sleep'	-0.011
nian 'to study/read'	-0.011
ti 'to kick'	-0.011
zipai 'to take a selfie'	-0.011
qing 'to invite/treat'	-0.011

MC1-2, *xihuan* 'likes'-CxN		TC2, *xihuan* 'likes'-CxN	
kan 'to see/watch'	0.122	*kan* 'to see/watch'	0.963
chi 'to eat'	0.111	*chi* 'to eat'	0.181
nian 'to study/read'	0.079		
zuo 'to do'	-0.003		
zipai 'to take a selfie'	-0.003		
qu 'to go'	-0.007		
shuijiao 'to sleep'	-0.012		
ti 'to kick'	-0.012		
kaishi 'to start'	-0.012		
zhuan 'to turn'	-0.012		
outu 'to vomit'	-0.012		
zhidao 'to know'	-0.012		

ku 'to cry'	-0.012
ting 'to listen/hear'	-0.012
shuo 'to say/speak'	-0.012
mai 'to buy'	-0.012
shengqi 'to become angry'	-0.012
qing 'to invite/treat'	-0.012
you 'to have'	-0.012

RP3

In MC1-3, *renshi* 'to meet/recognize' was found to be used only once, and that single instance was inside the *xiang* 'feels like' construction (not shown in tables). In TC3, the lexical item *chi* 'eat' was used nineteen times, two of which were inside *xiang* 'feels like' constructions. Additionally, *outu* 'vomit' was used four times in total, one that was used in a *xiang* 'feels like' construction. The top five ranking lexical items in the *yao* 'wants' construction listed below for MC1-3 were exclusively used in *yao* 'wants' constructions, but again were of very low token frequency: *fuxi* 'review' (n = 3), *chuqu* 'go out' (n = 2), *jieshao* 'introduce' (n = 1), *huan* 'exchange' (n = 1), *mianshi* 'interview' (n = 1). In contrast, *he* 'drink' has a more justified placement at the top ranking in *xihuan* 'likes' constructions, as it appeared fifty five times in total in MC1-3, thirty nine of which were inside *xihuan* 'likes' constructions.

Table 17. Contingency (Delta P, lexeme cues grammatical construction), (continued on next page)

MC1-3, *xiang* 'feels like'-CxN		TC3, *xiang* 'feels like'-CxN	
renshi 'to meet/recognize'	0.990	*outu* 'to vomit'	0.245
ti 'to kick'	0.790	*chi* 'to eat'	0.102
chi 'to eat'	0.214	*kan* 'to see/watch'	-0.007
zhao 'to search'	0.073	*mai* 'to buy'	-0.007
outu 'to vomit'	0.069	*qu* 'to go'	-0.007
zuo 'to do'	0.057		
zipai 'to take a selfie'	0.049		
zhidao 'to know'	0.042		
shuijiao 'to sleep'	0.040		
qu 'to go'	0.037		
shengqi 'to become angry'	0.022		
kan 'to see/watch'	0.014		
mai 'to buy'	0.003		
xi 'to wash'	-0.006		
qing 'to invite/treat'	-0.008		
wen 'to ask'	-0.010		
wan 'to play'	-0.010		
gei 'to give'	-0.010		
nian 'to study/read'	-0.010		

kaishi 'to start'	-0.010
tiao 'to jump'	-0.010
zhuan 'to turn'	-0.010
tie 'to stick'	-0.010
fang 'to place'	-0.010
huahua 'to draw/paint'	-0.010
cha 'to check'	-0.010
jiao 'to teach'	-0.010
fuxi 'to review'	-0.010
jieshi 'to explain'	-0.010
shui 'to sleep'	-0.010
gaosu 'to tell'	-0.010
chuqu 'to go out'	-0.010
mianshi 'to interview'	-0.010
huan 'to exchange'	-0.010
jieshao 'to introduce'	-0.010
he 'to drink'	-0.010
lai 'to come'	-0.010
xie 'to write'	-0.010
yong 'to use'	-0.010
ting 'to listen/hear'	-0.010
xue 'to study/learn'	-0.011
ku 'to cry'	-0.011

shuo 'to say/speak'	-0.011			
you 'to have'	-0.011			

MC1-3, *yao* 'wants'-CxN		TC3, *yao* 'wants'-CxN	
fuxi 'to review'	0.989	*kan* 'to see/watch'	0.482
chuqu 'to go out'	0.989	*mai* 'to buy'	0.148
jieshao 'to introduce'	0.989	*qu* 'to go'	0.065
huan 'to exchange'	0.989	*chi* 'to eat'	0.034
mianshi 'to interview'	0.989	*outu* 'to vomit'	-0.020
jiao 'to teach'	0.656		
gaosu 'to tell'	0.489		
shui 'to sleep'	0.489		
jieshi 'to explain'	0.489		
cha 'to check'	0.322		
huahua 'to draw/paint'	0.322		
fang 'to place'	0.239		
tie 'to stick'	0.239		
zhuan 'to turn'	0.239		
xi 'to wash'	0.228		
zhao 'to search'	0.156		
kaishi 'to start'	0.100		
xie 'to write'	0.089		
zuo 'to do'	0.079		

ting 'to listen/hear'	0.077
ku 'to cry'	0.074
wen 'to ask'	0.063
he 'to drink'	0.062
gei 'to give'	0.056
yong 'to use'	0.044
shuijiao 'to sleep'	0.039
outu 'to vomit'	0.037
wan 'to play'	0.034
kan 'to see/watch'	0.026
zipai 'to take a selfie'	0.022
qu 'to go'	0.015
zhidao 'to know'	0.015
mai 'to buy'	0.011
lai 'to come'	0.011
shuo 'to say/speak'	0.005
xue 'to study/learn'	0.004
qing 'to invite/treat'	-0.005
chi 'to eat'	-0.005
shengqi 'to become angry'	-0.007
you 'to have'	-0.009
nian 'to study/read'	-0.011
ti 'to kick'	-0.011

tiao 'to jump'	-0.011
renshi 'to meet/recognize'	-0.011

MC1-3, *xihuan* 'likes'-CxN		TC3, *xihuan* 'likes'-CxN	
he 'to drink'	0.691	*chi* 'to eat'	0.139
chi 'to eat'	0.257	*kan* 'to see/watch'	-0.023
kan 'to see/watch'	0.114	*outu* 'to vomit'	-0.023
xie 'to write'	0.106	*mai* 'to buy'	-0.023
tiao 'to jump'	0.106	*qu* 'to go'	-0.023
nian 'to study/read'	0.072		
zipai 'to take a selfie'	0.014		
xi 'to wash'	0.011		
zuo 'to do'	-0.008		
qu 'to go'	-0.014		
shuo 'to say/speak'	-0.016		
wen 'to ask'	-0.019		
wan 'to play'	-0.019		
shuijiao 'to sleep'	-0.019		
gei 'to give'	-0.019		
zhao 'to search'	-0.019		
ti 'to kick'	-0.019		
kaishi 'to start'	-0.019		
zhuan 'to turn'	-0.019		

tie 'to stick'	-0.019
fang 'to place'	-0.019
huahua 'to draw/paint'	-0.019
cha 'to check'	-0.019
jiao 'to teach'	-0.019
fuxi 'to review'	-0.019
jieshi 'to explain'	-0.019
shui 'to sleep'	-0.019
gaosu 'to tell'	-0.019
chuqu 'to go out'	-0.019
mianshi 'to interview'	-0.019
renshi 'to meet/recognize'	-0.019
huan 'to exchange'	-0.019
jieshao 'to introduce'	-0.019
xue 'to study/learn'	-0.019
outu 'to vomit'	-0.019
ku 'to cry'	-0.019
lai 'to come'	-0.019
zhidao 'to know'	-0.019
yong 'to use'	-0.019
ting 'to listen/hear'	-0.019
shengqi 'to become angry'	-0.019
mai 'to buy'	-0.019

qing 'to invite/treat'	-0.019
you 'to have'	-0.019

4.2. Interim discussion

RQ1 will be addressed direction after answering its four sub-questions (a, b, c, d). These will be revisited again in the following Discussion chapter (Chapter VI).

RQ1a: Are the frequency distributions in early experience Zipfian (allowing learners to attend to and learn the most frequent lexical items first)? The frequency distribution in MC1 was heavily skewed toward *chi* 'eat' in the *xiang* 'feels like' construction. The remaining constructions and lexical items were used in very low token frequency despite some variation in lemma types in each of the remaining two constructions. Each successive MC found high token frequency and skewing for a different construction, i.e. *xihuan* 'likes' in MC1-2 and then *yao* 'wants' in MC1-3. In each successive MC, the lexical items in *yao* 'wants' constructions followed more Zipfian distributions than did either *xiang* 'feels like' or *xihuan* 'likes' constructions. The latter two constructions heavily favored *chi* 'eat' even through the end of RP5.

RQ1b: Does learner use match the relative frequencies in their past experience? In TC1, *xiang chi* 'feels like eating' is strongly predicted from frequency distribution, collostructional strength, and Delta P (construction -> lexeme) in MC1. Delta P (lexeme -> construction) was a less reliable predictor across nearly all constructions in the MCs and corresponding TCs investigated. In TC2, the heavy use of *xihuan chi* 'likes to eat' is strongly predicted again from frequency distribution, collostructional strength, and Delta P (construction -> lexeme) in MC1-2. TC3 witnessed a greater scattering of distinct lexemes across all three constructions, which coincides with a more frequent and Zipfian distribution of lexemes in the *yao* 'wants'

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construction. Whether or not this scattered distribution in TC3 was *caused* by the distributions in MC1-3 is difficult to judge because the many single-instance patterns (one lexeme in one construction) are so few in number.

RQ1c: Do these matching frequencies reflect orders of acquisition, i.e. are the first-learned lexical constructions in each grammatical construction those that appeared more frequently in that grammatical construction in prior experience? The order of lexemes used in each construction in each TC largely followed the order of their most frequent orders of usage in the MC of the same RP.

RQ1d: Will the first-learned lexical constructions in each grammatical construction be those that are more distinctively associated with that grammatical construction in prior experience? This is the case found for collostructional strength and for Delta P (construction -> lexeme), but not for Delta P (lexeme -> construction).

RQ1: How strongly is contingency learning at play during the earliest stages of construction learning in a typologically distant L2? The close matches in frequency distribution, collostructional strength, and Delta P (construction -> lexeme) in each RP point to contingency learning to indeed play a role during early construction learning, given the particular classroom conditions the learners experienced in the present corpus. Other factors besides frequency distribution in each MC and contingency learning may help explain the distributions of patterns in each TC. The following sub-section will make a brief consideration for one such factor.

4.3. Salience in concreteness measures

We see in the analyses above that some of the highly frequent and distinctively associated lexical items in the learners experience did not end up in their production. Additionally, and only

rarely, some of the infrequent items showed up in a TC. One explanation for this may lie in *concreteness,* which Brysbaert et al. (2013) operationalize as "the degree to which the concept denoted by a word refers to a perceptible entity" (p. 1). Native speakers of English rated the concreteness measures, just as were the learners in the present study who learned the meaning of each new Chinese word through an English gloss, spoken or in text for them to read. This access to meaning through English renders these concreteness ratings relevant to this particular group of learners. This section is included only to offer a very brief introduction to a factor that can interact with frequency effects, and may have influenced the distribution of production in the TCs in each RP.

To illustrate these, *zuo* 'do' was highly frequent in MC1-2, but has a concreteness rating out of 5 (and standard deviation) of 1.57 (0). Crossley, Kyle, and Salsbury (2016) found that words rated as less concrete were learned by L2 learners later than words rated as more concrete. The construction *xiang* 'feels like' ("feel" concreteness rating = 2.28, standard deviation = 1.41), *yao* 'want' (1.93, 1.33), and *xihuan* 'like' (1.89, 0.99) all have below average concreteness ratings, but these could have been overcome by very high token frequency in the preceding MC. By contrast, *outu* 'vomit' has a very high concreteness rating (4.75, 0.65), appeared in MC1 only 74 times, but appeared in TC1 5 times across four different learners' TCs (not shown in figures or tables here). That frequency and frequency distribution do not predict all language use is consistent with perspectives in Usage-based research frameworks (e.g. Crossley, Kyle, and Salsbury, 2016). This will be revisited in the Discussion chapter (Chapter VI), and again in a discussion on future directions in the final chapter (Chapter VII).

CHAPTER V. FREQUENCY ACCOMPLISHED IN INTERACTION

Analyses in the preceding chapter found *xiang chi* 'feels like eating' to be a pattern used in exceedingly high frequency in RP1 relative to the remaining lexical items and constructions included in the analysis. How this particular pattern came to be used so frequently is not immediately clear. A frequency search in CLAN through all of the lexical items in the first day's Teaching Proficiency through Reading and Storytelling (TPRS) class finds the following uses of *xiang* 'feels like' and *chi* 'eat(ing)' from each participant:

Table 18. Lemma tokens spoken by each participant in first TPRS class (see Appendix A)

Participant	*xiang* 'feels like'	*chi* 'eat(ing)'
Teacher	186	187
Grayson	11	5
Sovi	6	4
Vanessa	3	1
Troy Bolton	2	0
John	1	1
Ethan	1	1
Veronica	1	0
Lydia	0	1
Multiple Students	12	12
Total	223	212

The general pedagogical task in a TPRS lesson, as described in Ray & Seely ([1997] 2015) and in Waltz (2015), involves the teacher using the target language item to ask learners questions about an unfolding story to (a) provide input for acquisition of that target structure--in this case *xiang chi* 'feels like eating', and (b) offer choices to students regarding what to add to the story, thus orienting mainly to the imagery of the story, and a smaller focus on linguistic form. Input frequency is a fairly distinctive feature to TPRS teaching practices. As Waltz (2015) comments: "Repetition in CI [comprehensible input] teaching relies on very high numbers. In a typical 40 to 50 minute story-asking class, novice-level students should be hearing each new word 50 to 70 times at a minimum. Experienced TPRS teachers can up that total to well over 100. Soon after that session, a reading passage will further reinforce the new items by repeating them another several dozen times both in writing and through oral translation, circling [question asking] and discussion of the text" (p. 53).

The stories from the first six TPRS class meetings in the present corpus, accounting for the first two RPs, are provided in Appendix B. The story created during this initial 50-minute class meeting is included in *pinyin* and English here for ease of reference: *Pinyin: Tom Cruise kù, dànshì Tom Cruise kū, yīnwèi Tom Cruise xiăng yào[9] chī banana. Tom Cruise zài Hollywood, zài Hollywood méiyŏu Banana. Tom Cruise qù Chicago, Chicago hăo, yīnwèi Chicago yŏu Banana, Chicago de Banana hăo chī, Tom Cruise gāoxìng le. English:* 'Tom Cruise was cool, but Tom Cruise cried because Tom Cruise wanted to eat bananas. Tom Cruise was in Hollywood. There were no bananas in Hollywood. Tom Cruise went to Chicago. Chicago was

---

[9] A frequency search in CLAN turned up zero results for *yao* 'wants', indicating that the teacher who typed this story after the class had added *yao* 'wants' despite its absense from the discussion in class.

good because Chicago had bananas. Chicago's bananas were good tasting. Tom Cruise was

happy now.'

What remains to be understood is how the singular instances of *xiang* 'feels like' and *chi*

'eat' in the resulting story bear any relationship with the 200+ instances of their use during the

"task-in-process" (Seedhouse, 2005) of *story-asking*. Of particular interest in the present analysis

is how, on this first day, the teacher and students used the Chinese pattern *xiang chi* 'feels like

eating' to (a) learn language through it's use (mainly comprehension) and (b) co-construct their

workspace, i.e. their recurrent institutional practices. Chapter II reviewed the basic framework of

institutional CA, which will be applied in the analysis here.

