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## Differences in Code-Switching between Chinese Heritage and Non-Heritage Learners in Computer-Mediated Communication

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### Cover Page Footnote

Special thanks to the Yidan Foundation and Pomona College for their sponsorship of this research.

# Differences in Code-Switching between Chinese Heritage and Non-Heritage Learners in Computer-Mediated Communication

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## Abstract

In the fields of bilingualism and second language (L2) acquisition, growing attention has been paid to code-switching in Chinese heritage learners, as they show how early linguistic and cultural influence affects language use. Most existing studies focused on balanced bilinguals, but little has been done to understand the differences in code-switching between Chinese heritage and non-heritage learners. Moreover, no studies have focused on L2 code-switching in computer-mediated communication, which has become a daily routine of many L2 learners after the COVID pandemic. To fill these gaps, the present study compared differences in code-switching instances between five Chinese heritage and five non-heritage learners in a semi-structured interview in English conducted via Zoom. Results showed that the heritage learners have more instances of code-switching from English to Chinese and knowledge of Chinese cultural terms but fewer linguistic errors than the non-heritage learners. Results also revealed that all the learners shared similar code-switching reasons, but the heritage and non-heritage learners differed in their self-reported code-switching situations.

*Keywords:* Chinese heritage learner, code-switching, computer-mediated communication

Although the COVID-19 pandemic significantly affected global mobility, especially students and schools (for a review, see Xiao & Kun, 2023), people were still able to get connected on the internet. Thanks to technology, more and more people now have opportunities to engage themselves in multilingual and multicultural settings. For many, learning a second language may also lead to a rediscovery of their cultural heritage. Heritage learners are language learners who have had previous linguistic and cultural exposure to another language. Given such a unique learning background, they might be more likely to code switch, wherein more than one language is used in the same conversation or utterance. Code-switching (CS), sometimes considered a linguistic deficiency (for a review, see Cheng & Butler, 1989), actually serves as an important factor for adaptation in conversations where more than one language is being used. Corresponding to the current understanding of CS, the present study investigates differences in CS between Chinese heritage and non-heritage learners. More importantly, our research focuses on such differences in computer-mediated communication (CMC) because CMC has become a vital way of communication for many second language (L2) learners after the COVID-19 pandemic, and CMC has a different atmosphere and communication norms than vis-à-vis communication. To the best of our knowledge, no prior studies focused on CS among heritage learners in a computer-mediated communication environment. Therefore, this study examines differences in English-Chinese CS between Chinese heritage and non-heritage learners in a semi-structured interview conducted via Zoom.

## **Theoretical Framework**

Developed from Hymes et al. (1972), communicative competence is defined as the ability to use language accurately and appropriately in interaction (e.g., Canal & Swan, 1980; Bachman & Palmer, 1996, 2010). According to Bachman and Palmer, language ability includes two main categories: language knowledge and strategic competence. The former includes organizational knowledge (e.g., vocabulary and grammar) and pragmatic knowledge (e.g., social and cultural norms reflected in language use), whereas the latter refers to the operational function of using language knowledge to complete acts in communication. This componential view of communicative competence accentuates the crucial knowledge and skills that are required to be successful in interaction.

However, the complexity of the linguistic mechanism for interaction goes beyond such a componential view. In a natural human conversation, a person needs to constantly adjust her utterances according to the micro-level ongoing sequential context (e.g., Levinson, 2012; Schegloff, 2007; Verschueren, 1999). In other words, being adaptive is the driving force for a natural conversation because interlocutors need to achieve their communicative goals and maintain a cooperative relationship with each other in interaction (e.g., Xiao, F., 2018). For example, a student may want to borrow a textbook from the library. The librarian may tell her that the requested textbook will not be available until a future date (a conditional offer). Therefore, the student needs to adjust her request accordingly. She may accept the offer by changing her requested date or deny the offer and find another solution. As shown in this communication, adaptation in interaction determines the results of a conversation. Such adaptation may also include CS because knowing different languages is common among young people due to globalization and international mobility (e.g., Kramsch, 2014). In an academic setting such as a college, international engagement is an important part of higher education, which often includes the presence of international students on campus and study abroad. Therefore, many conversations can happen in a multilingual setting, which may involve CS as part of adaptation in interaction.

## Literature Review

The phenomenon of CS applies to the basic principle of switching language. Haugen (1950) first defined it as language borrowing, stating that people who know two languages “may switch rapidly from one to the other, but at any given moment they are speaking only to resort to the other for assistance” (p. 211). In other words, he is defining intrasentential code switching, which takes place without the person’s explicit awareness. He also explains the presence of loanwords, loanblends, and loanshifts, the former most commonly evaluated in modern-day CS. Similarly, Fu (2004) defines CS as the “Use of two or more languages in the same sentence or utterance” (p.1). While another study defines CS specifically to be the insertion of words or grammar from the speaker’s mother tongue into the dominant language (Cui & Xie, 2015), most prior studies examined adhered to definitions similar to Fu (2004). One study specified the inclusion of intrasentential switching (Wu, 2018). Several other papers (e.g., Wang & Wu, 2016) listed no specific definition of CS but implied a definition involving intrasentential switching from one language to the other. In the present study CS is defined as the use of more than one language’s grammatical system or vocabulary in the same utterance.

In order to quantify instances of CS, Zhang, L. (2014) administered a language evaluation test and calculated the percent accuracy, resulting in findings that supported Chinese heritage language learners maintaining implicit knowledge of compound sentences in Mandarin. When evaluating preferences for certain types of loanwords in CS participants, Nelson (2013) analyzed frequency data to reveal that L2 Chinese learners show preferences for English transliterations over other forms of loanwords. Another method, as used in Wu (2018), compared proportions of emotion-type levels according to appropriateness between initial and follow-up interviews of L2 Chinese learners. Wu (2018) found that these learners showed qualitative and quantitative improvement when describing emotions using the target language. In a similar study, Wang and Wu (2016) organized transcribed instances of CS by use and graded efficiency, concluding that conversational CS was primarily used to repair language gaps in Chinese conversation. Another administered a survey with demographics percentages, which found that L2 English learners from China primarily used CS because one language lacked the proper equivalent for a word in the other (Fu, 2004). For empirical studies on L2 learners, assessments are typically distributed and graded by native speakers. Furthermore, studies using quantitative analysis focused on the types of words borrowed and when. In the context of this study, attention will be paid to similar instances.