5.1. Institutional CA

Institutional CA is described in basic detail in Chapter II. The present analysis draws

from Drew & Heritage (2010) with a focus on three key properties of institutional talk

(summarized in Kasper & Wagner, 2014): (1) goal-orientation, (2) special constraints on

allowable contributions, and (3) institution-specific inferential frameworks. At each turn in the

interaction we ask "why that now?" to discover the methods the participants themselves use to

maintain orderliness in ways particular to accomplishing their institutional goals.

### 5.1.1. Talking TPRS "story-asking" into being

In the first extract presented below, one of the camp's lead instructors is introducing the

goals and methods of the class. This is the first class meeting on the first day of camp (see

Appendix A for the camp schedule). Upon first glance at the images below, these institutional

identities are made visible through the participants' displays (or lack of displays in resisting) of

matching t-shirts for "students" and a differentiated t-shirt for the teacher. In addition, the students sit in desks facing the front board and teacher, displaying a pre-arranged orientation toward that wall in the room and the teacher. (TEA = teacher, STS = students)
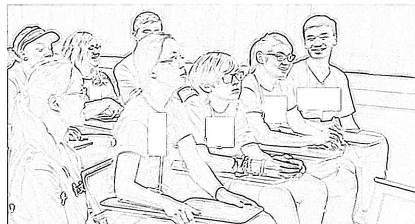
Extract 2.[10]

```
71    TEA:   OK, let's learn Chinese (.)

72    TEA:   to learn Chinese we're going to talk story

73           because em mor- (.) we're in Hawai- i

74           have you heard about talk story in Hawai- i?

75    STS:   ((SOV, JOH shake head, remaining STS GZ at TEA))
```
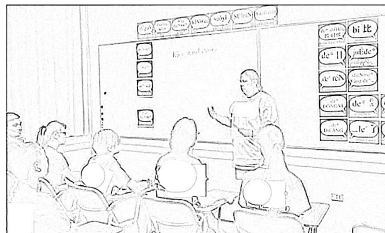


```
      (1.0)

76    TEA:   they tell stories that's it

77    SOV:   oh.

78    STS:   ((smiling))
```

```
      eheheheheh
```


Lines 71-78 show the teacher formulating statements and questions about the institutional goal ("learn Chinese") followed by an account of how students will accomplish that goal. We can see this all performed with great precision to keep her introduction light and funny. Lines 71, 72,

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[10] CA transcription are in monospaced Courrier New font following Clift (2016).

and 73 are formulated as a *call to action*, an *account of the process* for how that action will be accomplished, and a *justification* for the process, respectively. Line 74 serves as the first pair-part of a question-answer adjacency pair. The first words "have you heard about" visibly serve to project a complex explanation that the students, who are all newcomers to Hawai'i, are unlikely to possess knowledge of. Most students to not respond and continue to gaze at the teacher, while two students, Sovi and John, visibly shake their heads. Line 76 confirms that the students expected the teacher to answer her own question. The teacher formulates her third-turn response to indicate that there is, contrary to the complex answer projected by the question, nothing new or special, ending with "that's it." Sovi's use of falling intonation in "oh" displays her evaluation of the teachers answer as something like a "let down." Sovi's display of her evaluation of the "let down" answer serves to verify the irony across the turns (big question, simple answer), and many other students treat the sequence as laughable.

Taken together, the teachers light and simplistic call to action ("learn Chinese" on line 71), through her somewhat incongruous, place-based reasoning for how ("talk story" on line 72/"tell stories" on line 76) and why ("because...we're in Hawaii" on line 73) telling stories will serve to accomplish learning Chinese, and her achievement in causing students to smile and laugh (line 78), along with the efficient achievement of this affective work in just eight turn constructional units (TCUs), together serve a unified accomplishment: project institutional goals and tasks as being light, fun (i.e. low anxiety). In view of institutional interaction (Heritage & Clayman, 2010), the teacher, a representative of the institution, makes the first move to "talk into being," but the continued gaze and laughter from the students shows their initial complicity in treating the teacher's talk as unproblematic. The students thus ratify the teacher and stated goal and methods, use actions besides talk to "talk" the institution into its first stage of being.

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Later in the same class meeting, we see the teacher write *xiang chi* 'feels like eating' on the front white board. The pattern will soon serve as a resource for the students and teacher to create their story.

Extract 3

```
410    TEA:   ((/GZ JOH & SOV))((GZ at front board with marker))
              just had lunch. right?
411    JOH:   [mm

412    SOV:   [eheheheh

413    TEA:   +((writing on board: "xiang"))--------------
              +good (6.0)
414           ((caps black marker))
```
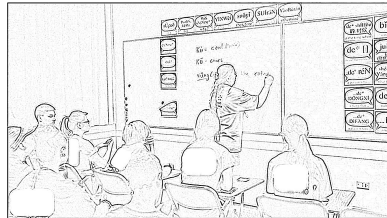


```
415              +((uncaps blue marker))
              xia::::+:n:::g3 hh
              feels like
416           +((writing on board: "CHI = feels like eating"))
              +(2.5) chi1 (9.0)
                   eating
```


Lines 410-416 show the teacher doing *direct instruction.* The teacher prefaces her introduction of *xiang chi* 'feels like eating' with shared experience and knowledge; lunch was on the printed schedule (see Appendix A) and they all just finished lunch together. In lines 414 through 416 we see the students gaze at her writing as it appears on the board in different colors.[11] The teacher displays her pronunciation of the sound of phrase slowly and with a long

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[11] Colors and capitalization here follow the Tonally Orthographic Pinyin (TOP) system as described in Waltz (2015).
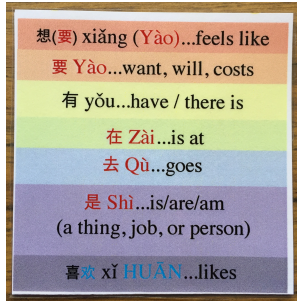
pause between each part. Taken together, we see a fairly standard classroom practice--the presenting of knowledge of how to say a new phrase and what it means (note: without reference to context, yet). At this point, the teacher has yet to demonstrate how the linguistic pattern relates to the task of story building.

In the next extract we see the first student, Grayson, attempt, and then conform, to the interactional demands of the teacher, namely to use *xiang chi* 'feels like eating' for asking questions and *xiang* 'feels like' as an answer. In addition to the front board and the teacher's talk, we see Grayson use a separate vocabulary card (most likely the front side). As a general breakdown, lines 425 through 427 bring us to the closing of the teacher's direct instruction of *xiang chi* 'feels like eating', ending with "yeah," formulated as a question with its relatedly high intonation. This final "yeah" marks the end of the direct instruction sequence, and helps project a "so now what?" connection with the *xiang chi* 'feels like eating' that the teacher just defined and demonstrated. Following, lines 428 through 440 find the teacher holding Grayson to an institution-specific *language policy*. It is relevant to know that prior to line 410, the teacher had asked questions about Superman and Lex Luthor, establishing *Superman ku4* 'Superman is cool' and *Lex Luthor ku1* 'Lex Luthor cried' (see xvii for tone transcriptions). Also note that in line 426 the teacher is showing hand gestures she made up to help students remember the meaning of each Chinese word as she says it.

Extract 4

```
425   GRA:  ((looks down at vocabulary card))--------------=
```


"Super Seven" vocabulary card (front)   (back)


```
426   TEA:  +((belly tickle then LH to mouth))
            +xiang3 chi1 (1.0)
             feels like eating
```



```
427         ((/taps board two times))
            ↑°yeah° (0.5)
428   GRA:  =+---------------------------------------------
             +((raises LH))------------------------------=
```
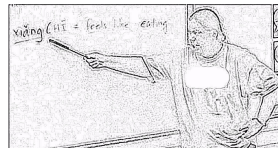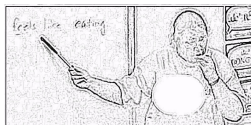


```
429   TEA:  ((arms down, GZ at students from stage L to R))
            ↑superma+n (0.5)
430   GRA:  =-------------------------------------------
                  +((GZ at TEA))
431   TEA:  +((GZ and pointer at board "xiang", then "feels like"))
            +((LH tickles belly))
            +xia:ng3
             feels like
```



```
432         +((RH to mouth))
            +chi:1 (.)
             eating
```

```
433   TEA:   +((LH fingers open and close six times))-----------
             +↑ma (.)°yes or no°
              (yes/no question marker)
```



```
434   GRA:   --((lower LH))

435          +((shakes H LR))
             +no=
436   TEA:   =+((LH palm flat, vertical 'stop'))--------------
              +(0.5)
```
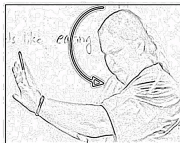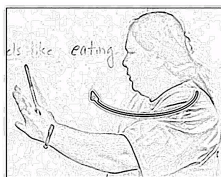


```
437          +((H nodding high low three times))
             +xia:ng3 (0.5)
              feels like
```



```
437          +((H RL three times))
             +bu4 xia:ng3
              doesn't feel like
```



```
438   GRA:   +((shakes H LR))
             +bu4 xiang3
              doesn't feel like
439   TEA:   xi- +((GZ at GRA))
                  +((/LF point at GRA 'what he said!'))
                  +((body leans down toward GRA and smile, eyes wide))
             fe-
440          ((points at GRA, then leans toward excited))
             bu4 °xia::ng3°
             doesn't feel like
```


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In lines 429 through 433 the teacher recycles Superman from a whole-class conversation that took place just before this sequence, now asking if Superman wanted. The teacher formulates the question using the target item *xiang chi* 'feels like eating'. We see Grayson look at the card on his desk, most likely as a resource for comprehending the teacher's question, when he then answers in line 434 using English "no". The teacher provides other-repair in line 436 by demonstrating two acceptable answers. It may be due to her modeling having only used embodied gestures and Chinese--no English explanation of what she was asking--that on line 440 she displays excitement toward Grayson's reformulation into Chinese of his formerly English response on 438.

The suggestion of Superman can also be viewed as "bait" in longer "fishing" process, i.e. a *candidate offering* of a detail to add to the story. In this segment of the interaction the teacher is looking for a *person* to add to the story. Later she fishes--i.e. asks the students to supply--food, events, and more. Superman need not be the person added to the story, but by asking a question about Superman, the student are exposed to a model for the types of fictional people they might suggest to add to the story. Also of note, Grayson had begun raising his hand on line 428, just prior to the teacher's question, which may reveal why the teacher did not call on him--she was still talking. However, we see soon afterwards that hand raising may not be an enforced rule in the interactional repertoire that this teacher enforces (though hand-raising may still be allowed). Through attempted behaviors and responses, we begin to see the teacher and students shaping this into a space for the sharing of ideas for stories.

Noteworthy here is the teacher's divergence from question-answer-evaluation sequences commonly found in classrooms. In classroom settings where a teacher embodies a position of being knowledgeable ([+K]) about the *content* being discussed (language is a separate matter to
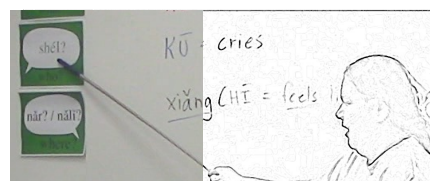
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return to shortly), the teacher will typically *confirm* or *reject* student answers as being "right" or "wrong," respectively. In the extract above, however, the teacher treats both of the two answers (*xiang* 'feels like (eating)' or *bu xiang* 'doesn't feel like (eating)') as acceptable and praiseworthy. However, just before this on line 436, we saw the teacher initiate repair when Grayson used English to answer her in line 435. Through these two distinct actions, the teacher displays a bifurcation in her epistemic access and authority. That is, relative to the students, the teacher conducts herself as [+K] in matters concerning the form and use of the Chinese language, but [-K] in matters concerning story content and imagery.

In the next extract, we see the teacher expand the discussion by using an open-ended question involving *shei* 'who' to invite students to supply (potentially) *any* person for the story.

Extract 5


```
452   TEA:   +((RH pointer at shei 'who'))
              +shei2 (0.5)
               who?

453          +((RH pointer at board 'feels like'))---------------
              +xiang3
               feels like
454          ((LH piano fingers R to L))------------
              °remember what this means?°
455          (1.0)

456   SOV:   ((GZ at board))
              Lex [Luthor
457   GRA:       [who feels like (.) eating

458   TEA:   ----------------------------------------------------
              this means we don't know the answer yet
459          ----------------------------
              so we're all going to guess
```

In lines 452 and 453 the teacher uses *shei xiang* 'who feels like feels like' (presumably eating) to initiate the first pair part of a question-answer adjacency pair as an *open-ended request*

for a person. In line 454, she asks a second question about how students should understand her

hand gesture. Following we see Sovi and Grayson orient to the teacher's different questions. In

line 455 Sovi orients to the *content* requested by the teacher, and so supplies Lex Luthor on line

456. In contrast, Grayson orients to the comprehension check focused on the teacher's hand

gesture, and so states what the hand gesture is used to ask students to do. It may be because the

teacher directs her question at many students that she treats Sovi's lone response as inadequate,

and so clarifies the meaning of the gesture so more students will contribute ideas.

The teacher is thus seen to be working at both social (the institutional task of co-creating

stories) and linguistic (learning Chinese) levels, both of which require that everyone understand

the teacher's questions. The teacher's regular interruptions, such as checking if students

remember what her "guess" gesture means, can be analyzed as the teacher's orientation to the

students needing clarification on how to participate in the task. By understanding (1) the

meaning of the teacher's Chinese questions, and (2) how to participate in the task, the task can

move forward and fulfill the underlying pedagogical goal of acquiring Chinese through input and

interaction.

The next extract begins with Grayson again raising his hand as he gazes at the teacher.

The teacher calls on him in line 465, indicating that hand raising is an option in this group for

requesting turns (the other option simply being to state an answer).

Extract 6
```
465   TEA:  +((/LH points at GRA, GZ at GRA))
            +shi4 de
             yes
466   GRA:  ((GZ at TEA))
            >mister trump<
467   TEA:  +((GZ at other students))
            +mister trump
468   STS:  hmhmhmhm heh
```


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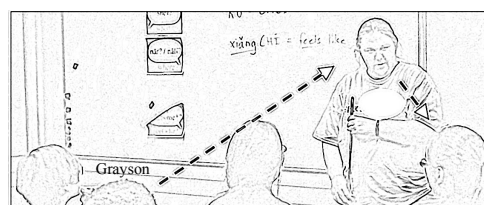
```
469   TEA:   ((announcing intonation))
             ↑mis:ter trump
470   TRO:   ((GZ at GRA))


471          ↑mister

472   TEA:   ((LH pointer at xiang 'feels like'))
             xiang3 chi1 (0.2)
             feels like eating
473          ((LH fingers closed to open))
             ↑ma (1.0)
             (question marker)
474   SOV:   °xiang3°
             feels like (yes)
475   TEA:   ((GZ at SOV, nods))
             xiang3
             feels like (yes)
476          ((points to SOV))
             °good answer° xiang3
                          feels like (yes)
477   SOV:   ((smiles, RH fist pump down 'got it!'))

478   TEA:   ((looking L to R across STS))
             mister trump (.) °xiang3 chi1° (1.5)
                          feels like eating
479   TEA:   +((/slight head shake, leans toward sts))
             +tong2 xue2 men (.)
             students/classmates
480          °that means >students<°
481          +((Hs folded 'bad news')) +((H shaking))
             +mister trump (.)          +bu4 xiang3 chi1
                                          doesn't feel like eating
482   STS:   ((GZ at TEA))

483   GRA:   ((head back, smiling))
             °ohh°
```
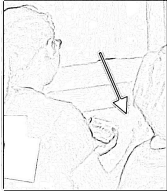
Unpacking this sequence, in line 466 we see Grayson proffer an answer to the teacher's

question back in lines 452 to 453 (the question and answer were separated by an insertion

sequence in which the teacher clarified how she wanted the students to understand her "guess"

gesture). Unlike Grayson's use of English "no" in line 435 above, the teacher in line 467 does not

orient to the language as problematic,[12] nor does she respond with a third turn that would close the question-answer sequence. Instead she initiates repair as a new insertion sequence in the form of a confirmation request from the students. Many of the students treat Grayson's answer (and possibly the teacher's response) as laughable, which the teacher treats as *potential* ratification. Additionally on line 470 Troy Bolton addresses Grayson directly, specifically treating Grayson's use of the word "mister" as interesting. In lines 469, 472, and 473 the teacher continues to check for ratification from Grayson's classmates by using a new first pair part to a question-answer adjacency pair. In line 474, Sovi attempts to ratify Grayson's proffered person using one of the two language options that the teacher had demonstrated back in lines 436 to 438--*xiang* 'feels like' or *bu xiang* 'doesn't feel like'. In lines 475 and 476 we see the teacher echo Sovi's response and then praise her, possibly for using the target-like form without additional help (*xiang* 'feels like (eating)' was present in the immediately preceding question but which part of the question to left to Sovi to reformulate as a hearable answer). Sovi thus demonstrates her understanding of *ma* and the teacher's hand gesture for it as marking a question, and that she has learned which part of the question to reformulate into an answer. Also of interest, the teacher again shows a dual attention to (1) language use and learning, and (2) social participation in the collaborative task. The teacher's use a soft voice in line 476 is hearable as her attempt to praise Sovi's display of learning while not taking away the focus on the immediate group goal of ratifying Grayson's person into the story. In line 478, the teacher looks around at the students one more time while stating the candidate story fact. In lines 479 to 481, the teacher announces that Grayson's idea has been rejected.

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[12] The teacher had recently introduced a "two-word rule", allowing student up to two words of English at a time.

In the final extract for the present analysis, we see with the teacher launching another request from students for a candidate person to add to the unfolding story. The teacher here is visibly restating her initial invitation for ideas from lines 452 to 453, which, up until this moment neither she nor the students have treated as satisfying the initial request, formulated as a question.

Extract 7

```
504   TEA:  she:i2
              who
505         ((LH F points to wall poster shei2 'who', F taps twice))

506         +((LH F points to xiang3 'feels like'))
            +xiang3 chi1
             feels like eating
507         +((RH piano fingers L to R 'add magic/guess'))
            +°yeah? °
508         +((RH piano fingers R to L 'add magic/guess'))
            +shei2 xiang3 chi1
             who feels like eating
509   ETH:  tom cru:ise.

510   TEA:  to+m ↑cruise

511   VER:  ((GZ at TEA, begins smiling))
              +hh
512   STS:  hehehe[heh hah hah hah

512   TEA:        [((GZ at ETH<VER,VAN,GRA,TRO,SOV;LYD>SAL))
            to[m cruise xiang3 chi1 ma
513   STS:    [((return GZ on TEA<SOV,VER=VAN=TRO=GRA))
514   ETH:  (sure/chi1)
                  /eats
515   JOH:  ((H nods))

516   SOV:  ((GZ at board))

517         xiang3
            feels like (yes)
518   TEA:  +((/H nods))
            +XIANG3 o:k tom cruise
             feels like (yes)
519         tom cruise (.) xiang3 chi1-
                         feels like eating
```
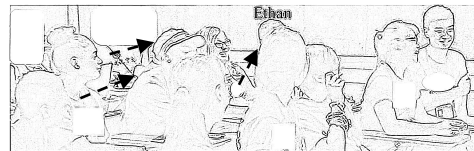
In lines 504 to 508 the teacher again asks *shei xiang chi* 'who feels like eating'. She asks this twice, possibly to give students time to think of a suggestion. Ethan offers "Tom Cruise" as an answer. Many of the students treat Ethan's answer, or possibly the combination of his answer *and* the teacher's display of uptake on line 510, as laughable. The teacher formulates a question as a request for ratification, to which Ethan, Sovi, and John show explicit ratification through talk (sure/chi and xiang 'feels like (yes)') and a head nod. The teacher treats the students' laughter, plus their secondary ratification toward Ethan's proffered person, by confirming *Tom Cruise xiang chi* 'Tom Cruise wants/wanted to eat'. At this point in the analysis we have uncovered how Tom Cruise ended up in the class story--this was Ethan's idea.

The interactional video-recorded data analyzed so far reveals the situated actions accomplished by the participants in each usage of the learning object, *xiang chi* 'feels like eating'. These actions are restated in the following table:

Table 19. Target forms and actions accomplished through their use

Extract, *line, speaker*	Form, *support*	Action Formation
Extract 3, *lines 415-416, teacher*	*xia:::::n:::g3* 'feels like' (2.5) *chi1* 'eating' (9.0), *writing on front board*	direct instruction, focus on sound, spelling, gestures, and context-free meaning
Extract 4, line 426, teacher	*xiang3 chi1* 'feels like eating', *hand gestures, board writing*	direct instruction, focus on sound, spelling, gestures, and context-free meaning
Extract 4, *lines 429-433, teacher*	*Superman xiang chi ma* 'did Superman want to eat', *hand*	candidate offering of a person in the story, formulated as a y/n question

	gestures, board writing	
Extract 5, *lines 452-453, teacher*	*shei xiang* 'who feels like (eating)', *hand gesture, comprehension check*	open-ended request for a person in the story, formulated as a question
Extract 6, *lines 469, 472-473, teacher*	*mister trump xiang chi ma* 'did Mr. Trump feel like eating?', *hand gestures, board writing*	request for ratification from the proffering student's classmates, formulated as a y/n question
Extract 6, *line 474, Sovi*	*xiang* 'feels like (eating)', *(possibly board writing)*	attempted ratification
Extract 6, *line 475-476, teacher*	*xiang* 'feels like (eating)', good answer, *xiang* 'feels like (eating)'	evaluation of student's language use
Extract 6, *line 478, teacher*	*mister trump... xiang chi* 'Mr. Trump... felt like eating'	final check for ratification from the proffering student's classmates, formulated as a statement
Extract 6, *line 481, teacher*	*mister Trump bu xiang chi* 'Mr. Trump didn't feel like eating', *head shaking*	announcement of rejection of the proffering student's suggestion for a person in the story
Extract 7, *lines 504 to 506, teacher*	*shei xiang chi* 'who feels like eating', *wall sign (text), hand gesture ("guess")*	restatement of the open-ended request for a person in the story, originally asked on lines 452-453, formulated again as a question
Extract 7, *line 508,*	*shei xiang chi* 'who feels like	verbatim repetition

teacher	eating?' *hand gesture ("guess")*	
Extract 7, *line 512,* *teacher*	*tom cruise xiang chi ma* 'Does Tom Cruise feel like eating?' *(no support)*	request for ratification from the proffering student's classmates, formulated as a y/n question
Extract 7, *line 516,* Sovi	*xiang* 'feels like (eating)', *(possibly board writing)*	attempted ratification
Extract 7, *line 518,* teacher	*xiang* 'feels like (eating)' *ok,* *(no support)*	display of acceptance of proffered person
Extract 7, *line 519,* *teacher*	*tom cruise xiang chi* 'Tom Cruise feels like eating', *(no support)*	announcement of acceptance of the proffering student's suggestion for a person in the story

The actions listed in the table above can be subdivided into three stages: (1) introduction of the linguistic form and question format in lines 415-416, 426, and 429-433, (2) an first and unsuccessful attempt at "fishing" for a candidate story detail--a story person in this case--in lines 452-453, 469, 472-473, 474, 475-476, 478, and 481, and (3) a second and successful attempt at "fishing" for the same candidate story detail in lines 504-506, 508, 512, 516, 518, and 519. Within that, Sovi's use of the target phrase as modeled by the teacher, *xiang* 'feels like', to function as an answer to the present question, is also itself evidence of her learning, and remains useful to driving along the present task. The second two stages are displayed vertically in the table below for a more direct comparison.

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Table 20. Actions performed using xiang chi *'feels like eating' and* xiang *'feels like (eating)'*

First attempt at "fishing" for a story detail (a person)	Second attempt at "fishing" for the same story detail
1 open-ended request, formulated as question, by the teacher	1 open-ended request, formulated as question, by the teacher
2 request for ratification of a student's suggestion, y/n question, by the teacher	2 request for ratification of a student's suggestion, y/n question, by the teacher
3 attempted ratification, by Sovi (a student)	3 attempted ratification, by Sovi (a student)
4 evaluation of language use, by the teacher	4 display of acceptance of proffered suggestion, by the teacher
5 final check for ratification, statement, by the teacher	5 announcement of acceptance, statement, by the teacher
6 announcement of rejection, negative statement, by the teacher	

5.2. Interim discussion

In these segments of interaction, the teacher was found to be using *xiang chi* 'feels like eating' to provide choices to the students for building the story, which, in the end, is about Tom Cruise searching for bananas. The teacher led the interaction, giving some choices in the form of open-ended questions, and some as *either-or* questions. Waltz (2015) refers to this in a glossary as a "Choice-type question: a question that offers a choice to the student, usually using the word 'or'" (p. 174). In most of the turns at talk, it was the teacher who worked to maintain classroom conduct with focus on learning Chinese through building a story. Over this short segment of time, some of the students contributed to this institutional structure through their relevant placement of responses. These few extracts offer only an initial glimpse into the 200+ times *xiang chi* 'feels

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like eating' ended up being used in this one lesson. This illustrates another concept in the TPRS literature by Waltz (2015), referred to as "Proximal repetition: repeating a new [Chinese] character [i.e. a lexical item] several times very close to its initial use, to provide more repetition at the start" (p. 175). The video data, represented in the extracts above, reveal that this "repetition" is manifested in interaction as the sequence of actions as listed in the table above. Proximal repetition is also relevant to Constructionist research (e.g. Goldberg et al., 2007), which has mainly looked in laboratory training setting to test for effects from early and frequent exposure to a new linguistic item. As a representative of the learning institution who is experienced in managing classrooms in her particular way, the analysis provided here demonstrates how this one teacher took the lead in "talking the institution into being" and how the students cooperated to co-construct the institutional practices together.

CHAPTER VI. DISCUSSION

6.1. Frequency distribution, contingency, and learning

The research questions for the present study will be addressed in turn here. These will build on the brief interim discussions in each analysis in the preceding chapters.

RQ1: How strongly is contingency learning at play during the earliest stages of construction learning in a typologically distant L2? The close matches in frequency distribution, collostructional strength, and Delta P (construction -> lexeme) in each RP point to contingency learning to indeed play a role during early construction learning, given the particular classroom conditions the learners experienced in the present corpus.

RQ1a: Are the frequency distributions in early experience Zipfian (allowing learners to attend to and learn the most frequent lexical items first)? The frequency distribution in MC1 was heavily skewed toward *chi* 'eat' in the *xiang* 'feels like' construction. The remaining constructions and lexical items were used in very low token frequency despite some variation in lemma types in each of the remaining two constructions. Each successive MC found high token frequency and skewing for a different construction, i.e. *xihuan* 'likes' in MC1-2 and then *yao* 'wants' in MC1-3. In each successive MC, the lexical items in *yao* 'wants' constructions followed more Zipfian distributions than did either *xiang* 'feels like' or *xihuan* 'likes' constructions. The latter two constructions heavily favored *chi* 'eat' even through the end of RP5.

RQ1b: Does learner use match the relative frequencies in their past experience? In TC1, *xiang chi* 'feels like eating' is strongly predicted from frequency distribution, collostructional strength, and Delta P (construction -> lexeme) in MC1. Delta P (lexeme -> construction) was a less reliable predictor across nearly all constructions in the MCs and corresponding TCs investigated. In TC2, the heavy use of *xihuan chi* 'likes to eat' is strongly predicted again from

frequency distribution, collostructional strength, and Delta P (construction -> lexeme) in MC1-2. TC3 witnessed a greater scattering of distinct lexemes across all three constructions, which coincides with a more frequent and Zipfian distribution of lexemes in the *yao* 'wants' construction. Whether or not this scattered distribution in TC3 was *caused* by the distributions in MC1-3 is difficult to judge because the many single-instance patterns (one lexeme in one construction) are so few in number.

RQ1c: Do these matching frequencies reflect orders of acquisition, i.e. are the first-learned lexical constructions in each grammatical construction those that appeared more frequently in that grammatical construction in prior experience? The order of lexemes used in each construction in each TC largely followed the order of their most frequent orders of usage in the MC of the same RP. The analyses across all five recording periods found frequency distribution and orders of vocabulary acquisition, as produced by the ten learners in freely written and freely spoken stories (the test corpora, or TCs), to pattern closely on the input and interaction they experienced prior to each TC. Given the particular instructional environments provided, contingency learning appears to have been a productive learning mechanism aiding the acquisition of PROCESS words like *chi* 'eat' and *kan* 'see/watch'.

RQ1d: Will the first-learned lexical constructions in each grammatical construction be those that are more distinctively associated with that grammatical construction in prior experience? This is the case found for collostructional strength and for Delta P (construction -> lexeme), but not for Delta P (lexeme -> construction).

6.2. Concreteness as a limiting factor toward frequency effects

RQ2: To what degree might the salience of individual lexical items interact with frequency, i.e. does lower-rated *concreteness* of meaning necessitate greater frequency of exposure, whereas higher-rated concreteness allows for learning from less frequent exposure? This analysis touched only lightly on the potentially limiting factor to frequency distribution in experience, namely concreteness as a type of salience. To repeat here, Brysbaert et al. (2013) operationalize concreteness as "the degree to which the concept denoted by a word refers to a perceptible entity" (p. 1). The lexical item *zuo* 'do' had a low concreteness rating, implying that it could require a higher frequency of encounters to entrench and associate with any particular construction. Conversely, *outu* 'vomit' had a very high concreteness rating, implying that it would not have to be encountered many times to be entrenched and associated with contexts for use.

6.3. Institutional interaction and the frequent re-use of a linguistic pattern

RQ3: How is the statistical skewing of language-in-use accomplished in the present data's social interaction? In terms of goal-orientation, special constraints on allowable contributions, and institution-specific inferential frameworks, this analysis of institutional interaction found the teacher's frequent use of *xiang chi* 'feels like eating' to provide choices to the students for building the story. Some of these choices were open-ended, and some were *either-or* questions. Waltz (2015) refers to this in a glossary as a "Choice-type question: a question that offers a choice to the student, usually using the word 'or'" (p. 174). In most of the turns at talk, the teacher established the classroom conduct to focus around learning Chinese through building a story. The teacher was found to initially guide the class through the business at hand, and when

the students contribute to this institutional structure. These few extracts offer only an initial

glimpse into the 200+ times xiang chi ended up being used in just this lesson--all that repetition

in negotiations for just *one sentence* in the final story product. This also illustrates a concept in

the TPRS literature by Waltz (2015), referred to in the glossary as "Proximal repetition:

repeating a new character [i.e. lexical item] several time very close to its initial use, to provide

more repetition at the start" (p. 175). The video data, represented in the extracts above, reveal

that this "repetition" is manifested in interaction as a sequence of actions as listed in the table

above. Proximal repetition is also relevant to Constructionist research (e.g. Goldberg et al., 2007)

who found positive effects from introducing a construction not only frequently, but also early in

exposure. As a representative of the learning institution who is experienced in managing

classrooms in her particular way, the analysis provided here demonstrates how she takes the lead

in "talking the institution into being" and the students complete the interaction to co-construct the

institutional practices with her.

The teacher in the TPRS classes also showed frequent word and pattern re-use so the

students had the sound-meaning resources ready to use when reading Chinese character texts in

CCR (TPRS Reading) class. The teacher was observed to accomplish this by using Chinese to

ask students for new story details, ask students to confirm or reject story details, confirm with

students the details added to the story canon as the story unfolded, and to check comprehension.

After CCR, the students then used printed copies of those texts as physical resources to use when

handwriting Chinese character texts. This all served the institutional purpose of maximize

frequency of a narrow net (Krashen, 2013) of language that would be re-used across classes over

different days.