### *Chinese Heritage Learner*

Since the present study focuses on heritage learners, the term of heritage learner needs to be defined. According to Valdes (2005), a heritage learner is “a student of language who is raised in a home where a non-English language is spoken. The student may speak or merely understand the heritage language and be, to some degree, bilingual in English and the heritage language” (p. 412). The same definition is used in other studies, such as Chen (2013), and Taguchi, Zhang, and Li (2017). Luo (2015) defines heritage learners as people “who have at least one parent whose native language is a variety of Chinese,” but are not necessarily familiar with their heritage language (p. 2). Different from Luo’s (2015) definition, which highlights the importance of language, Xiao, Y. (2006) defines a heritage learner as somebody who has a home background in a minority language. The extent to which the participant’s home background immerses them in another language is not outlined clearly. However, the Xiao, Y.’s (2006) definition includes the status of a heritage learner as a minority language, which is what the Valdes (2005) criteria also includes (Valdes, 2005, p. 411). The papers that used the Valdes’ (2005) definition do not include context on minority

languages, meaning theirs cover a broader scope of language use. Valdes (2005) examined minority languages in America, where English is the most spoken language. In the context of studies conducted in America, the definition can be kept.

### ***Previous Findings***

We searched for empirical studies on Chinese-English CS in Google Scholar, LLBA (Linguistics and Language Behavior Abstracts and CAJ (Chinese Academic Journals) and found 17 studies that focused on this topic. (See Appendix I for study profiles). Eight of the 17 articles focused on Chinese learners, whereas 11 articles focused on English learners in China. For example, Fu (2004) distributed a survey for Chinese learners of English who had been studying the language for more than 10 years. Even after gaining a very high level of proficiency, many of them still chose to code-switch because they wished to use the proper word in conversation; a translated counterpart did not have the exact meaning they wanted. On the other hand, He, J. (2015) focused on the pedagogical aspect of CS by examining an English learning classroom. Chinese words were inserted into classroom lectures in order to build rapport with students and analyze similarities between both languages. Different from Fu (2004) and He, J. (2015), Zhang and Shi (2011) distributed an online questionnaire via Chinese social media to determine reasons for using both English and Chinese in the same utterance. One of the reasons was for projecting a more well-educated online image. However, the most commonly selected reason, similar to the previously discussed studies, was to properly express concepts using words that fit them most.

Following these three studies, the next section of papers discussed how CS manifested in both pedagogical and non-pedagogical settings. For example, Jia (2007), who interviewed Chinese national students studying abroad in a predominantly English-speaking part of Canada, noticed that students with lower proficiency rates copied parts of interlocutor questions into their own responses, regardless of what language the questions were asked in. Questions asked in Chinese tended to provoke answers of the same language, as for English, demonstrating informants' adaptation in multilingual conversations. On the other hand, Wang and Wu (2016) noticed college students use CS in an L2 classroom to better indicate conversational turn-taking. Cui and Xie (2015), also from a pedagogical perspective, phrased CS as a diversion from achieving fluency in one language. However, they found, after analysing multiple classroom sessions and test results from L2 English learners, that mild amount of CS could be conducive to language learning. Informants whose assignments and in-class comments that contained intrasentential borrowing from English had higher grades on their final exams, though this correlation needed further testing.

Heritage learners continue to be a diverse demographic in language pedagogy. Chen (2013), who composed a study of 10 second-generation college-graduate age immigrants who qualified as heritage speakers, found that all of them had varying levels of fluency. Again, the difference between this study and others is that it mainly focuses on heritage speakers rather than non-heritage learners. While few described themselves as heritage speakers, the author noted that all of the informants fulfilled the Valdés (2005) definition of a heritage speaker. Regarding differences between Chinese heritage learners and L1 Chinese speakers, Li et al. (2017) tested differences in mitigation devices used in different social situations. Another group of non-heritage learners was used as a control demographic. The findings showed that these heritage learners tended to be more proficient at using Chinese mitigation devices than their non-heritage counterparts, yet not as proficient as L1 speakers.

For many studies, Chinese heritage learners fall between the L1 Chinese speakers and non-heritage L2 Chinese learners in terms of fluency. Zhang, L. (2014) showed that CHL, when given an acceptability judgment task testing 16 pairs of correlatives, were more accurate than non-heritage learners yet not as proficient as native speakers. Xiao, Y. (2006),

who evaluated Chinese heritage learner proficiency in multiple aspects, stated that heritage learners scored significantly higher than non-heritage learners in listening, speaking, and grammar, but not in reading comprehension and writing. Similarly, Taguchi et al. (2017) found that Chinese heritage learners outperformed non-heritage learners on pragmatic comprehension and speech production when given a test evaluated for grammatical correctness, appropriateness, and clarity.

In sum, most prior studies suggest that Chinese heritage learners' linguistic performance is generally better than non-heritage learners but still inferior to native speakers. Despite what previous literature states about Chinese heritage learners, CS between CHLs is described as an emergent and creative function (He, A. 2013). Observations of several CHL age groups, from children in community-based Chinese language schools to young adults in university courses, demonstrate instances of CS as remarkably fluid and sometimes contradictory of standard grammar rules between both languages. While not directly focusing on CS, Zhang, D. (2004) wrote one of the few, if not only, studies exploring the effect of computer mediated communication (CMC) on CHL education. Interacting in a computer-mediated chat room appeared to help heritage learners improve fluency with characters. While many of them relied on pinyin at first in the chat rooms feature, they gradually learned to use more characters and accumulated more vocabulary knowledge than their non-heritage counterparts. However, no existing studies have directly examined CS of CHL and non-CHL learners in CMC. CMC has become an indispensable part of human communication after the COVID pandemic. Both CHL and non-CHL learners are more adoptive and willing to communicate with technology. Therefore, it is critical to understand the nuances in the CS phenomenon between these two types of L2 learners in CMC, because CMC allows L2 learners to have more opportunities to use the target language outside of the classroom setting, and in turn, may become an important part of their target language development. To this end, the present study is the first to examine such a phenomenon in the context of Chinese and English, and aims to shed light on the differences between CHL and non-CHL learners in CS between Chinese and English. In particular, the present study addresses the following research question: What are the differences between CHL and non-CHL learners in CS in a Zoom communication?