CHAPTER VII. CONCLUSIONS, LIMITATIONS, AND FUTURE DIRECTIONS

7.1. Conclusions

7.1.1. Contingency learning in beginning instructed SLA

One implication from this study pertains to the role of skewing input during the early

acquisition of constructions as foundation material to accelerate acquisition. That is, if

contingency learning is at play when PROCESS words are frequently and distinctively

encountered in particular grammatical constructions, then we should expect similar effects at

other levels of language, as in when a phonetic articulation is frequently and distinctively

encountered in a limited set of lexical items. Bybee (2006) describes *autonomy* as one of *the*

mind's response to repetition. In this phonetic learning example, each articulation of a lexical

item that an early learner hears is unlikely to be exactly identical to previous pronunciations

heard. A learner will likely hear slight variations in the pronunciation of one word many

hundreds of times, and these high type and token frequencies, and, assumedly, moderate

distribution across the other lexical items, facilitates the autonomy of that phoneme as an

independent category. TC5 in the present study found a similar *autonomy* of *chi* 'eat', which

jumped to the *yao* 'wants' construction before the more frequent lexical members of that same

construction in MC1-5 had appeared in TC5.

Autonomy as a result contingency learning has implications for the types of skewing and

the goals of that skewing a comprehension-based teacher might choose to follow. This is a

question of whether, say, fifty sparsely experienced lexical items and grammatical constructions

in a *wide net* (Krashen, 2013) of linguistic exemplars will entrench in the same way that the

targeted repetition of just a few lexical and grammatical constructions, to achieve strong

entrenchment and schematization, results in autonomous categories. Each entrenched and

autonomous unit can serve as a resource for learning new categories, including phonemes to distinguish sounds in new lexical items, lexical items to understand the basic meanings of people, places, physical objects, events, etc. in longer utterances heard, and even grammatical constructions to understand action semantics of those utterances.

7.1.2. Implications for teacher-researcher collaboration.

Creating learner corpora can be very costly in terms of time and money spent on collection of video, audio, and texts, and the transcription that follow. One solution for collecting large amounts of written data without the need to further transcribe and sort the texts is to have students type stories and other writing tasks on computers, and then send their finished work to specific folders.[13] Teachers can maintain a journal of the activities and tasks the students did in lesson, a list of students who were absent (missing out on valuable input and interaction), impressionistic recollections of the most frequent or most new language chunks the students heard, read, wrote, or spoke, and the content of what was talked about, i.e. pictures, film clips, stories, culture, an so forth.

Researchers should also find opportunities to offer feedback and collaborate more closely with the teachers from whom they collect data. This can help generate new research questions, and help the researcher understand the goals and sequences in instruction that serve as context for the learner's experiences, and help better understand why they learned what they learned when they did.

One reason for choosing this summer camp for the present learner corpus was having observed the speed at which the students were found to be reading and comprehending the

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[13] Thanks to Kris Kyle for pointing out this solution.

language in previous summers. This positions the camp learning somewhere closer to the laboratory-type environments in the usage-based studies of effects from skewed input (Goldberg et al., 2007; Casenhiser & Goldberg, 2005; Goldberg et al., 2004) than classrooms in which input and repetition are not integral to the learning experience. It is one of my hopes that the present study can serve as an example of the utility of these particular types of classrooms for further Constructionist/Usage-based research.

7.1.3. Implications for teaching practices

I know of only two books that directly address teaching practices from Cognitive Linguistics perspectives. Littlemore (2009) and Holme (2009) do well in discussing such concepts as conceptual metaphor and embodiment, respectively. Additionally, literature for teachers from Constructionist perspectives should discuss features of input in terms of effects from early exposure, token frequency, frequency distribution, and distinctive of association on category learning, along with the sub-types of learning that happen as a result of those experiences with the input, including entrenchment, schematization, contingency learning, and autonomy. If this only serves to convince teachers to use the target language more in class, then something positive will have been gained.

7.2. Limitations and future directions

Corpus data reflects a balance between the normal pressures on language use that occur in daily interaction and writing when beginning users of the language have to keep track of many components at once, including how sounds, lexical items, grammatical structures, and the larger discourse all cohere to create meaningful talk or writing. It is, however difficult to discern from

corpus data what underlying competencies the learners might otherwise exhibit in a controlled test, i.e. sentence completion or card sorting, as past Constructionist studies have done (Bencini & Goldberg, 2000; Gries & Wulff, 2005).

The writing and speaking samples for TC1-TC4 were created by the learners specifically for the research project. Future analyses can take into account the spontaneous and aided talk the learners produced in the contexts of the ongoing classroom interaction over time.

Measures of distinctiveness did not account for lexical items that did not occur in the three grammatical constructions, but did otherwise appear in those test corpora. Future analyses can look for collostructional strength and bi-directional Delta P for *repulsed* collexemes.

Building Eskildsen (2011), the construct of *portability* is an important future direction, as the first writing samples, as well as samples created in other TCs reused exact people, foods, and locations from classes. It will be interesting to investigate the possible co-occurrence of greater schematization along with portability as differing accounts of creativity in construction use.

APPENDIX A: Camp Schedule (***recording periods included)

Monday, July 11 (Opening day)
    9:00—10:50 a.m. *Opening Session*
    11:00—11:50 a.m. *Media Lab* ***begin Recording Period 1 (RP1)***
        12:00—12:50 p.m. *Lunch*
    1:00—1:50 p.m. (beginning track in TPRS room) *Listening-speaking class*
    1:55—2:40 p.m. (beginning track in TBLT room) *Listening-speaking class*
    2:45—3:25 p.m. (beginning track in TPRS room) *Reading* (read *Giuseppe* by Waltz, 2014)
    3:30—4:25 p.m. (all students in TBLT room) *Intro to Banking, Meeting with Mentors*
    4:30—5:30 p.m. (outdoor) *Wushu*
        5:35—6:55 p.m. *Dinner and rest*
    7:00—8:00 p.m. *Study hall and Banking*
    8:00—9:00 p.m. *Cultural activities*

Tuesday, July 12 (Standard Schedule)
    9:00—9:50 a.m. (beginning track in TPRS room) *Listening-speaking class 1*
    10:00—10:50 a.m. (beginning track in TBLT room) *Listening-speaking class 2*
    11:00—11:50 a.m. (all students in computer lab) *Media Lab*
        12:00—12:50 p.m. (Campus Center or Hemenway Hall) *Lunch*
    1:00—1:50 p.m. (beginning track in TPRS room) *Reading class 1* (read *Egbert* by Waltz, 2014)
    1:55—2:40 p.m. (beginning track in TBLT room) *Reading class 2*
    2:45—3:25 p.m. (students meet with mentor teachers in both rooms) *Writing class*
    3:30—4:25 p.m. *S.T.E.M. class*
    4:30—5:30 p.m. (outdoor) *Wushu*
        5:35—6:55 p.m. *Dinner and rest*
    7:00—8:00 p.m. *Study hall and Banking*
    8:00—9:00 p.m. *Cultural activities*

Wednesday, July 13 (Excursion day)
    9:00—9:50 a.m. (beginning track in TPRS room) *Listening-speaking class 1*
     ***9:45am Test Corpus 1 (TC1)*, students individually write a story in pinyin for five minutes, no support
    10:00—10:50 a.m. (beginning track in TBLT room) *Listening-speaking class 2* ***begin RP2***
    11—11:50 a.m. (all students in computer lab) *Media Lab*
        Local field trip

Thursday, July 14 (Standard Schedule) (read *Herbert* by Waltz, 2014)

Friday, July 15 (Standard Schedule) (read *niurou xiang chi mian* 'cow feels like eating noodles' by Waltz, unpublished)

Saturday, July 16 (Weekend schedule)
    8:30—10:30 a.m. cultural workshop (in English)
    10:30 a.m. Brunch
    1:00 p.m. Depart from dorm for local field trip
    4:30 p.m. Return. Dinner; evening free.

Sunday, July 17 (Weekend schedule)
    Free morning; brunch
    1 pm: depart from dorm for local field trip
    4:30 pm: return
    Dinner on campus; evening free

Monday, July 18 (Standard Schedule)
　　　***9:45am TC2*, students individually write a story in pinyin for five minutes, card permitted
　　　***begin RP3* at 10am, TBLT room, in Listening-speaking class 2 (read *George* by Waltz, 2014)

Tuesday, July 19 (Standard Schedule) (continue reading *George*)

Wednesday, July 20 (Excursion day)
　　9:00—9:50 a.m. (beginning track in TPRS room) *Listening-speaking class 1*
　　10:00—10:50 a.m. (beginning track in TBLT room) *Listening-speaking class 2*
　　11—11:50 a.m. (all students in computer lab) *Media Lab*
　　　　Local field trip (museum)
　　　　4:30 p.m. Return. Rest. Dinner.
　　　　7:00—9:00 p.m. Study hall, Banking, and Movie Night.

Thursday, July 21 (Standard Schedule)
　　　***9:45am TC3,* students individually write a story in pinyin for five minutes, no support
　　　***begin RP4* at 10am, TBLT room, Listening-speaking class 2 (continue reading *George*)

Friday, July 22 (Standard Schedule)
　　　(read *Pandarella* by Waltz, 2014)
　　　***7:10pm TC4* (student in pairs meet in front of a camera to collaborate stories, five to seven minutes, no notes or other support permitted)

Saturday, July 23 (Weekend Schedule)
　　8:00 a.m. Depart from dorm for local field trip
　　10:15 a.m. Depart from location for Chinatown, for dimsum lunch and discovery walk.
　　2:00 p.m. Return from Chinatown.
　　Afternoon and evening free. Dinner in cafeteria.

Sunday, July 24 (Weekend Schedule)
　　Free morning; brunch (10:30 a.m.) in cafeteria
　　1:00 p.m. Depart from dorm for local field trip
　　4:30 p.m. Return from field trip. Dinner in cafeteria; evening free.

Monday, July 25 (Last instructional days)
　　　***begin RP5* at 9am, TPRS room, Listening-speaking class 1
　　(continue reading *Pandarella*)
　　Standard schedule except for the following:
　　3:30—4:30 p.m. (TBLT room) *Improvisational theater training*

Tuesday, July 26 (Last instructional days)
　　Standard schedule except for the following:
　　3:30—4:30 p.m. (TBLT room) *Improvisational theater training*
　　Last regular classes.

Wednesday, July 27 (Testing/rehearsal day)
　　9:00—11:00 a.m. (TBLT room) *Improvisational theatre training. Draft acts for final performance.*
　　11:00—12:00 noon (separate room) *Work on exit survey and "can-do" statements*
　　　　12:00—12:55 p.m. (Campus Center or Hemenway Hall) *Lunch*
　　1:00—3:20 p.m. (various rooms) *Oral, reading & writing assessments*
　　　***TC5, see Appendix E for samples and support*
　　3:30—4:20 p.m. (TBLT room) *Improvisational theater training. Rehearsal.*
　　4:30—5:30 p.m. *Wushu*

APPENDIX B: Stories Created in TPRS Listening-Speaking Classes in RP1-RP2

The following *Original* story texts were pasted into this appendix just as they appeared on the students' shared *Wikispaces* web pages. Each day after the TPRS listening-speaking class a teacher typed the story--the final product from the students' and teacher's spoken collaboration that morning--into the students' shared *Wikispaces*. The students were then able to access that day's story text, along with any prior days' story texts, during the day's Media Lab hour to assist in typing their own content. The texts below represent stories created in RP1 and RP2 only. *Pinyin* (Romanized spelling) and English versions have been added under each *original* text below. The *pinyin* and English versions are provided only for the present reader, and were not available to the students during the camp. Each *pinyin* version was generated by Google Translate and checked for accuracy after being pasting here.

July 11

Original: Tom Cruise 酷，但是 Tom Cruise 哭，因为 Tom Cruise 想要吃 banana。 Tom Cruise 在 Hollywood，在 Hollywood 没有 Banana。 Tom Cruise 去 Chicago，Chicago 好，因为 Chicago 有 Banana，Chicago 的 Banana 好吃，Tom Cruise 高兴了。

Pinyin: Tom Cruise kù, dànshì Tom Cruise kū, yīnwèi Tom Cruise xiǎng yào chī banana. Tom Cruise zài Hollywood, zài Hollywood méiyǒu Banana. Tom Cruise qù Chicago, Chicago hǎo, yīnwèi Chicago yǒu Banana, Chicago de Banana hǎo chī, Tom Cruise gāoxìng le.

English: Tom Cruise was cool, but he cried because Tom Cruise wanted to eat bananas. Tom Cruise was in Hollywood. There were no bananas in Hollywood. Tom Cruise went to Chicago. Chicago was good because Chicago had bananas. Chicago's bananas were good tasting. Tom Cruise was happy now.

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July 12

Original: 昨天 Tom Cruise 在 Hollywood ，他想吃 banana，但是在 Hollywood 没有 Banana。 Tom Cruise 去了 Chicago。 Angelina Jolie 也在 Chicago，Tom Cruise 跟 Angelina Jolie 在 Batman 的家吃 Banana。但是 Chicago 的 Banana 不好 吃，Tom Cruise 呕吐了。昨天呱呱(Guāguā)高兴，今天他不高兴。呱呱是 BananaMeister，他想要吃 Banana。呱呱说 Chicago 的 Banana 不好吃，他没有吃 Chicago 的 Banana，他吃了 Red Velvet Cake. 今天 Johnny Depp 也想吃 Banana，Johnny Depp 去了夏威夷(Xiàwēiyí- Hawaii)，他说:"小龙 (Xiǎo Lóng)，我跟你吃 Banana 好吗?" 小龙说:"你不酷，你是不酷的人。我不想跟你吃 Banana。" Johnny Depp 哭了。

Pinyin: Zuótiān Tom Cruise zài Hollywood, tā xiǎng chī banana, dànshì zài Hollywood méiyǒu Banana. Tom Cruise qù le Chicago. Angelina Jolie yě zài Chicago, Tom Cruise gēn Angelina Jolie zài Batman de jiā chī Banana. Dànshì Chicago de Banana bù hǎo chī, Tom Cruise ǒutù le. Zuótiān guāguā (Guāguā) gāoxìng, jīntiān tā bù gāoxìng. Guāguā shì BananaMeister, tā xiǎng yào chī Banana. Guāguā shuō Chicago de Banana bù hǎo chī, tā méiyǒu chī Chicago de Banana, tā chī le Red Velvet Cake. Jīntiān Johnny Depp yě xiǎng chī Banana, Johnny Depp qù le xiàwēiyí (Xiàwēiyí- Hawaii), tā shuō: "Xiǎolóng (Xiǎo Lóng), wǒ gēn nǐ chī Banana hǎo ma?" Xiǎolóng shuō: "Nǐ bú kù, nǐ shì bù kù de rén. Wǒ bù xiǎng gēn nǐ chī Banana." Johnny Depp kū le.

English: Yesterday Tom Cruise was in Hollywood. He wanted to eat bananas, but there were no bananas in Hollywood. Tom Cruise went to Chicago. Angelina Jolie was also in Chicago, Tom Cruise and Angelina Jolie ate bananas at Batman's house. But Chicago's bananas were not good tasting. Tom Cruise vomited. Yesterday Guagua [a student] was happy. Today he

is not happy. Guagua is the Banana Meister. He wants to eat bananas. Guagua said Chicago's bananas are not good tasting. He has never eaten Chicago's bananas. He has eaten red velvet cake. Today Johnny Depp also wants to eat a banana. Johnny Depp went to Hawaii. He said, "Xiao Long [a student], I will eat bananas with you, ok?" Xiao Long said, "You are not cool, you are not a cool person. I do not want to eat bananas with you." Johnny Depp cried.

July 13:

Original: 有一个人生气，谁生气? Britney Spears不生气，Joker也不生气，他们都高兴，两个人都高兴。 是Squidward生气，他在Bikini Bottom生气。 他生气因为他没有朋友。Squidward要不要朋友?他不要朋友。 虽然他没有朋友，但是他不要朋友，他要女朋友。 他要两个女朋友。 Squidward生Patrick的气，因为Patrick 有三个女朋友。 但是Patrick跟Squidward说:有三个女朋友不好。 Squidward生Patrick的气，因为Patrick说:有三个女朋友不好。 Squidward要两个女朋友。

Pinyin: Yǒuyī gè rén shēngqì, shéi shēngqì? Britney Spears bù shēngqì, Joker yě bù shēngqì, tāmen dōu gāoxìng, liǎng gèrén dōu gāoxìng. Shì Squidward shēngqì, tā zài Bikini Bottom shēngqì. Tā shēngqì yīnwèi tā méiyǒu péngyǒu. Squidward yào bú yào péngyǒu? Tā bú yào péngyǒu. Suīrán tā méiyǒu péngyǒu, dànshì tā bú yào péngyǒu, tā yào nǚ péngyǒu. Tā yào liǎng gè nǚ péngyǒu. Squidward shēng Patrick de qì, yīnwèi Patrick yǒusān gè nǚ péngyǒu. Dànshì Patrick gēn Squidward shuō: Yǒusān gè nǚ péngyǒu bù hǎo. Squidward shēng Patrick de qì, yīnwèi Patrick shuō: Yǒusān gè nǚ péngyǒu bù hǎo. Squidward yào liǎng gè nǚ péngyǒu.

English: There was a person who was very angry. Who was it? Britney Spears was not angry. The Joker was also not angry. They were both happy. The two of them were both happy. It was Squidward who was angry. He was angry at Bikini Bottom. He was angry because he had

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no friends. Did Squidward want friends? He did not want friends. Although he didn't have friends, he did not want friends. He wanted a girlfriend. He wanted two girlfriends. Squidward was angry at Patrick because Patrick had three girlfriends, but Patrick said to Squidward: "Having three girlfriends is not good." Squidward was angry with Patrick because Patrick said, "Having three girlfriends is not good." Squidward wanted two girlfriends.

July 14:

Original: Squidward要女朋友，因为他没有女朋友，Patrick有三个女朋友。谁有两个男朋友? Katniss Everdeen 有两个男朋友，一个叫Peter，一个叫Gail。 Peter 很好看，Gail 不好看。Taylor Lautner喜欢汉堡包，他喜欢吃鸡肉汉堡包。 Taylor Lautner有两个女朋友，一个女朋友是Miley Cyrus。 Miley Cyrus也喜欢吃汉堡包，但是不喜欢吃鸡肉。今天是Taylor Lautner的生日，Miley Cyrus跟 Taylor Lautner说:"今天是你的生日，我们去看电影，好不好?" 看电影的时候，TL喜欢吃鸡肉，MC喜欢吃 汉堡包。今天他们在North Pole看电影，但是在North Pole没有鸡肉，TL生气，他不高兴。 MC也生气，因为 在North Pole也没有汉堡包。在North Pole 有Penguin汉堡包，但是没有人要吃Penguin汉堡包，所以他们都生气。

Pinyin: Squidward yào nǚ péngyǒu, yīnwèi tā méiyǒu nǚ péngyǒu, Patrick yǒusān gè nǚ péngyǒu. Shéi yǒu liǎng gè nán péngyǒu? Katniss Everdeen yǒu liǎng gè nán péngyǒu, yīgè jiào Peter, yīgè jiào Gail. Peter hěn hǎokàn, Gail bù hǎokàn.Taylor Lautner xǐhuān hànbǎobāo, tā xǐhuān chī jīròu hànbǎobāo. Taylor Lautner yǒu liǎng gè nǚ péngyǒu, yīgè nǚ péngyǒu shì Miley Cyrus. Miley Cyrus yě xǐhuān chī hànbǎobāo, dànshì bù xǐhuān chī jīròu. Jīntiān shì Taylor Lautner de shēngrì, Miley Cyrus gēn Taylor Lautner shuō: "Jīntiān shì nǐ de shēngrì, wǒmen qù

kàn diànyǐng, hǎo bù hǎo?" Kàn diànyǐng de shíhòu, TL xǐhuān chī jīròu, MC xǐhuān chī

hànbǎobāo. Jīntiān tāmen zài North Pole kàn diànyǐng, dànshì zài North Pole méiyǒu jīròu,TL

shēngqì, tā bù gāoxìng. MC yě shēngqì, yīnwèi zài North Pole yě méiyǒu hànbǎobāo. Zài North

Pole yǒu Penguin hànbǎobāo, dànshì méiyǒu rén yào chī Penguin hànbǎobāo, suǒyǐ tāmen dōu

shēngqì.

English: Squidward wanted a girlfriend because he didn't have a girlfriend. Patrick had

three girlfriends. Who had two boyfriends? Katniss Everdeen had two boyfriends. One was

called Peter, one was called Gail. Peter was very good looking, Gail was not good looking.

Taylor Lautner liked to eat hamburgers. She liked to eat chicken hamburgers. Taylor Lautner had

two girlfriends. One girlfriend was Miley Cyrus. Miley Cyrus also liked to eat hamburgers, but

she didn't like to eat chicken meat. Today is Taylor Lautner's birthday. Miley Cyrus said to

Taylor Lautner: "Today is your birthday. Let's go see a movie, ok?" While watching movies,

Taylor Lautner liked to eat chicken, and Miley Cyrus liked to eat hamburgers. Today they are in

the North Pole watching movies, but the North Pole doesn't have chicken. Taylor Lautner is

angry. She is very unhappy. Miley Cyrus is also angry because the North Pole does not have

hamburgers. There are penguin burgers at the North Pole, but nobody wants to eat penguin

burgers. So they are all angry.

July 15:

Original: 小明喜欢看什么电影?小明喜欢看Science Fiction的电影吗?小明喜欢看

Kung-fu的电影吗? Tom Cruise喜欢看Bollywood的电影，Bollywood的电影很好看。他看电

影的时候不吃牛肉，但是他看电影的时候喜欢自拍，他吃猪肉(鸡肉)的时候自拍。今天是

星期五，今天Tom Cruise在Bollywood吗?他不在，今天他在Transyvania，他不在

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Pennsylvania，他在 Transyvania的时候自拍。他想跟谁自拍?他想跟好看的人自拍。谁是好看的人? Johnny Depp是好看的人， 所以Tom Cruise想跟JD自拍。但是JD不要跟TC自拍，因为他是好看的人，跟好看的人自拍要钱，TC没有 钱，他生气，他生JD的气。

Pinyin: Xiǎomíng xǐhuān kàn shénme diànyǐng? Xiǎomíng xǐhuān kàn Science Fiction de diànyǐng ma? Xiǎomíng xǐhuān kàn Kung-fu de diànyǐng ma? Tom Cruise xǐhuān kàn Bollywood de diànyǐng, Bollywood de diànyǐng hěn hǎokàn. Tā kàn diànyǐng de shíhòu bù chī niúròu, dànshì tā kàn diànyǐng de shíhòu xǐhuān zìpāi, tā chī zhūròu (jīròu) de shíhòu zìpāi. Jīntiān shì xīngqí wǔ, jīntiān Tom Cruise zài Bollywood ma? Tā bú zài, jīntiān tā zài Transylvania, tā bú zài Pennsylvania, tā zài Transylvania de shíhòu zìpāi. Tā xiǎng gēn shéi zìpāi? Tā xiǎng gēn hǎokàn de rén zìpāi. Shéi shì hǎokàn de rén? Johnny Depp shì hǎo kàn de rén, suǒyǐ Tom Cruise xiǎng gēn JD zìpāi. Dànshì JD bú yào gēn TC zìpāi, yīnwèi tā shì hǎokàn de rén, gēn hǎokàn de rén zìpāi yào qián, TC méiyǒu qián, tā shēngqì, tā shēng JD de qì.

English: What movies does Xiao Ming [a student] like to watch? Does Xiao Ming like to watch Science Fiction movies? Does Xiao Ming like to watch Kung-fu movies? Tom Cruise likes to watch Bollywood movies. Bollywood movies are very good to watch. He does not eat beef while watching movies, but he likes to take selfies while watching movies. He takes selfies while eating pork/chicken. Today is Friday. Today, is Tom Cruise in Bollywood? He is not there. Today he is in Transylvania. He is not in Pennsylvania. He takes selfies while in Transylvania. Who does he want to take selfies with? Johnny Depp is a good looking person, so Tom Cruise wanted to take a selfie with Johnny Depp. But didn't want to take a selfie with Tom Cruise because he is a good looking person. Good looking people want money for taking selfies. Tom Cruise doesn't have money. He is angry. He is angry at Johnny Depp.

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July 18:

Original: 哪儿有恶心的东西? Cafeteria有恶心的东西。什么是恶心的东西? Granola 不是恶心的东西，Granola是好吃 的东西。 Pancake也不是恶心的东西，Pancake是好吃的 东西。沙拉是不是恶心的东西?不是!但是Cafeteria 的鸡蛋是恶心的东西，我们都不喜欢 Cafeteria的鸡蛋。有一个人喜欢吃恶心的东西，不是Glen Coco喜欢吃恶心的东西，也不是 Barney喜欢吃恶心的东西，是Oscar the Grouch喜欢吃恶心的东西。Oscar the Grouch喜欢吃 什么恶心的东西? Oscar the Grouch不喜欢吃沙拉，因为他说沙拉是恶心的东西，沙拉上有 鸡蛋很恶心。周末的时候，Oscar the Grouch吃了一个沙拉， 沙拉上有鸡蛋，很恶心，所 以星期一他拉肚子了。

Pinyin: Nǎ'er yǒu ěxīn de dōngxī? Cafeteria yǒu ěxīn de dōngxī. Shénme shì ěxīn de dōngxī? Granola bú shì ěxīn de dōngxī,Granola shì hào chī de dōngxī. Pancake yě bùshì ěxīn de dōngxī, Pancake shì hào chī de dōngxī. Shālā shì bú shì ěxīn de dōngxī? Bú shì! Dànshì Cafeteria de jīdàn shì ěxīn de dōngxī, wǒmen dōu bù xǐhuān Cafeteria de jīdàn. Yǒu yīgè rén xǐhuān chī ěxīn de dōngxī, bú shì Glen Coco xǐhuān chī ěxīn de dōngxī, yě bú shì Barney xǐhuān chī ěxīn de dōngxī, shì Oscar the Grouch xǐhuān chī ěxīn de dōngxī. Oscar the Grouch xǐhuān chī shénme ěxīn de dōngxī? Oscar the Grouch bú xǐhuān chī shālā, yīnwèi tā shuō shālā shì ěxīn de dōngxī, shālā shàng yǒu jīdàn hěn ěxīn. Zhōumò de shíhòu, Oscar the Grouch chīle yī gè shālā, shālā shàng yǒu jīdàn, hěn ěxīn, suǒyǐ xīngqí yī tā lā dùzi le.

English: Where are disgusting things? The cafeteria has disgusting things. What is a disgusting thing? Granola is not a disgusting thing. Granola is a good tasting thing. Pancakes are also not disgusting things. Pancakes are good tasting things. Is salad a disgusting thing? It is not! But the cafeteria's eggs are disgusting things. We all dislike the cafeteria's eggs. There

was a person who liked to eat disgusting things. It wasn't Glen Coco who liked to eat disgusting things. Did Oscar the Grouch like to eat disgusting things? Oscar the Grouch did not like to eat salad because he said salad was a disgusting thing. There were eggs on the salad. They were very disgusting, so on Monday he had an upset stomach.

(stories from TPRS listening-speaking class meetings in RP3-RP5 not included here)

APPENDIX C: Mentored Writing Samples

The following photographs represent the writing activities experienced by all ten learners

at the camp during the first two RPs, exemplified by Lydia, Sovi, and Troy Bolton.

Lydia, July 12	Lydia, July 14
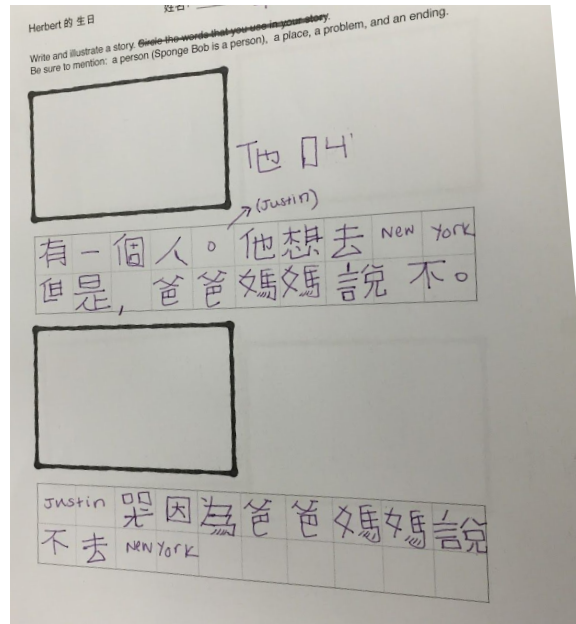
Sovi, July 12	Sovi, July 12
Sovi, July 14	Sovi, July 14

Sovi, July 15	Sovi, July 15

苹果好吃！」

小五跟小五的妹妹吃苹果！

小五要吃汉堡包。但是，他在家没有汉堡包。

小五的妹妹说：汉堡包不好吃！

Troy Bolton, July 12	Troy Bolton, July 12

Guiseppe / Egbert   姓名：_____   甲 写作2-1

Guiseppe 在 North Pole。
Guiseppe 想吃坡萨在

在 North Pole 有 Baba John's。

Guiseppe 在 Baba John's 脑出

Write captions for the illustrations.
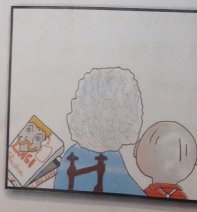
Egbert 哭了！

Egbert 的爸爸妈妈

Egbert 跟 Grmama Ester 吃披…
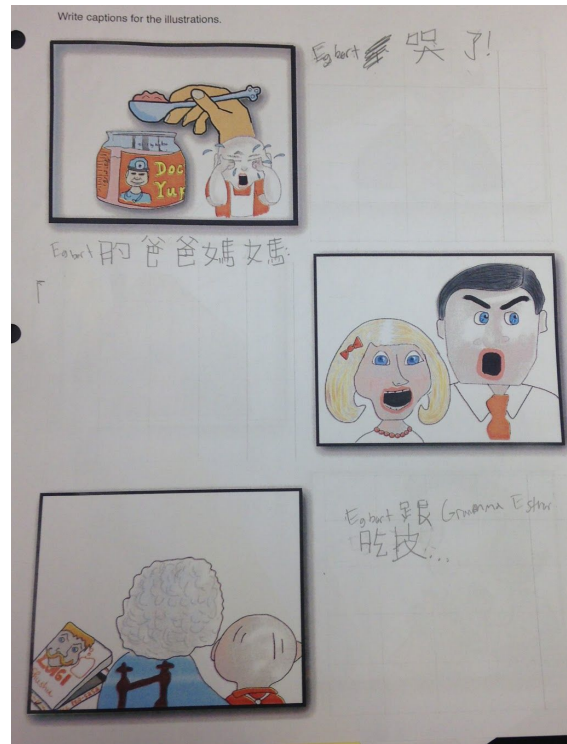
Troy Bolton, July 14	Troy Bolton, July 15
Write and illustrate a story. Be sure to mention: a person (Sponge Bob is a person), a place, a problem, and an ending. 很是麻煩的 小明他不好的 小明小破有心灵。 xinling 在宿舍 老师进来老师說 睡觉! 因为的九节 Fin 9:70.	在 的家 是我旧家 的爸爸是我的爸爸的朋友。 旧 的爸爸生气了我的爸 爸,因为我的爸爸
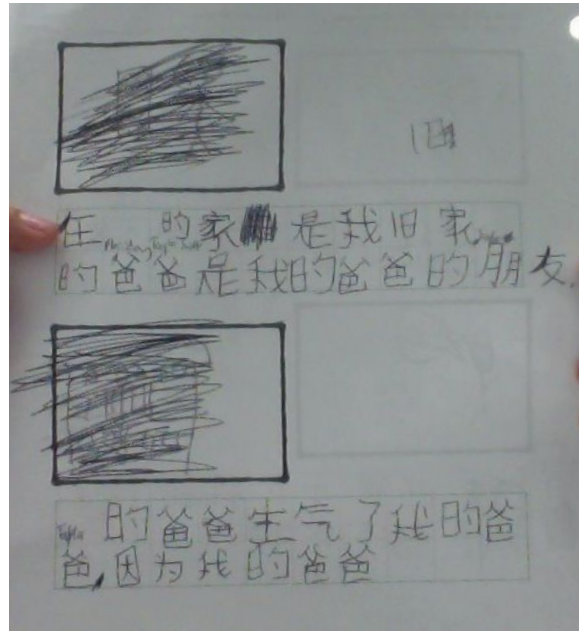
APPENDIX D: 'Traceback' procedures for TC1-TC2 for Lydia, Sovi, and Troy Bolton