## Methodology

Before discussing our study, we would like to discuss the definition of CS. We did a keyword search to see how this term was used in previous literature. 17 empirical articles were found in the databases of Google Scholar, LLBA (Linguistics and Language Behavior Abstracts), and CAJ (Chinese Academic Journals). The keywords included were English, Chinese, Mandarin, heritage speaker, heritage learner, code switching, and language borrowing. Boolean criteria were used for similar terms to prevent redundancy. English language articles published after 2004 that examined adult participants in either America or China were included. Articles that studied child participants were also excluded. Features coded included definitions of code switching or language borrowing, definitions of heritage learners, research questions, key findings, participant demographics, data collection methods, and analytic methods (see Appendix I). The first two features aided in finding a definition for locating and analyzing participants. Participant demographics similarly helped in creating criteria for potential participants. Research findings, key findings, and data collection and analysis methods offered information on common trends as well as a framework for analyzing study data. Limitations contextualized gaps in knowledge.

Out of 17 articles, seven focused on code switching. Four of those articles contained a definition of code switching. Fu (2004) defines it as the "Use of two or more languages in the

same sentence or utterance” (p. 1), while Cui and Xie (2015) specifies code switching as “the activity that learners consciously or unconsciously inlay speech segments of [mother tongue] into the grammatical system of English in the conversion between the two languages” (p. 1). Jing (2015) notes code switching as a simple change in language, both within and between sentences (p. 3). Zhang and Shi (2011) clarify it as intersentential code switching. Remaining articles listed no specific definition of CS but implied a definition involving intrasentential switching from one language to the other. Common features included in these definitions include the insertion of another language into an utterance from one language or the use of two separate utterances from each language. Other features to be considered are the languages specifically used. In the seven studies, all of them examined code switching between Mandarin and English. In this study, code switching is defined as the use of more than one grammatical structure and/or vocabulary from either Mandarin or English in the same sentence.

Seven articles on heritage learners used the Valdes’ definition of heritage learner (2005), namely individuals raised with English and another language and attain some degree of bilingualism in English and the heritage language. For example, Xiao, Y. (2006) defines a heritage learner as somebody who has a home background in a minority language in comparison to English. Luo (2015) states a person who has at least one parent who is a native speaker of Chinese may call themselves a heritage learner, while Zhang, L. (2014) states Chinese heritage language learners know 80 to 90 percent of commonly used grammar rules. These definitions vary in their specifics but all are in line with Valdes (2005). In the present study, a Chinese heritage learner is defined as somebody who has had exposure to Mandarin Chinese before entering a formal schooling system and is currently studying to improve fluency in it. They may gain exposure from another adult in the household other than their parents, such as a caretaker, but one or both parents must be familiar with and show the child aspects of their heritage culture. Early exposure includes both aural and visual input.

## **Informants**

Informants were five heritage learners and five non-heritage learners of Chinese with an age range from 18-24. Eight out of the 10 were female. They were recruited through social media advertisements and emails. They were all first language English speakers, and reported having taken a third-year level or higher of Chinese courses. After completing an online background survey, they were interviewed respectively for 30 to 45 minutes via Zoom. Self-reported heritage learners demonstrated early exposure to Chinese culture in their survey responses, meaning that they qualified as heritage learner informants. Accordingly, self-reported non-heritage learners showed no early exposure to Chinese culture or language in their responses.

A semi-structured interview was used to maximize the benefits of both structured and unstructured formats (e.g., Smith, 1995). Questions were drawn from a 30-question bank and split into two sections. The first section included themes such as cultural differences, Chinese language learning, family history, exposure to Chinese media, and Chinese food culture. The second section included questions about CS in the participants’ daily lives (Appendix II for interview questions). A pilot study with four informants was done prior to informant recruitment for question viability, meaning that the initial question bank was refined to 25 questions instead. The interlocutor (the 2<sup>nd</sup> author), for the pilot and formal interviews, documented each instance of Mandarin-English CS on another document concurrently. The code scheme included all words and sentence patterns used in Chinese. In addition, the average number of sentences per response and the average number of words per response were calculated for each interview. Each Zoom session was recorded, and informants received a



\$10 Amazon gift card two business days after interview completion. The 10 interview recordings were analysed qualitatively with descriptive statistics. All CS excerpts were sorted by category, and the data were triangulated by both authors.

To encourage genuine CS, the interlocutor stated previous knowledge in both Mandarin and English. However, there was no CS at all from the interlocutor's side, meaning all CS input came directly from the informant.

## Results

### *Descriptive Statistics*

The heritage learner group spent an average of 4.8 sentences per response and 38.2 seconds per response. The non-heritage learner group spent an average of 5.9 sentences per response and 48.2 seconds per response. In terms of sentences per response, there is no noticeable difference between heritage and non-heritage learners. For response time, there is a difference of 10.0 seconds.

Several groups of CS tokens were formulated, the first being names of people. The second included all non-proper nouns, designated as objects. The third group referred to kinship terms. The fourth label, traditional culture, included names of holidays and cultural concepts specific to Chinese culture. Place nouns were names of geographic designations. Food nouns and social-media specific terms were two more groups. Proper nouns, such as book titles, which did not fit into previous proper noun categories were placed in the "other nouns" group. The final three designations were verb phrases, singular verbs, and adjectives.

Table 1. *CS in HL Interviews*

Informant	Interview Duration (min)	Avg. Sen./Resp.	Avg. Time/Resp. (sec)	CS Tokens
1	55:26	7.304	54.399	Tokens: 16 Names: 2 (Lexie 刘, 孟子) (Lexie Liu, Mencius) Item: 3 (古诗词, 毛笔字, 马圆桌) (ancient poems, calligraphy, mahjong) Kinship term: 3 (姥姥, 爷爷, 奶奶) (maternal grandmother, paternal grandfather, paternal grandmother) Traditional culture: 3 (端午节 x2, 元宵节) (Dragon Boat Festival, Lantern Festival) Place: 0 Food: 5 (猪油汤, 汤圆, 粽子 x3) (Pork soup, sweet rice ball soup, sticky rice wrap) Media: 2 (小红书, 微博) (Little Red Book, Weibo. Both social media networks) Adjective: 0

				Chinese phrases: 1 (老毕笑醒) (Lao Bi woke with a smile) Chinese-English phrases: 0
3	41:52	X	55.046	<p>Tokens: 18 Names: 0 Items: 2 (课本, 老师) (Textbook, teacher) Kinship term: 0 Traditional culture: 1 (扫墓) (Tomb-Sweeping) Place: 4 (上海, 绿岛, 九九, 外滩) (Shanghai, Lu Dao, 99 Ranch, the Bund) Food: 8 (狮子头, 凉面, 炒饭, 小笼包, 包子, 饺子, 烧粉蒸肉, 炸酱面) (Lion's head, cold noodles, fried rice, soup dumplings, steamed buns, dumplings, steamed pork, noodles with fried bean sauce) Media: 0 Adjective: 0 Chinese phrases: 1 (炸饺子) (fry dumplings) Chinese-English phrases: 2 (Techniques such as 蒸, 炒; 你们什么时候回 Claremont) (Techniques such as steaming, frying; When are you returning to Claremont)</p>
4	24:45	2.61	14.972	<p>Tokens: 3 Names: 2 (周克学, 周绝伦) (Zhōu Kèxué, Zhōu Juélún) Items: 0 Kinship term: 0 Traditional culture: 0 Place: 0 Food: 1 (粽子) (Sticky rice wrap) Media: 0 Adjective: 0 Chinese phrases: 0 Chinese-English phrases: 0</p>
5	44:34	4.571	36.888	<p>Tokens: 15 Names: 4 (Professor 萧, Professor 庄, 鲁迅, 孔乙己) (Professor Xiāo, Professor Zhuāng, Lǚ Xùn, Kǒng Yǐjǐ)</p>

				<p>Items: 3 (注音 x2, 童话) (Mandarin phonetic symbols, fairy tales)</p> <p>Kinship term: 0</p> <p>Traditional culture: 0</p> <p>Place: 0</p> <p>Food: 5 (黄子面, 炸酱面, 豆瓣鱼片, 粽子, 汤圆) (Huángzǐ noodles, noodles with fried bean sauce, dòubàn fish fillet, sweet rice ball soup)</p> <p>Media: 3 (美洲话语, 我的少女时代, 当你) (American Chinese curriculum, Our Times (movie), When You (song title))</p> <p>Adjective: 0</p> <p>Chinese phrases: 0</p> <p>Chinese-English phrases: 0</p>
9	38:08	4.917	29.653	<p>Tokens: 21</p> <p>Names: 3 (白凤夕, 聂老师, 小李) (Bái Fēngxī, Teacher Niè, Xiǎo Lǐ)</p> <p>Items: 0</p> <p>Kinship term: 4 (哥哥, 哥, 爸爸, 妈妈) (Older brother, older brother (abbreviation), father, mother)</p> <p>Traditional culture: 4 (红包, 中秋节 x3) (Red envelope, Mid-Autumn Festival)</p> <p>Place: 2 (台湾, 鼓浪屿) (Taiwan, Gǔlàngyǔ Island)</p> <p>Food: 3 (汤圆 x2, 月饼) (Sweet rice ball soup, mooncakes)</p> <p>Media: 3 (美洲话语, 一百一次结婚, 有点甜) (American Chinese curriculum, One Hundred Marriages (a movie), A Little Sweet (song title))</p> <p>Adjective: 0</p> <p>Chinese phrases: 1 (拜见父王) (Meet the king)</p> <p>Chinese-English phrases: 1 (to go 跳-ing between 东西) (To go jumping between things)</p>

Note: Avg. = Average; Sen. = Sentence; Resp. = Response.

The heritage learner group had an average of 2.2 name-related tokens, 1.6 item-related tokens, 1.4 kinship tokens, 1.6 tokens related to Chinese holidays and culture, 1.2 place name tokens, 4.4 food-related tokens, 1.6 media-related tokens including book, movie, and song titles, 0 adjective tokens, 0.6 Chinese phrase tokens, and 0.6 Chinese-English phrase tokens. Collectively, each informant interview had an average of 14.8 CS tokens.

Informants 3 and 9 used Chinese-English phrases during the interview. All of their instances were grammatically correct. Informant 3 listed cooking techniques, then asked a question in correct Chinese, replacing the place name with an English equivalent. Informant 9 stated “to go 跳 ing (jump-ing) between 东西 (things),” which is another interesting situation in which Chinese words are inserted into an English sentence in a grammatically correct way.

Table 2. CS in NHL Interviews

Informant	Interview Duration (min)	Avg. Sen./Resp.	Avg. Time/Resp. (sec)	CS Tokens
2	1:00:06	6.500	56.573	Tokens: 22 Names: 1 (曲婉婷) (Qū Wǎntíng) Items: 0 Kinship term: 1 (阿嬷) (Grandmother) Traditional culture: 0 Place: 9 (广东, 台湾x3, 屏东, 台东, 花莲, 米兰, 台北) (Guangdong, Taiwan, Pingtung, Taitung, Hualian, Milan, Taipei) Food: 4 (齿轮饼, 葱油饼, 麻辣火锅, 麻辣烫) (Gear pancake, scallion pancake, spicy hotpot, spicy soup) Media: 7 (家有儿女, 时代汉语, 我的胜利, 月老x4) (Family with Children (a TV show), Modern Chinese, My Victory (song name), Till We Meet Again (movie)) Adjective: 0 Chinese phrases: 0 Chinese-English phrases: 0
6	52:56	7.612	52.624	Tokens: 7 Names: 1 (孔子) (Confucius) Items: 0 Kinship term: 0 Traditional culture: 0 Place: 1 (西安) (Xi'an) Food: 0 Media: 5 (101次求婚, 湘鄂, 听妈妈的话, 朋友, 月亮代表我的心) (101 Marriage Proposals (movie), Resonance (short story title), Listen to Mother (song title), Friends (song title)) Adjective: 0 Chinese phrases: 0 Chinese-English phrases: 0