Supplementary data is offered here to show how three of the beginning learners may have pieced together the language needed for the first two text corpora (TCs). Traceback procedures (Eskildsen, 2014, 2017; Dabrowska & Lieven, 2005; Vogt & Lieven, 2010) have been performed under a Usage-based framework (e.g. Tomasello, 2003) to verify grammatical *creativity* during early-stage language development. Prior L2 adult (Eskildsen, 2014, 2017) and L1 child (Dabrowska & Lieven, 2005; Vogt & Lieven, 2010) studies have shown that learners in the early stages of language development rely mostly on repeating whole utterances they have heard or said before. Learners also, but less often, perform simple substitutions of single words or short lexical string into utterances they are otherwise repeating from what they heard or said before. In the traceback tables below, the *Closest matches* columns provide a glimpse into the prior exposure the learners could have been utilizing when writing for the test corpus. The *Schemas* columns highlight the relevant exact matches inside each prior heard or read utterance and the utterance produced in the test corpus, along with broader categories that also match (UTT = utterance of unspecified category, REF = referent (e.g. person, food), PRO = process (e.g. action, activity, event), LOC = location, ATTdes = descriptor). The *Operations* columns represent the minimum possible ways of piecing together the material in the *Schemas* column to arrive at the utterance in the *Utterance written* column (REP = verbatim repetition, SUB = substitutions, ADD = add, DROP = drop). As much as possible, the piecing together derivation process was performed in left-to-right fashion, beginning with the first word in the TC's written utterances (the target utterance), and proceeding on to the next lexical item or items until the final word in the target utterance were accounted for in prior experience. The people and sources are: TEA =

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any of a number of teachers in different classrooms; LYD = Lydia; SOV = Sovi; TRO = Troy

Bolton; TXT = text, likely read aloud chorally with classmates and a teacher

Test Corpus 1 (July 13, 2016, ~9:45-9:50am)

Lydia (LYD)	Sovi (SOV)	Troy Bolton (TRO)

TC1: Lydia (LYD)

	Utterance written	Closest matches	Schemas	Operations
1	*Tom Cruise zai Hollywood* 'Tom Cruise was in Hollywood'	(July 12, TEA) *zuotian Tom Cruise zai Hollywood danshi zai Hollywood meiyou bananas* 'yesterday Tom Cruise was in Hollywood but there were no bananas in Hollywood'	[Tom Cruise zai Hollywood]	REP

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2	*ta xiang chi bananas* 'he wanted to eat bananas'	(July 12, TEA) *ta gen shei chi bananas* 'who did he eat bananas with'	[ta 'he/she' + UTTERANCE]	
		(July 12, TEA) *Guagua xiang chi bananas* 'Guagua feels like eating bananas'	[REFERENT *xiang* 'feels like' *chi* 'eating' bananas]	SUB
3	*Hollywood mei you bananas* 'Hollywood didn't have bananas'	(July 12, TEA) *zuotian Tom Cruise zai Hollywood danshi zai Hollywood meiyou bananas* 'yesterday Tom Cruise was in Hollywood but there were no bananas in Hollywood'	[Hollywood *mei you* 'didn't have' bananas]	REP
4	*Chicago you bananas* 'Chicago had bananas'	(July 11, TEA) *zai Chicago you bananas* 'in Chicago there were bananas'	[Chicago *you* 'had' bananas]	REP

5	*Tom Cruise qu Chicago yinwei Chicago you hao bananas* 'Tom Cruise went to Chicago because Chicago had good bananas'	(July 11, LYD) *Tom Cruise qu Chicago* 'Tom Cruise went to Chicago'	[Tom Cruise *qu* 'went' Chicago]	
		(July 13, multiple students) *yinwei Patrick you san ge nv pengyou* 'because Patrick had three girlfriends'	[UTTERANCE *yinwei* 'because' UTT]	ADD
		(July 11, TEA) *Chicago you bananas* 'Chicago had bananas'	[Chicago *you* 'had' bananas]	SUB
		(July 11, TEA) *zai Hollywood you haochi de banana* 'in Hollywood there were good tasting bananas'	[haochi de 'good tasting' bananas]	SUB
6	*zai Batman de jia* 'at Batman's home'	(July 13, TEA) *Squidward zai bu zai Batman de jia* 'was Squidward at or not at Batman's home'	[*zai* 'at' Batman *de jia* 'Batman's house']	REP

7	*Tom Cruise chi bananas gen Angelina Jolie* 'Tom Cruise ate bananas with Angelina Jolie'	(July 12, TEA) *Tom Cruise chi le bu hao chi de banana* 'Tom Cruise ate bad tasting bananas'	[Tom Cruise *chi* 'ate' UTT banana]	DROP
		(July 12, TEA) *Tom Cruise gen Angelina Jolie chi de banana* 'the banana that Tom Cruise ate with Angelina Jolie'	[*gen* 'with' Angelina Jolie]	ADD
8	*Tom Cruise outu yinwei bananas bu hao danshi Angelina Jolie mei you outu* 'Tom Cruise vomited because bananas were not good but Angelina Jolie didn't vomit'	(July 12, TEA) *Tom Cruise outu le* 'Tom Cruise vomited'	[Tom Cruise *outu* 'vomited']	
		(Above, LYD) *Tom Cruise qu Chicago yinwei Chicago you hao bananas* 'Tom Cruise went to Chicago because Chicago had good bananas'	[UTT *yinwei* 'because' UTT]	ADD
		(July 12, TEA) *Chicago de bananas bu hao chi* 'Chicago's bananas were not good tasting'	[bananas *bu* 'not' *hao* 'good']	SUB

	Utterance written	Closest matches	Schemas	Operations
		(July 12, TEA) *danshi Hollywood meiyou bananas* 'but Hollywood didn't have bananas'	[*danshi* 'but REF *meiyou* 'didn't have']	ADD
		(Above, LYD) *Tom Cruise chi bananas gen Angelina Jolie* 'Tom Cruise ate bananas with Angelina Jolie'	[UTT Angelina Jolie]	SUB
		(July 12, TEA) *Grayson mei you outu* 'Grayson didn't vomit'	[REF *meiyou* 'didn't' *outu* 'vomit']	SUB

TC1: Sovi (SOV)

	Utterance written	Closest matches	Schemas	Operations
1	*Squidward mei you nvpengyou* 'Squidward didn't have a girlfriend'	(July 13, TEA) *Squidward mei you nvpengyou* 'Squidward didn't have a girlfriend'	[Squidward *meiyou* 'didn't have' nvpengyou '(a) girlfriend']	REP

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2	*Squidward shengqi* 'Squidward became angry'	(July 13, TEA) *Squidward shengqi* 'Squidward became angry'	[Squidward *shengqi* 'became angry']	REP
3	*Patrick you san ge nv pengyou* 'Patrick had three girlfriends'	(July 13, TEA) *yinwei Patrick you san ge nv pengyou* 'because Patrick had three girlfriends'	[Patrick *you* 'had' *san ge* 'three' *nvpengyou* 'girlfriends']	REP
4	*Squidward zai Bikini Bottom* 'Squidward was at Bikini Bottom'	(July 13, multiple students) *Squidward zai Bikini Bottom* 'Squidward was in Bikini Bottom'	[Squidward *zai* '(was) at' Bikini Bottom]	REP
5	*Squidward bu gaoxing* 'Squidward was not happy'	(July 13, TEA) *weishenme Squidward bu gaoxing* 'why was Squidward unhappy'	[Squidward *bu* 'not' *gaoxing* 'happy']	REP

6	*Patrick ye bu gaoxing yinwei Patrick gen Squidward shuo sange nv pengyou bu hao* 'Patrick was also not happy because Patrick said to Squidward three girlfriends is not good'	(Above, SOV) *Patrick you san ge nv pengyou* 'Patrick had three girlfriends' (July 12, TEA)	[Patrick UTT *you* 'had' *san ge* 'three' *nv pengyou* 'girlfriends']	
		guagua ye bu gaoxing 'Guagua was also unhappy' (July 13, TEA)	[REF *ye* 'also' *bu* 'not' *gaoxing* 'happy']	SUB
		yinwei Patrick gen Squidward shuo 'because Patrick said to Squidward' (July 13, TEA)	[*yinwei* 'because' Patrick *gen* 'with' Squidward *shuo* 'said']	ADD
		Patrick gen Squidward shuo Squidward, you san ge nv pengyou bu hao 'Patrick said to Squidward having three girlfriends is bad'	[Patrick *gen* 'with' Squidward *shuo* 'said' REF *you* 'having' *san ge* 'three' *nv pengyou* 'girlfriends' *bu* 'not' *hao* 'good']	SUB + DROP

7	*Squidward bu sheng Spongebob de qi* 'Squidward wasn't angry at Spongebob'	(July 13, TEA) *Squidward bu sheng Spongebob de qi* 'Squidward didn't get angry at Spongebob'	[Squidward *bu* 'not' *sheng* Spongebob *de qi* 'become angry at Spongebob']	REP
8	*Tom Cruise xiang chi bananas* 'Tom Cruise wanted to eat bananas'	(July 11, multiple students) *Tom Cruise xiang chi banana* 'Tom Cruise wanted to eat a banana'	[Tom Cruise *xiang* 'feels like' *chi* 'eating' banana]	REP
9	*zai Hollywood mei you bananas* 'in Hollywood there were no bananas'	(July 12, TEA) *zuotian Tom Cruise zai Hollywood danshi zai Hollywood meiyou bananas* 'yesterday Tom Cruise was in Hollywood but there were no bananas in Hollywood'	[UTT *zai* 'at' Hollywood *meiyou* 'didn't have' banana]	REP

10	*Tom Cruise qu Chicago* 'Tom Cruise went to Chicago'	(July 11, multiple students) *Tom Cruise qu Chicago* 'Tom Cruise went to Chicago'	[Tom Cruise *qu* 'went' Chicago]	REP
11	*ta zai Batman de (unclear)* 'at Batman's (unclear)'	(July 12, TEA) *Tom Cruise zai Batman de jia outu le* 'Tom Cruise vomited in Batman's home'	[zai 'at' Batman de 'Batman's']	REP
12	*Tom Cruise mei you bananas* 'Tom Cruise didn't have bananas'	(July 11, TEA) *Tom Cruise xiang chi bananas danshi mei you bananas* 'Tom Cruise wanted to eat bananas but he didn't have any bananas'	[Tom Cruise UTT meiyou bananas]	DROP

13	*Tom Cruise*	(Above, SOV) *Tom Cruise mei you bananas* 'Tom Cruise didn't have bananas'	[Tom Cruise UTT]	REP

TC1: Troy Bolton (TRO)

	Utterance written	**Closest matches**	**Schemas**	**Operations**
1	*Patrick Star xiang chur pizza* "	(July 13, TEA) *Patrick you nvpengyou* " (July 11, TEA) *Tom Cruise xiang chi banana haishi Tom Cruise xiang chi pisa* "	[Patrick (Star)] [REF *xiang* 'feels like' *chi* 'eating' pisa/pizza]	SUB
2	*Squidward bu xiang chur pizza* "	(July 11, TEA) *Tom Cruise bu xiang chi pisa ma* " (July 13, TEA) *Squidward bu gaoxing* "	[REF *bu* 'doesn't' *xiang* 'feel like' *chi* 'eating' pizza] [Squidward *bu* 'not' UTT]	SUB

3	*Squidward bu ren* "	(Above, TRO) *Squidward bu xiang chur pizza* "	[Squidward *bu* 'not']	
		(July 13, TEA) *shengqi de ren shi shei* "	[UTT *ren* 'person']	SUB
4	*Patrick chur pizza* "	(July 13, TEA) *Patrick you nvpengyou* "	[Patrick UTT]	
		(July 11, TEA) *Tom Cruise xiang chi banana haishi Tom Cruise xiang chi pisa* "	[UTT *chi* 'ate' pizza]	SUB
5	*Squidward otu da [/de?] pizza yao [/hao?] chur* "	(Above, TRO) *Squidward bu xiang chur pizza* "	[Squidward UTT pizza]	
		(July 12, TEA) *Tom Cruise outu le* 'Tom Cruise vomited'	[REF *outu* 'vomited']	SUB
		(July 12, TEA) *Tom Cruise chi le bu hao chi de banana* "	[REF *de* ATTRIBUTE REF]	SUB
		(July 12, TEA) *ta chi de banana hao bu hao chi* "	[REF *hao chi* 'good tasting']	SUB

6	*Patrick kū enway Patrick bu yao chur da [/de?] pizza* "	(Above, TRO) *Patrick chur pizza* "	[Patrick UTT pizza]	
		(July 11, TEA) *Giuseppe ku yinwei ta bu xiang chi bu hao chi de pisa* "	[REF ku 'cried' yinwei 'because' REF bu 'didn't' PROCESS chi 'eat' pizza]	SUB + DROP
		(missing: *da* 'big' *pisa*/pizza)		
7	*Patrick qu Spongebob's house da [/ta?] bu ku le* "	(Above, TRO) *Patrick kū enway Patrick bu yao chur da [/de?] pizza* "	[Patrick UTT]	DROP
		(July 12, TEA) *Spongebob qu le Batman de jia* "	[REF qu le 'went' Batman de 'Batman's' jia 'home'	
		(July 12, TEA) *ta bu ku le* "		
8	*Spongebob xiang chur da [/de?] pizza* "	(Above, TRO) *Patrick qu Spongebob's house da [/ta?] bu ku le* "	[Spongebob]	
		(Above, TRO) *Patrick Star xiang chur pizza* "	[REF xiang 'feels like' chi 'eating' pizza]	SUB
		(July 11, TEA) *Giuseppe bu xiang chi bu hao chi de pisa* "	[*de* (genitive) pizza]	SUB

9	*Spongebob otu da pizza* "	(Above, TRO) *Spongebob xiang chur da [/de?] pizza* "	[Spongebob]	
		(Above, TRO) *Squidward otu da [/de?] pizza yao [/hao?] chur* "	[*otu* 'vomited' *da [/de?]* (genitive) *pizza*]	SUB
10	*Spongebob bu hao chur da pizza* "	(Above, TRO) *Spongebob otu da pizza* "	[Spongebob]	
		(July 12, TEA) *Tom Cruise chi le bu hao chi de banana* "	[REF UTT bu 'not' hao chi de 'good tasting']	SUB
		(Above, TRO) *Spongebob otu da pizza* "	[*da [/de?]* (genitive) *pizza*]	
11	*Patrick ku le* "	(Above, TRO) *Patrick qu Spongebob's house da [/ta?] bu ku le* "	[Patrick UTT ku le 'cried']	DROP