7	50:29	6.196	51.003	<p>Tokens: 11  Names: 2 (萧老师, 周興哲) (Professor Xiāo, Zhōu Xingzhé)  Items: 1 (城堡) (Castle)  Kinship term: 0  Traditional culture: 0  Place: 7 (武汉, 昆山 x2, 上海 x4) (Wuhan, Kunshan, Shanghai)  Food: 0  Media: 0  Adjective: 0  Chinese phrases: 0  Chinese-English phrases: 1 (天火 by 王晋康) (Skyfire (short story) by Wáng Jinkāng)</p>
8	39:42	5.195	46.532	<p>Tokens: 1  Names: 0  Items: 0  Kinship term: 0  Traditional culture: 0  Place: 0  Food: 0  Media: 0  Adjective: 1 (糟糕) (How terrible)  Chinese phrases: 0  Chinese-English phrases: 0</p>
10	28:01	4.226	34.294	<p>Tokens: 16  Names: 1 (Professor 萧) (Professor Xiāo)  Items: 5 (成语 x2, 古武记, 二话, 表情包) (4-character idioms, ancient warfare, differing opinion, emoji)  Kinship term: 0  Traditional culture: 0  Place: 2 (黑龙江, 北京) (Heilongjiang, Beijing)  Food: 3 (煲仔饭 x2, 麻婆豆腐) (Claypot rice, Mapo tofu)  Media: 0  Adjective: 1 (委婉) (Indirect)  Chinese phrases: 2 (榫, 榫(卯)结(构)) (Mortise, tenon structure)  Chinese-English phrases: 2 (委婉-ing, 清 Dynasty) (Indirect-ing, Qīng Dynasty)</p>

Note. Avg. = Average; Sen. = Sentence; Resp. = Response.

The non-heritage learner group had an average of 11.2 CS tokens per informant interview. By group, there were an average of 1 name-related token, 1.2 item tokens, 0.2 kinship tokens, 0 tokens related to Chinese holidays and culture, 3.8 place name tokens, 1.2 food-related tokens, 0.4 adjective tokens, 0.4 Chinese phrase tokens, and 0.6 Chinese-English phrase tokens.

In the case of Informant 10, one Chinese phrase was communicated in a grammatically incorrect manner via omission of half the characters in the expression. For one of the Chinese-English phrases, the English suffix -ing is attached to an adjective, which is incorrect in both languages because English does not allow the use of -ing behind an adjective, and the word is an adjective in Chinese too, meaning it cannot be used as a verb.

Table 3. HL Code-switching Interview Responses

Informant	Frequency of CS	High CS Situations	Low CS Situations	Reasons for CS
1	Not often	Around people with similar linguistic background	In most situations	Maintain flow of conversation
3	A lot	Speaking with friends	In academic situations	Easier to express certain feelings in other language
4	Often	Speaking with friends, in stores	Most situations, with strangers	Build unity with friends
5	All the time	With friends and family	Around people who do not know Mandarin	Compensate for lack of Mandarin knowledge
9	Mainly will speak English and Chinglish	With Mandarin-English bilinguals	People who do not know Mandarin	To make up for lack of Mandarin knowledge

Table 4. NHL Code-Switching Interview Responses

Informant	Frequency of CS	High CS Situations	Low CS Situations	Reasons for CS
2	Very often	In Mandarin-speaking countries	In English-speaking countries	To make cross language jokes, maintain flow of conversation
6	Sometimes	When conversing with native Mandarin speaker	Will usually not voice CS	Cannot think of a certain word
7	A few times	When writing in Mandarin or	After not having	To make learning Mandarin easier



		speaking Mandarin	Mandarin exposure	
8	Almost never	With Mandarin class peers	Outside an academic setting	Language practice
10	Once an hour	With Mandarin-speaking significant other	Around people who do not speak Mandarin	For clarity when using specific terms. Aids with communicating ideas to a specific group of people without others overhearing

### *Qualitative Analysis*

Most of the words code switched from Mandarin to English were proper nouns. Informant Three was able to use both Mandarin verbs and sentence structure. Only on occasion did heritage learners use intersentential code switching. All informants borrowed noun phrases. Informant 6 listed “听妈妈的话,” which translates to “Listen to Mother,” albeit as a full name for a Mandarin song rather than a verb phrase. Larger words were typically not decomposed into smaller units. An overlapping theme involved food. For example, five out of 10 responses included the word 粽子 multiple times. Many informants did not seem to realize that they were code switching at all. Informant 5, who self-described a very low frequency of code switching between Mandarin Chinese and English on the Code Switching section of the interview, displayed a fairly high frequency in practice, having used 15 CS tokens, matching the average for the heritage learner group.

Heritage learners used 1.4 times the number of CS tokens for names than their non-heritage learner counterparts. For example, Informant 1 used two names, the words for Mencius and Lexie Liu, compared to Informant 6, who mentioned Confucius. Notably, heritage learners used far more kinship terms per average than non-heritage learners. Informant 9 created additional abbreviations, using 哥 to refer to an older brother instead of the traditional two-character 哥哥. Heritage learners also used more CS tokens relating to traditional Chinese culture, with over half of them mentioning holidays and other festivals as opposed to one non-heritage learner informant.

Both groups shared multiple reasons for why they code-switch. Two informants from each group cited CS as a way of communicating with limited Mandarin skills, while Informant 2 from the non-heritage group and Informant 1 from the heritage group stated CS helped them maintain the flow of conversation. Generally speaking, heritage learners and non-heritage learners differed in their frequency of token uses across certain topics, but their reasons for CS in the first place are related.

## **Discussion**

The purpose of this study was to find differences in CS between Mandarin heritage and non-heritage learners in a computer-mediated conversational setting. Heritage learners had a greater type and token frequency of CS than their non-heritage counterparts, with more frequent usage of CS in names, kinship terms, food, and Chinese traditions. Non-heritage learners code-switched for place names at a greater frequency. Almost all informants code-switched for proper nouns. One informant from the heritage learner group used a complete verb-noun phrase with minimal borrowing from English save for the English place name,

while one non-heritage learner and one heritage learner each conjugated either a verb or an adjective in a manner distinctly aligned with English grammar. Similarly, their reasons for CS overlapped, the most cited reasons relating to maintaining a flow in conversation and for ease of communication, whether related to a deficit in Mandarin knowledge or not.

Reasons for CS align with previous studies, such as Fu (2004), Zhang and Shi (2011), and Wang and Wu (2016), all of which cited similar reasons for why informants decided to use CS, as well as the benefits. Despite all participants offering similar input for questions about CS, heritage learner response times were 10 seconds shorter than the non-heritage group, with their responses being an average one sentence shorter. This may be due to several factors, one being that heritage learners have better fluidity in CS. However, they may have also been more comfortable with discussing parts of their culture and identity due to having previous exposure. Luo (2015) stated Chinese heritage learners tended to show less anxiety than their non-heritage peers when placed in an environment which allows use of Chinese.

## **Implications**

These results suggest important considerations for second-language pedagogy. All informants used lexically correct proper nouns when CS, meaning many instances of CS should not be considered as errors. For the few instances of verb or verb-phrase borrowing, these should also be considered a stage in the learning process because the informants who performed those switches understood the meaning of the words being used. Additionally, all of the heritage learners were, on some part, Chinese American. In this way, Mandarin-English CS helped draw awareness to their identity. To create an inclusive classroom and facilitate discussions for cross cultural communication, CS should not be discouraged but embraced as an important language-learning tool.

## **Limitations and Future Directions**

There are two major limitations in this study. The semi-structured interview can be considered naturalistic but it may not represent all possible CS situations in daily life. Future studies may triangulate the findings of the present study with recordings of learners' daily conversations to see if the findings are applicable in other CS situations. In addition, most of the informants in the present study were female. Future studies may want to counterbalance gender of their informants to see if gender affects CS in CMC.

## **Conclusion**

In a computer-mediated communication environment, Chinese heritage learners code-switched between their two languages more frequently than their non heritage counterparts, and their answers were slightly shorter with a shorter duration. These differences can be attributed to a variety of reasons, from heritage learners having an advantage in previous cultural exposure to their level of comfort using another language in daily conversations. However, in order to gain a complete understanding of CS over computer-mediated communication, more aspects of CMC, including written mediums such as email and texting, must be considered as well. This study, regardless, is one of the first to examine the linguistic skills of Chinese heritage learners through computer-mediated communication.



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Appendix I: Literature Table

Study	Definition of Code-Switching	Definition of Heritage Learner	Theoretical Framework	Research Questions	Key findings	Participants	Data collection methods	Data analytic methods
Fu (2004)	“Use of two or more languages in the same sentence or utterance”	N/A	N/A	Why and how do people resort to code switching when learning another language?	Seventy-five percent of respondents said they code-switched because they could not find the proper equivalent in one of the languages	30 ESL learners (L1 Chinese) from the ages of 21-44 who have been learning English for at least ten years	Questionnaire asking people about their backgrounds with Chinese and English, but also asks their attitudes on code switching.	Percentages from survey results
Jia (2007)	N/A	N/A	N/A	How do Chinese test takers code switch between Chinese and English in interviews?	Students with lower proficiency tended to copy parts of the interview questions into their own answers Language use depended on what language the interviewer used- participants used the language the question was asked in	16 Chinese graduates and undergraduates studying in Toronto	Interviewed Chinese students studying in Canada with TOEFL oral examination	Transcription of exam data, qualitative analysis with special attention paid to themes and salient comments concerning CS

<p>Cui &amp; Xie (2015)</p>	<p>“phenomenon that learners insert phonetic forms, vocabulary, phrases, sentences of MT (Mother Tongue) into English-dominated expressions or the activity that learners consciously or unconsciously inlay speech segments of MT into the grammatical system of English in the conversion between the two languages”</p>	<p>N/A</p>	<p>Interlanguage theory with four hypotheses: Comprehensible Input Hypothesis, Comprehensible Output Hypothesis, Affective Filter Hypothesis and Interaction Hypothesis</p>	<p>How do Chinese test takers code switch between Chinese and English in a language assessment?</p>	<p>Moderate amount of CS can be conducive to developing English proficiency</p>	<p>55 English major sophomores from China in one university in southern China</p>	<p>Participants given sample English questions asking them to define certain terms from a sentence, etc.</p>	<p>Qualitative analysis, namely analyzing CS trends in interview transcripts and exam results</p>
<p>He (2015)</p>	<p>“The phenomenon in which the speaker changes the</p>	<p>N/A</p>	<p>N/A</p>	<p>Why is code-switching used in FL education by teachers?</p>	<p>Code-switching used to communicate concepts otherwise</p>	<p>2 English language teachers from a university in China (L1 Chinese)</p>	<p>Recording of teaching process of two teachers</p>	<p>Qualitative analysis of class transcripts with special attention paid to occasions spent using CS</p>

	language he or she uses from another language”				clunky in TL, also used as tool to build rapport with students and commonalities between ML and TL			
Zhang & Shi (2011)	“Mixing of words, phrases and sentences from two distinct grammatical systems across sentence boundaries within the same event”	N/A	Meme Theory (Susan Blackmore). Derived from memetics, essentially states that language is passed on through imitation	How do people on Chinese social media use code-switching as a form of imitation?	CS used for a variety of different reasons, one of which being to properly express concepts	Unclear (only one IP address can fill out the survey), study did not report it	Questionnaire survey distributed on Internet via diaocha, asks participants to self-report levels of code-switching and their attitudes towards it	Qualitative analysis with special attention paid to reasons behind CS, as well as histograms
Nelson (2013)	“adaptation by one language of lexical material from another language to its own morphological, syntactic, and phonological patterns” This paper in particular	N/A	N/A	What kind of loan words from English appear in Chinese, and what are the most common types?	Groups with informants who had lived in foreign English-speaking country for longer period of times showed preference for borrowed English word transliterations But mostly, people	43 Chinese citizens studying at NYU and Nanjing University, all of whom had studied ESL for at least two years. Some heritage learners may have been included, but are not disclosed.	Four-part survey distributed to students at Nanjing University. First part of survey was collection of background information Second through fourth parts were forced choice questions where participants had to choose	Quantitative analysis in the form of frequency analysis (namely, to show preferences for one type of borrowing over another)