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12	*Patrick Qu Patrick house yao bu ku le* "	(Above, TRO) *Patrick qu Spongebob's house da [/ta?] bu ku le* "	[Patrick qu 'went' REF house UTT bu 'didn't' ku 'cry' le 'any more']	
		(July 13, TEA) *yao qu* "	[yao 'wanted' PRO]	SUB
13	Fin.	(missing: 'fin')		

Test Corpus 2 (July 18, 2016, ~9:45-9:50am)

Lydia (LYD)	Sovi (SOV)	Troy Bolton (TRO)
(handwritten text)	*(handwritten text)*	*(handwritten text)*

TC2: Lydia (LYD)

	Utterance written	Closest matches	Schemas	Operations
1	*ni xihuan chi pizza* 'you like to eat pizza'	*(July 18, TEA) ni xihuan bu xihuan chi exin de shala* 'do you like to eat disgusting salad or not?'	[*ni* 'you' *xihuan* 'like' UTT *chi* 'eat' REF]	
				SUB
		(July 14, KRI) ta xiang chi pisa 'he wants to eat pizza'	[REF PRO *chi* 'eat' pizza]	
2	*yinwei pizza how chur* 'because pizza is good tasting	*(July 12, TXT) Egbert bu xiang chi pisa yinwei pisa bu hao chi* 'Egbert doesn't want to eat pizza because pizza is not good tasting'	[*yinwei* 'because' *pisa*/pizza *bu* 'isn't' *hao chi* 'good tasting]	DROP

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3	*zoutian Larry tu wo de pizza* 'yesterday Larry threw up my pizza'	(July 15, TEA) *zuotian ta bu xihuan* 'yesterday he didn't like it'	[*zuotian* 'yesterday' UTT]	
		(missing: Larry)	[REF *outu*	SUB +
		(July 18, TEA) *wo outu danshi Grouch bu outu* 'I vomited but Grouch didn't vomit'	'vomited'] [*wo* 'I']	SUB
		(July 12, TEA*)* *tamen ye chi Grandma Esther de pisa* 'they also ate Grandma Esther's pizza'	[UTT REF *de* (genitive) *pisa*/pizza]	ADD + SUB
		(missing: [*outu* 'vomited' REF] as transitive verb)		
4	*jintian wo shengchi yinwei Larry tu wo de pizza* 'today I'm angry because Larry threw up my pizza'	(July 18, TEA) *jintian Oscar the Grouch la duzi* 'today Oscar the Grouch had an upset stomach'	[*jintian* 'today' UTT]	SUB
		(July 14, KRI) *wo sheng qi* 'I am angry'	[*wo* 'I' *shengqi* 'became angry']	SUB
		(above, LYD) *ni xihuan chur*	[UTT *yinwei*	

		pizza. yinwei pizza how chur 'you like to eat pizza. Because pizza is good tasting' (above, LYD) *Larry tu wo de pizza* 'Larry threw up my pizza'	'because' UTT] [Larry *tu* 'vomited' *wo de* 'my' pizza]	SUB
5	*suyi Larry mayo punyo* 'so Larry has no friends'	(July 18, TEA) yi*nwei ta shi Grouch suoyi Grouch xihuan chi exin de dongxi* 'because he is a Grouch therefore a Grouch likes to eat disgusting things' (above, LYD) *yinwei Larry tu wo de pizza* 'because Larry vomited up my pizza' (July 13, TEA) *ta hen shengqi yinwei ta meiyou pengyou* 'he was very angry because he didn't have friends'	[*suoyi* 'because' UTT] [Larry UTT] [REF meiyou pengyou]	SUB SUB
6	*danshi wo you dua punyo* 'but I have *many friends'	(July 15, TEA) *wo meiyou qian danshi wo hen xiang gen ni zipai* 'I don't have money but I really want to take a selfie with you'	[*danshi* 'but' *wo* 'I' UTT] [*wo* 'I' *you* 'have'	SUB

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		(July 15, TXT) *wo you mian* 'I have noodles'	REF] [REF *you* 'have'	SUB
		(July 15, TXT) *ta de jia you hen duo dianying* 'his home has very many movies'	*hen* 'many' *duo* 'many' REF] [*pengyou* 'friend']	SUB
		(July 15, TXT) *ta xihuan gen pengyou kan dianying* 'he likes to with friends watch movies'		
7	*jintian hen lei* 'today (I'm) very tired'	(above, LYD) *jintian wo shengqi* 'today I am angry'	[*jintian* 'today' UTT]	
		(July 15, GRP) *wo hen lei* 'I'm very tired'	[REF *hen* '(am)	SUB
		(July 14, TXT) *wei shenme bu xiang chi dimsum* 'why (drop:he) not want to eat dimsum'	very' *lei* 'tired'] [REFdrop]	DROP ("pro-drop")
8	*do wode punyo shi ku* 'All my friends are cool'	(July 18, TEA) *zai Sesame Street de shala dou exin* 'The salads at Sesame Street are all disgusting'	[*dou* 'all' UTT]	
		(July 14, TEA) *Johnny Depp shi wo nan pengyou de pengyou*	[UTT *wo de* 'my' *nan* 'boy' pengyou 'friend']	SUB + DROP

	bu shi wo de nan pengyou 'Johnny Depp is my boyfriend's friend, not my boyfriend'		SUB
	(July 15, TXT) *ta de pengyou shi Craig* 'his friend is Craig'	[REF de pengyou shi UTT]	SUB
	(July 14, TXT) *Herbert ku yinwei ta de pengyou sheng ta de qi* 'Herbert cried because his friend was angry with him'	[REF ku]	
9	*jintian wo otu yinwei chur exian de chala* 'today I vomited because (I) ate disgusting salad'	(above, LYD) *jintian hen lei* 'today (drop: I) am very tired'	[*jintian* 'today' UTT]	
		(July 18, TEA) *wo outu danshi Grouch bu outu* 'I vomited but Grouch didn't vomit'	[*wo* 'I' *outu* 'vomited' UTT]	SUB
		(above, LYD) *yinwei Larry tu wo de pizza* 'because Larry vomited up my pizza'	[*yinwei* 'because' UTT]	SUB + DROP
		(July 18, TEA) *zhoumo chi le shala* 'weekend (I) ate salad'	[REFdrop *chi le* 'ate' REF]	SUB
		(July 18, TEA) *danshi shei*		

	xihuan chi exin de shala 'but who likes to eat disgusting salad'	[PRO *exin de* 'disgusting' *shala* 'salad']	SUB
10	*Oscar ye chur exian de chala* 'Oscar also ate disgusting salad'	(July 18, TEA) *weishenme Oscar chi exin de shala* 'why did Oscar like to eat disgusting salad'	[Oscar *chi* 'ate' *exin de* 'disgusting' *shala* 'salad']	
		(July 12, TXT) *tamen ye chi Grandma Esther de pisa* 'they also ate Grandma Esther's pizza'	[REF *ye* 'also' *chi* 'ate' REF]	SUB

TC2: Sovi (SOV)

	Utterance written	Closest matches	Schemas	Operations
1	*wo jintian xihuan jidan* 'today I like eggs'	*(July 13, CYN) women jintian yao qu zhenzhugang* 'today we will go to Pearl Harbor'	[REF *jintian* 'today' PRO UTT]	DROP
		(July 11, AMY) wo yao ma 'I want a horse'	[*wo* 'I' PRO REF]	SUB
		(July 18, TEA) danshi shei xihuan chi exin de shala 'but who likes to eat disgusting salad'	[UTT REF *xihuan* 'likes' PRO REF]	ADD
		(July 18, TEA) 'shala shang you cafeteria de jidan 'on the salad there are cafeteria eggs'	[UTT *jidan* 'chicken egg(s)']	SUB
2	*wo hen xihuan jidan* 'I really like eggs'	*(July 14, TEA) wo hen xihuan Johnny Depp* 'I really like Johnny Depp'	[*wo* 'I' hen 'really/very' *xihuan* 'like' REF]	
		(Above, SOV) wo jintian xihuan jidan 'today I like eggs'	[UTT *jidan* 'chicken egg(s)']	SUB

3	*yinwei wo chi duo de jin dan* 'because I ate many eggs'	*(July 15, TEA) yinwei wo shi laoshi* 'because I am a teacher'	[*yinwei* 'because' *wo* 'I' PRO REF]	
		(July 18, TEA) wo chi exin de dongxi de shihou wo outu 'When I eat disgusting things I throw up'	[wo chi REF UTT]	SUB
		(July 18, TEA) hen duo ren shuo McDonald's de dongxi bu exin 'a lot of people said McDondald's's things are not disgusting*'	[ATTadv duo REF UTT]	SUB
		(July 18, TEA) you mei you hao chi de jidan 'were there or were there not good tasting eggs'	[ATTdes PRO REF de jidan]	SUB
4	*wo ye xihuan chi ji ro* 'I also like to eat chicken'	*(above, SOV) wo hen xihuan jidan* 'I really like eggs'	[*wo* 'I' ATTadv *xihuan* REF]	
		(July 15, TEA) Tom Cruise ye xihuan chi zhurou 'Tom Cruise also likes to eat pork'	[REF *ye* 'also' *xihuan* 'like(s)' *chi* 'to eat' REF]	SUB
		(July 15, KRI) zai Rome de pengyou xiang chi jirou 'the friends in Rome wanted to eat chicken'	[REF PRO *chi* 'eat' *jirou* 'chicken meat']	SUB

5	*wo ye xihuan kan dianying* 'I also like to watch movies'	*(above, SOV) wo ye xihuan chi ji ro* 'I also like to eat chicken'	[*wo* 'I' *ye* 'also' *xihuan* 'like' PRO REF]	
		(July 15, TXT) Craig kan dianying de shihou chi le niurou mian 'When Craig was watching the movie, he ate beef noodles'	[REF *kan* 'watch' *dianying* 'movie']	SUB
6	*zuotian qi Bishop Museum* 'yesterday (drop:I/we) went to Biship Museum'	*(July 14, TEA) zuotian qu le (location) ma* 'yesterday did you go to (location)'	[*zuotian* 'yesterday' *qu le* 'went' LOC Q]	
		(July 13, SOV) Tom Cruise qu Chicago 'Tom Cruise went to Chicago'	[REF *qu* 'went' LOC]	SUB + DROP
7	*Bishop Museum hai hao yinwei wo hen lei le* 'Bishop Museum was just ok because I was very tired'	*(not captured) hai hao* 'just ok'	[*hai hao* 'just ok']	
		(above, SOV) wo hen xihuan jidan yinwei wo chi duo de jin dan 'I really like to eat eggs because I ate many eggs'	[UTT *yinwei* 'because' UTT]	ADD
		(July 15, GRP) wo hen lei 'I'm very tired'	[*wo* 'I' *hen* '(am) very' *lei* 'tired']	SUB
		(July 18, TEA) tai lei le '(drop:you/we) are too tired CRS'	[UTT 'too' *lei le* 'tired']	SUB

8	*laoshi shuo ta xihuan Bishop Museum* 'the teacher said he/she likes Bishop Museum'	*(July 14, JIA) (surname) laoshi shuo Peeta bu hao kan* 'Teacher (surnme) says Peeta is not good looking'	[NAME *laoshi* 'teacher' *shuo* 'said' UTT]	SUB
		(July 18, TEA) ta xihuan chi exin de shala 'he likes to eat disgusting salads'	[REF *xihuan* 'likes' UTT]	
9	*wo ye shou wo xihuan Bishop Museum* 'I also said I like Bishop Museum'	*(above, SOV) wo ye xihuan kan dianying* 'I also like to watch movies'	[*wo* 'I' *ye* 'also' PRO UTT]	
		(July 15, TEA) Tom Cruise bu shi gen Angelina Jolie zipai yinwei Angelina shuo wo bu yao 'Tom Cruise did not take a selfie with Angelina Jolie because Angelina said I don't want to'	[UTT REF *shuo* 'said' *wo* 'I' NEG PRO]	SUB
		(above, SOV) laoshi shuo ta xihuan Bishop Museum 'the teacher said he/she likes Bishop Museum'	[REF *shuo* 'said' REF *xihuan* 'like' Bishop Museum]	SUB

10	*jiro hen hao chi* 'chicken is good tasting'	*(July 15, TXT) jintian de mian hen hao chi* 'today's noodles are very good tasting'	[REF *hen* 'very' *hao chi* 'good tasting']	
		(July 15, KRI) zai Rome de pengyou xiang chi jirou 'the friends in Rome wanted to eat chicken'	[UTT PRO jirou 'chicken meat']	SUB
11	*ni ye xihuan jiro ma* 'do you also like chicken'	*(July 18, TEA) ni ye xihuan* 'you also like'	[*ni* 'you' *ye* 'also' *xihuan* 'like']	
		(above, SOV) wo ye shou wo xihuan Location Z 'I also said I like Location Z'	[UTT REF *xihuan* 'like' REF]	
		(above, SOV) jiro hen hao chi 'chicken is good tasting'	[*jiro* 'chicken meat']	SUB

12	*zoutian wo chu le jiro le* 'yesterday I ate chicken meat'	*(above, SOV) zuotian qi (location)* 'yesterday (drop:I/we) went to (location Z)'	[*zoutian* 'yesterday' UTT]	
		(above, SOV) yinwei wo chi duo de jin dan 'because I ate many eggs'	[COD *wo* 'I' *chi* 'eat' REF]	SUB
		(July 15, TXT) Craig kan dianying de shihou chi le niurou mian 'when Craig was watching the movie, he ate beef noodles'	[UTT REFdrop *chi le* 'ate' REF]	SUB
		(above, SOV) (location Z) hai hao yinwei wo hen lei le '(location Z) was just ok because I was very tired'	[UTT *le* (currently relevant state)]	ADD
13	*wo xihuan ni* 'I like you'	*(Above, SOV) wo ye shou wo xihuan Location Z* 'I also said I like Location Z'	[UTT *wo* 'I' *xihuan* 'like' REF]	
		(Above, SOV) ni ye xihuan jiro ma 'do you also like chicken'	[*ni* 'you']	SUB
14	*bu ji dao* 'I don't know'	*(July 18, TEA) bu zhidao* '(I) don't know'	[bu zhi dao]	REP

	Utterance written	Closest matches	Schemas	Operations
1	*Xiao Ming bu xiang chi shala* "	(July 15, TEA) *xiaoming xihuan kan dianying* 'Xiao Ming (name) likes to watch movies'	[Xiao Ming (name) PRO PRO REF]	
		(July 11, TEA) *Tom Cruise bu xiang chi pisa ma* 'Tom Cruise doesn't feel like eating pizza'	[REF *xiang* 'feels like' *chi* 'eating' REF]	SUB
		(July 18, TEA) *Oscar the Grouch bu xihuan chi hao chi de shala* 'Oscar the Grouch doesn't like to eat bad tasting salad'	[shala 'salad']	SUB
2	*Ta bu xiangchi shala ein wei chi like si* 'he didn't feel like eating salad because eating was like dying'	(July 11, TEA) *ta bu xiang chi Burger King* 'he doesn't like to eat Burger King'	[ta 'he' bu 'didn't' xiang 'feel like' chi 'eating' REF]	
		(Above, TRO) *Xiao Ming bu xiang chi shala* 'Xiao Ming doesn't feel like eating salad'	[UTT shala 'salad']	SUB