	focuses on lexicological borrowing (borrowing of words)				preferred semantic loans		between one of two words to fill in the blank. One choice was a semantically adapted word/native word, the other was a phonetic adaptation.	
Chen (2013)	N/A	Someone “raised in a home where a non-English language is spoken, who speaks or merely understands the heritage language, and who is to some degree bilingual in English and the heritage language” (7)	Norton Peirce’s identity theory, Dörnyei’s process oriented model	Evaluates the fluency levels of Taiwanese heritage learners.	All participants had somewhat different levels of fluency	10 second-generation immigrants, all either college/graduate students or recent graduates. Varying levels of proficiency, few described themselves as being heritage learners.	Informants assessed using modified OPI (oral proficiency interview) offered by ACTFL (american council on teaching foreign languages) Chinese reading test from third-grader Taiwanese Mandarin Chinese curriculum used Use of semi-structured interviews	Qualitative analysis in terms of relation between proficiency as graded through given exams as well as participant self-evaluation
Dadurian (2020)	N/A	“Heritage speakers are a subgroup of bilinguals who are exposed to a	Semantic shift (Pustejovsky)	What is the role of language dominance in linguistic coercion in a	N/A	N/A-likely college graduates or current students who have had previous exposure	Interview task with sentences where participants had to choose what tense a target	Likely qualitative analysis

		minority home language from birth, either exclusively ( <i>sequential bilinguals</i> ) or in conjunction with the majority language ( <i>simultaneous bilinguals</i> ) <sup>1</sup> . Heritage speakers are children of immigrants or early immigrants (> age 5) themselves” (2)		Mandarin heritage learners context?		to their heritage language.	word was being expressed in, along with other tests for pragmatic comprehension	
Li et al. (2017)	N/A	“individuals raised in homes where a language other than English is spoken and who are to some degree bilingual in English and	N/A	“Are there differences between Chinese heritage learners and Chinese foreign language learners in their use of mitigation	HLs were more proficient than other L2 speakers, but less so than L1.	83 participants, 2 L2 speaker groups and one L1 speaker group. All either college students or graduates/graduate d. All of them somewhat proficient in Mandarin Chinese, self-	Sample survey with hypothetical scenarios and asked to provide sample responses.	Quantitative. Standard deviations and means of frequency per 100 characters for SFPs, mitigating particles shown. Wilcoxon, Kruskal-Wallis tests. SFPs sorted by words indicating request, suggestion, complaint



		the heritage language”		devices in speech act production?” (Li 157)		identified heritage learners.		
Luo (2015)	N/A	“Heritage learners are those who have at least one parent whose native language is a variety of Chinese.”	N/A	What are factors associated with language learning anxiety found in heritage learners?	People with no Mandarin background were most nervous, those with non-Mandarin background less nervous, those with Mandarin background even less nervous. Heritage learners showed more anxiety regarding literacy.	447 participants studying Chinese at two universities in America, only 171 evaluated due to them fitting the definition of a heritage learner. Amount of self-identified HL undisclosed.	Participants sorted into groups based on background proficiency in Chinese, took the Chinese Language Learning Anxiety Scale using 5-point Likert Scale, then analyze results	Quantitative (demographic percentages, Internal Consistency Reliability test conducted for answers)
Zhang, L. (2014)	N/A	Categorized as L1 speakers and L1/L2 users. According to Campbell and Rosenthal, CHLL learners already know 80-90% of grammatical	Valde’s HLL theory (that HL are L1 speakers and L1/L2 users), in which HL is L1. Children will typically have good grasp of L1 grammar system, but learning is interrupted	Can HLs gain full proficiency despite having their language learning of L1 interrupted during early childhood, as expressed through knowledge of compound sentences.	CHLLs demonstrated implicit knowledge of compound sentences based on pairs of correlatives	9 participants: 3 CHL, 3 CFL, 3 Chinese native speakers	Participants asked to fill out questionnaire. Questionnaire used data from set collected using acceptability judgment task (64 sentences testing 16 pairs of correlatives)	Quantitative (calculated percent accuracy for each question and particle per group).

		rules in Chinese prior to learning in an academic environment . Other studies show CHLL tend to use markers “le” and “jiu” more frequently than their non-HLL Chinese-learning counterparts.	when they go to formal schooling where L2 is used.					
Xiao, Y. (2006)	N/A	Classified as students who have a home background in the language. Very general.	N/A	How does home background affect Heritage language proficiency?	Heritage learners did significantly better in speaking, listening, and grammar, but not in reading comprehension and writing.	38 Chinese learners (20 heritage, 18 non-heritage). 36 used after 2 of the heritage learners dropped out of study.	Language assessment survey and interview among two groups: L2 non-heritage and L2 heritage learners.	One-way ANOVA on averages of score, group averages of error scores
Wu (2018)	N/A-seems to be intrasentential switching due to the use of the term “CS” in	N/A	Vygotskian sociocultural theory	Can L2 learners of Chinese improve in terms of recognizing and describing	Students made quantitative and qualitative improvement on retelling parts of the video,	25 students studying abroad in China, required to at least have one year of experience in Mandarin language learning.	Natural interview in Chinese as well as do some fill in the blank tasks. Had native speakers rate recorded video	Compared proportion of emotion labels between initial and follow-up interviews, graded labels based on appropriateness in given context

	describing participant responses			emotions in their target language?	especially when it came to describing emotions.	Some HLs may have been included.	responses from students in terms of proficiency. Participants given a video to watch, then interviewed on certain aspects of the video. Conducted follow up test a few months later.	
Wang & Wu (2016)	N/A-implied to be intrasentential CS	N/A	Conversation analysis	Do bilingual speakers use code-switching to coordinate turn taking in conversation?	Conversational CS mostly used to repair trouble sources when speaking in Chinese, as well as to indicate when classmates could take turns in the conversation.	56 Chinese teachers and 315 overseas students. All of varying proficiencies in Chinese, nothing on heritage learners.	Language courses recorded for 16 weeks, participants asked to fill out survey (demographic and perception section, then another evaluation with open and close ended questions on perceptions of CS	Data organized into use and effectiveness of code-switching
Taguchi, Zhang & Li (2017)	N/A	Valdes definition of HL: "individuals raised in homes	N/A	What is the difference in pragmatic competence between heritage	CHL learners outperformed NHL on pragmatic comprehension and	60 Chinese L2 learners from private college (31 HL, 29 NHL). Varying proficiencies,	Participants given comprehension test to evaluate pragmatic knowledge of	Evaluated in terms of appropriateness, grammatical correctness, clarity (scale of 0-3). Composite scores compared. Prior to

		where a language other than English is spoken and who are to some degree bilingual in English and the heritage language”		learners and foreign language learners of Chinese, and what is the relationship between heritage learner’s PC and language contact in social settings?	productionSurvey on language contact, text samples from production task	likely self-identified HLs	SFPs and FORs in a variety of speech acts (such as requests). Situation types created based on the importance of power relationship and distance. Production task also dispersed in which participants asked to produce a variety of speech acts.	analysis, check for MANCOVA and Pearson correlation
Zhang, D. (2004)	N/A	Valdes definition	“Vrasidas and Mclsaac (1999) indicated that students have a need to interact socially, as well as to learn, in a course setting” (4011)	What are the benefits and costs of using CMC as a format for Chinese heritage learners to learn their heritage language?	Interacting in a computer-mediated chat room appeared to help heritage learners improve fluency with characters. While many of them relied on pinyin at first in the chat rooms feature, they gradually learned to use more characters and accumulated more	4 participants attending an intermediate Chinese course at a college in the American Midwest.	Participants observed in both in-person classes and in an online medium over the course of an academic semester. Their chat logs from school-hosted chat rooms and final journal assignments were also collected and analyzed.	Qualitative analysis used to determine overlapping themes in the interview stage. Interviews all transcribed, marked for accuracy of Chinese vocabulary use. Chat room transcripts also evaluated for accuracy and number of unique characters.

					vocabulary knowledge than their non-heritage counterparts.			
He (2013)	“the transition from using linguistic units (words, phrases, clauses, etc.) of one language to using those of another within a single sentence” (304)	“who were either born in the United States or immigrated to the United States at a young age and who have had continuous exposure to Chinese at home” (307).	Multi-performance: performances done by people who are competent in multiple languages	How do Chinese heritage learners code-switch within a conversational turn unit (CTU), and how do they use their skills in both languages to further communication?	Code-switching in Chinese heritage learners appears to not follow standard guidelines of code-switching. For example, CHL speakers mixed both languages at junctions in sentences where the grammar was not fully compatible. TCU CS tends to be unpredictable, emergent, and creative in function.	Participants were CHL split into three groups: 12 in group A (4.5-9 years old), 4 in group B (13-17), and 54 in group C (18-22).	12 hours of audio-and video recordings from university courses, community-based HL schools, and home settings were analyzed. For Group B, observation occurred for a year.	Transcription and qualitative analysis used to mark where participants began CS as well as their specifics (e.g., how often per CTU).

## Appendix II: Interview Questions

### Chinese Learning

How long have you learned Chinese, and where did you learn it?

How difficult do you find learning Chinese?

What were your course materials? (What if the interviewee doesn't remember any?)

What were the most rewarding parts of learning Chinese?

What were the most challenging parts of learning Chinese?

What would you do differently if you were learning from the beginning?

### Pop culture

What is the most recent Chinese movie you have watched?

- Who was your favourite actor/character in that movie?
- If a director's name is mentioned: what other works have you seen from them?
- What did you like most about the movie?
- What did you think about the plot?
- If you use subtitles, how often?

What is the most recent Chinese book, or book discussing Chinese topics/written by Chinese authors, that you've read?

- What was the plot?
- What genre was it?
- What did you think about the characters?
- Have you read other works by the same author?

What Chinese songs have you listened to most frequently?

- What is your favourite genre?
- Who is your favourite artist?
- What time period do these songs come from?

What sort of visual art do you gravitate towards?

- What medium (traditional, physical)?
- What do you know about Chinese art?

### Food culture

- What are your favourite snacks (top 3)? Where do you typically get them?
- Have you ever found it difficult to locate them?

What are your favourite meals? How often do you eat them?

- Where are they usually prepared (restaurant or home)?

What do you eat on special occasions (e.g., holidays)?

- How are they prepared?
- Who prepares them?
- If you're involved in the preparation, what do you typically help with?

What was the last thing you cooked?

- What were the main ingredients?

The last time you visited home, who took charge of preparing meals?

### Traditions

In addition to American holidays, what other festivals do you celebrate?

- How do you celebrate them?
- If you have friends who celebrate the same things, what do they do?

What's your favourite holiday?

- Why is it your favourite holiday?
- Do you celebrate it any differently from the festivals mentioned earlier?
- Does your family have a distinctive way of celebrating said holiday?

What language do you use to refer to your family members?

- Could you share a few examples?
- How might this differ from the ways your peers greet their own families?

How does your family celebrate or react to major life events (e.g., a wedding)?

- Could you share a few examples?
- How might this also differ from the way your peers' families react?

### **Travel**

- How often do you return home?
- Are there special occasions you're required to return home for?

If you travelled to another country for leisure, describe your experience.

- Did you have to speak another language?
- Have you studied abroad? If not, do you plan to study abroad?
- How did the frequency of using that different language change while abroad?/From your opinion, how will the frequency of using that different language change while abroad?

When traveling within a country, what mode of transportation do you use the most?

If you studied abroad, where did you travel to and why?

- Describe your experience. Did you notice any cultural differences, and if so, what were they?

### **Cross Cultural Differences:**

How does your family support you in your education?

Describe your family history.

- How has it affected the way you regard your culture?

Is there anything else you would like to add?

### **Linguistic awareness:**

Code switching is defined as using more than one language's grammatical system and/or vocabulary in the same conversation.

How often do you find yourself code switching?

In what situations do you code switch the most?

In what situations do you not code switch at all?

Why do you code switch?

Are you aware of any benefits of code switching?

Are you aware of any disadvantages of code switching?