3	*Mayo time zai Waikiki beach ein wei do aquarium* 'There was no time at Waikiki because it was all aquarium'	(July 12, TEA) *zuotian Tom Cruise zai Hollywood danshi zai Hollywood meiyou bananas* 'yesterday Tom Cruise was in Hollywood but there were no bananas in Hollywood'	[UTT *meiyou* 'didn't have' REF], [*zai* 'at' LOC]	
		(Above, TRO) *Ta bu xiangchi shala ein wei chi like si* 'he didn't feel like eating salad because eating was like dying'	[UTT *yinwei* 'because']	
		(July 15, TEA) yinwei wo shi laoshi, dui, laoshi dou meiyou qian "	[UTT *dou* 'all' UTT]	
4	*Aquarium mama huhu einwei Aquarium wuliao* 'the aquarium was just ok because the Aquarium was boring'	(July 15, TEA) mamahuhu 'just ok'	'[*mamahuhu* 'just ok']	
		(Above, TRO) *Mayo time zai Waikiki beach ein wei do aquarium* 'There was no time at Waikiki because it was all aquarium'	[UTT *yinwei* 'because' LOC UTT]	ADD
		(July 15, card, likely seen while writing for this test corpus: [无聊 wuliáO bored , boring], not found in MC1-2)	[*wuliao* 'boring']	SUB

5	*huoshan talk wu liao einwei hen long* 'volcano talk is boring because it's very long'	(July 15, card, likely seen while writing for this test corpus: [火山 huoSHAN = volcano] not found in MC1-2)	[*huoshan* 'volcano']	
		(Above, TRO) *Aquarium mama huhu einwei Aquarium wuliao* "	[ATTdes *yinwei* 'because' UTT]	ADD
		(July 15, TXT) *jintian de mian hen hao chi* 'today's noodles are very good tasting'	[REF *hen* 'very' ATTdes]	SUB
6	*Xing Xing show you Yisi einwei bubbly room* 'star show was interesting because of the bubbly room'	(July 15, card, likely seen while writing for this test corpus: [星星 XINGXING = star] not found in MC1-2)	[*xingxing* 'star']	
		(July 15, card, possibly seen while writing for this test corpus: [有意思 you Yisi = interesting] not found in MC1-2)	[*youyisi* 'interesting' *(note: not segmented)*]	ADD
		(Above, TRO) *huoshan talk wu liao einwei hen long* 'volcano talk is boring because it's very long'	[UTT *yinwei* 'because' UTT]	ADD

APPENDIX E: TC5 Vocabulary Reference List and Writing Samples

Each student used his or her own copy of this list for the final story-writing task on July 27, 1pm. Students were limited to approximately one hour to complete their writing, and several teachers walked around the room to ensure the students did not use any other resources besides the two pages provided here:

Page 1

bǐ: 比	guì: 贵	mǎ: 马
bǐjīní: 比基尼	guò: 过	ma: 吗
búyòng: 不用	hànbǎobāo: 汉堡包	máfán: 麻烦
chī: 吃	hǎo: 好	méiyǒu: 没有
dà: 大	jǐ: 几	nán: 男
dànshì: 但是	jī: 鸡	nǎr/nǎlǐ: 哪儿
de: 的	jiā: 家	nǐ: 你
de shíhòu: 的时候	jiào: 叫	níu: 牛
diànnǎo: 电脑	jīdàn: 鸡蛋	níuròu: 牛肉
diànshì: 电视	jīntiān: 今天	nǚ: 女
diànyǐngyuàn: 电影院	jīròu: 鸡肉	pàng: 胖
diǎnzhōng: 点钟	jiù: 旧	pàiduì: 派对
dōngxī: 东西	kāi: 开	péngyǒu: 朋友
dōu: 都	kàn: 看	píngguǒ: 苹果
duō: 多	kù: 酷	qián: 钱
ěxīn: 噁心	kū: 哭	qǐng: 请
fēifǎ: 非法	lādùzi: 拉肚子	qù: 去
gāoxìng: 高兴	le: 了	rén: 人
gēn: 跟	liǎng ge: 两个	ròu：肉
	lǜsè de: 绿色的	shālā: 沙拉
	mà: 骂	shéi: 谁
		shēngqì: 生气

甲 vocabulary list 2016

Page 2

shēngrì: 生日	xióngmāo: 熊猫
shénme: 什么	xǐwǎn: 洗碗
shénme	xǐwǎnjī: 洗碗机
shì: 是	yào: 要
shuō: 说	yě: 也
suīrán: 虽然	yīfú: 衣服
suǒyǐ: 所以	yīnwèi: 因为
tā: 他	yǒu: 有
tā: 她	yuè: 月
tiàowǔ: 跳舞	zài: 在
wǎnfàn: 晚饭	zǎofàn: 早饭
wèishénme: 为什么	zhè: 这
wǒ: 我	zhōngfàn: 中饭
xǐ: 洗	zhōumò: 周末
xiǎng: 想	zhū: 猪
xiǎo: 小	zìpāi: 自拍
xǐhuān: 喜欢	zuò: 做
xīn: 新	zuótiān: 昨天
xìng: 姓	
xīngqī: 星期	
xīníu: 犀牛	

甲 vocabulary list 2016

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Lydia, page 1

昨天 George 吃 PIZZA 因 为 他 很 喜
欢 披萨 Giuseppe 在 Rome。他 是 George 的 朋
友。他 喜 欢 吃 鸡 肉 但 是 George
不 想 吃 鸡 George 也 有 朋 友 在
China。叫 A-san。A-san 喜 欢 吃 dim sum。
Giuseppe 很 生 了 的 气 所 以 George
哭 了 A-san 请 的 George 吃 dim sum 跟 他。
但 是 George 不 想 吃 dim sum。George 想 吃
披萨 A-san 也 很 生 George 的 气 George 很

Lydia, page 2

不 高 兴 因 为 George 的 两 个 朋 友
很 生 他 的 气。George 的 朋 友 叫
叫 Wendy 跟 他 说 "今 天 是 我
的 生 日 你 要 吃 披萨 吃 披
萨。George 很 高 兴 了 因 为 他
吃 披 萨 跟 他 的 朋 友。

Zuótiān George chī pizza yīnwèi tā hěn xǐhuān pīsà.
    'Yesterday George ate pizza because he really likes pizza'
Giuseppe zài Rome.
    'Giuseppe was in Rome'
Tā shì George de péngyǒu.
    'He was George's friend'
Tā xǐhuān chī jīròu dànshì George bù xiǎng chī jī.
    'He liked to eat chicken but George didn't feel like eating chicken'
Giuseppe hěn shēng George de qì suǒyǐ George kū le.
    'Giuseppe was angry at George so George cried'
George yě yǒu péngyǒu zài China.
    'George also had a friend in China'
Jiào A-san.
    'called A-San'
A-san xǐhuān chī dimsum.
    'A-San liked to eat dimsum'
A-san qǐng de George chī dimsum gēn tā, dànshì George bù xiǎng chī dimsum.
    'A-San treated George to eat dimsum with him, but George didn't feel like eating dimsum'
George xiǎng chī pīsà.
    'George felt like eating pizza'
A-san yě hěn shēng George de qì.
    'A-San also became angry at George'
George hěn-

-bù gāoxìng yīnwèi George de liǎng gè péngyǒu hěn shēng tā de qì.
    'George was very unhappy because George's two friends became very angry at him'
George de péngyǒu jiào Wendy.
    'George's friend was called Wendy'
Gēn tā shuō jīntiān shì wǒ de shēngrì.
    'said to him today is my birthday'
Nǐ yào chī pīsà, kǒu [: Chī] pīsà.
    'you want to eat pizza'
George hěn gāoxìng le yīnwèi tā chī pīsà gēn tā de péngyǒu.
    'George was now very happy because he ate pizza with his friend'

是一个牛。林星期一他吃
一个汉堡包。星期二他吃
一个汉堡包跟两个沙拉
星期三他吃一个汉堡包
跟两个沙拉跟三鸡肉包
子。星期四他吃一个汉堡
包跟两个沙拉跟三鸡肉
包子跟四个小苹。

Shì yī gè niú.
　'it/there was a cow'
Xīngqí yī tā chī yīgè hànbǎobāo.
　'Monday he ate a hamburger'
Xīngqí'èr tā chī yī gè gēn liǎng gè shālā.
　'Tuesday he ate a hamburger with two salads'
Xīngqísān tā chī yīgè hànbǎobāo gēn liǎng gè shālā gēn sān jīròu bāozi.
　'Wednesday he ate a hamburger with two salads with three chicken buns'
Xīngqísì tā chī yīgè hànbǎobāo gēn liǎng gè shālā gēn sān jīròu bāo zǐ gēn sì gè xiǎo píng.
　'Thursday he ate a hamburger with two salads with three chicken buns with four Xiao Pings'

星期一有两个人。一个人
是 PANDARELLA 一个人是 HERBERT 要吃
汉堡包但是 PANDARELLA 要吃苹果。
PANDARELLA 跟 HERBERT 说你为什么不想
吃苹果? HERBERT 跟 PANDARELLA 说因为我
想苹果噁心。PANDARELLA 很生气因
为她喜欢苹果。所以 PANDARELLA 去了
她的朋友的家她的朋友
是 CINDERELLA 今天是 CINDERELLA 的生 CINDERELLA 在

Xīngqí yī yǒu liǎng gèrén.
  'On Monday there were two people'
Yīgè rén shì Pandarella.
  'One person was Pandarella'
Yīgè rén shì Herbert.
  'One person was Herbert'
Herbert yào chī hànbǎobāo, dànshì Pandarella yào chī píngguǒ.
  'Herbert wanted to eat hamburgers, but Pandarella wanted to eat apples'
Pandarella gēn Herbert shuō nǐ wèishéme bùxiǎng chī píngguǒ?
  'Pandarella said to Herbert: Why don't you want to eat apples?'
Herbert gēn Pandarella shuō yīnwèi wǒ xiǎng píngguǒ ěxīn.
  'Herbert said to Pandarella: Because I think apples are disgusting'
Pandarella hěn shēngqì yīnwèi tā xǐhuān píngguǒ.
  'Pandarella was very angry because she liked apples'
Suǒyǐ Pandarella qù le tā de péngyǒu de jiā.
  'So Pandarella went to her friend's house'
Tā de péngyǒu shì Cinderella.
  'Her friend was Cinderella'
Jīntiān shì Cinderella de shēngrì.
  'Today was Cinderella's birthday'
Cinderella zài-
  (see continued text)

她的家开的派对。PANDARELLA 去 CINDERELLA
的派对 CINDERELLA 跟 PANDARELLA 说我要苹
果。PANDARELLA 跟 CINDERELLA 说我也要吃苹
果。CINDERELLA 说不是我不要苹果。
我要苹果电脑 PANDARELLA 很不高
兴因为她的两个朋友都
不要吃苹果 PANDARELLA 很喜欢绿
色的苹果。所以 PANDARELLA 去她
的家 PANDARELLA 的爸爸妈妈在家。

-tā de jiā kāi de pàiduì. (see previous text)
  'Cinderella hosted a party at her house'
Pandarella qù Cinderella de pàiduì.
  'Pandarella went to Cinderella's party'
Cinderella gēn Pandarella shuō wǒ yào píngguǒ.
  'Cinderella said to Pandarella: I want an apple'
Pandarella gēn Cinderella shuō wǒ yě yào chī píngguǒ.
  'Pandarella said to Cinderella: I also want to eat an apple'
Cinderella shuō bùshì.
  'Cinderella said: no'
Wǒ bùyào chī píngguǒ.
  'I don't want to eat an apple'
Wǒ yào píngguǒ diànnǎo.
  'I want an apple computer'
Pandarella hěn bù gāoxìng yīnwèi tā de liǎng gè péngyǒu dōu bùyào chī píngguǒ.
  'Pandarella was very unhappy because her two friends both did not want to eat apples'
Pandarella hěn xǐhuān lǜsè de píngguǒ.
  'Pandarella really liked green apples'
Suǒyǐ Pandarella qù tā de jiā.
  'So Pandarella went to her house'
Pandarella de bàba māmā zài jiā.
  'Pandarella's parents were at home'

妈妈跟 PANDA-BELLA 说你为什么不
高兴 PANDA-BELLA 跟妈妈说因为我
没有苹果.我很喜欢苹果
妈妈说我跟你的爸爸买
了很多苹果.我们给你都
的苹果.好不好? PANDA-BELLA 跟妈妈
说好. PANDA-BELLA 吃了都的苹果. PANDA-BELLA
很高兴但是她有一个麻
烦.她吃一万苹果!她想呕

吐!

Māmā gēn Pandarella shuō: Nǐ wèishéme bù gāoxìng?
　'Mother said to Pandarella: Why are you unhappy?'
Pandarella gēn māmā shuō: Yīnwèi wǒ méiyǒu píngguǒ.
　"Pandarella said to Mother: Because I don't have an apple'
Wǒ hěn xǐhuān píngguǒ.
　'I really like apples'
Māmā shuō: Wǒ gēn nǐ de bàba mǎi le hěnduō píngguǒ.
　'Mother said: I bought a lot of apples with your father'
Wǒmen gěi nǐ dōu de píngguǒ.
　'We give you all of the apples'
Hǎo bù hǎo?
　'(is that) good or not?'
Pandarella gēn māmā shuō: Hǎo!
　'Pandarella said to Mother: good!'
Pandarella chī le dōu de píngguǒ.
　'Pandarella ate all of the apples'
Pandarella hěn gāoxìng dànshì tā yǒu yīgè máfan.
　'Pandarella was happy but she had a problem'
Tā chī yī wàn píngguǒ!
　'She ate ten thousand apples'
Tā xiǎng ǒu-
　(see continued text)

tù! (see previous text)
　'She wanted to vomit!'

Troy Bolton, page 1

苹果比 PC 好．PC 是麻烦
因为，PC 不．我去苹果
．在苹果，我买两个
苹果的电视．我去我的
家，但是没有苹果的电
视．很不好．我哭因为
没有电果．我叫小明．
我喜欢 Startalk 因为 Startalk 是小
我们知道很．我高兴．

Troy Bolton, page 2

因为我买新的衣服．我
不喜欢熊猫因为熊猫是
不好看．我看牛．我是
一个人．但是，我不
喜欢多人．我很累．我
喜欢吃牛肉包子．我想
呕吐因为，我很累．但
是，没有牛肉．我想去
派对．我生气因为我累
F.N.

Píngguǒ bǐ PC hǎo.
'Apple is better than PC'
PC shì máfan yīnwèi, PC bù.
'PC is annoying because, PC is not-'
Wǒ qù píngguǒ.
'I went to Apple'
Zài píngguǒ, wǒ mǎi liǎng gè píngguǒ de diànshì.
'At Apple, I bought two Apple TVs'
Wǒ qù wǒ de jiā, dànshì méiyǒu píngguǒ de diànshì.
'I went to my house, but there weren't (any) Apple TVs'
Hěn bù hǎo.
'(It was) really bad'
Wǒ kū yīnwèi méiyǒu diàn guǒ.
'I cried because there was no [computer]'
Wǒ jiào xiǎomíng.
'I am called'
Wǒ xǐhuān Startalk.
'I like Startalk'
Yīnwèi Startalk shì xiǎo.
'Because Startalk is small'
Wǒmen zhīdào hěn.
'I know very-'

Wǒ gāoxìng, yīnwèi wǒ mǎi xīn de yīfú.
'I'm happy, because I bought new clothing'
Wǒ bù xǐhuān xióngmāo yīnwèi xióngmāo shì bù hǎokàn.
'I don't like pandas because pandas are not good looking'
Wǒ kàn niú.
'I saw a cow'
Wǒ shì yīgè rén.
'I am one person'
Dànshì, wǒ bù xǐhuān duō rén.
'But I don't like a lot of people'
Wǒ hěn lèi.
'I'm tired'
Wǒ xǐhuān chī niúròu bāozi.
'I like to eat beef buns'
Wǒ xiǎng ǒutù yīnwèi, wǒ hěn lèi.
'I feel like vomiting because, I'm tired.'
Dànshì, méiyǒu niúròu.
'but, there is no beef'
Wǒ xiǎng qù pàiduì.
'I feel like going to a party'
Wǒ shēngqì yīnwèi wǒ lèi.
'I'm angry because I'm tired'

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