Length of Residence and Chinese ESL Students' English Speaking Comprehensibility and Intelligibility

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Abstract —This study investigates the correlation between length of residence and learners' comprehensibility and intelligibility (namely "English speaking competence" throughout the paper) in a study abroad context. The investigator also examined the role of essential daily routines as a moderator of these correlations. Ten Chinese students who are currently studying at Northern Arizona University (NAU) were invited to participate in the research. They had different lengths of residence in the United States ranging from one year to five years. Based on Lu's (2014) study on the same group of students, the length of residence in English immersive environment should be positively correlated to comprehensibility and intelligibility and only slightly correlated to accentedness. The investigator of this study collected the amount of time each spends on nine critical daily life activities in a regular semester. Pearson correlation coefficients were calculated to demonstrate the relationship between English speaking competence and the time devoted to each of the nine activities. Follow-up interviews were conducted to each participant to qualitatively reinforce and verify the statistical results. The principal investigator (PI) of the study provides a recommended time planning to engage specific activities in an English-as-second-language (ESL) context improve Chinese ESL students' English speaking in terms of comprehensibility and intelligibility.

Index Terms—comprehensibility, intelligibility, length of residence, correlation, ESL

I. INTRODUCTION

Oral communication is always the first encounter for language learners to acquire a new language and improve their oral communication capability. Globalization promotes English to be a world Lingua Franca (ELF) and an increasing number of CHSs come to the USA to pursue higher education degrees. As of 2013, there are more than 230,000 Chinese students enrolled in U.S. universities, which means the number of Chinese students is almost the entire population of city of Madison in Wisconsin and four times larger than the population of Flagstaff, Arizona. Of all the international students in the USA, 28.7 percent of them are from China (Ministry of Education of China). Most of CHSs and even their parents believe an immersive way of English learning will not only help them improve their oral English capability but also learn their major discipline in a more effective, efficient and internationalized way (Ministry of Education of China). Therefore, a study abroad research is necessary to assist Chinese students even other international students to improve their English in an English immersive environment.

Language learning in a study abroad context is a new research field with linguistic emphases for second language acquisition (SLA) researchers. This research study is strongly related to the correlation research between length of residence in an immersive language environment and ESL speaking competence (i.e. comprehensibility and intelligibility). The project was developed and discussed on the two following research questions.

1. What activities in the language contact profile will potentially improve Chinese ESL students' English speaking competence in their daily life routine while they are studying abroad and interacting with American English native speakers?

2. How long should an ESL student devote into the critical activities to effectively improve their English speaking competence in a study abroad context?

II. LITERATURE REVIEW

The empirical study of linguistic aspect of study abroad started from the research of pragmatics and cross-cultural language learning (Kasper & Rose, 1999). Freed (1998, p.32) stated "since the late 1960s a gradually increasing literature has emerged which addresses the general topic of the linguistic impact of various types of study abroad experiences". Numerous previous literatures examined that ESL students could significantly develop their semantic judgment, comprehension speed, pragmatic knowledge and socio-pragmatic competence in an English immersive environment when study abroad (Taguchi, 2008; Youn, 2009; Kanagy, 1999; Kasper, 2001).

It is important to construct an operationalized measurement to evaluate Chinese ESL students' speech. Derwing and Munro (1997) as well as Kennedy and Trofimovich (2008) have provided the three factors as measurements of speech perception – comprehensibility intelligibility and accentedness. By far, there was an influential in-depth study

investigated by Derwing and Munro (1997), which was related to evaluate ESL speakers' English speaking quality. The study, focusing on L2 English learners' oral practice, first mentioned that using foreign accent, comprehensibility and intelligibility as three important measurements to evaluate Mandarin Chinese NSs who use English as foreign language (EFL). In the research, Munro and Derwing introduced the method of using Pearson correlation test to calculate if there are correlations between these three important factors. Munro and Derwing claimed that although the strength of a foreign accent is correlated with perceived comprehensibility and intelligibility, a strong foreign accent does not necessarily reduce the comprehensibility or intelligibility of L2 speech.

Kennedy and Trofimovich's (2008) study investigated how NSs' experience and semantic context (e.g. NSs with extensive experience interacting with NNSs have high possibility to comprehend NNSs' articulation with low intelligibility in different contexts) influence measures of intelligibility, comprehensibility and accentedness of NNSs' speech. They found out that NSs' background such as experience of talking to NNSs influenced their rating of NNSs' speech by using these three measurements. That is, NSs with more experience understood more NNSs' speech than NSs with less experience, but they did not rate it differently in comprehensibility. Additionally, Kennedy and Trofimovich clarified the specific and explicit meanings of the three terms, which laid the theoretical foundation of the present study. The term "intelligibility" emphasizes the clearness of EFL speakers' articulation. "Comprehensibility" focuses on how understandable EFL speakers' speech is. "Accentedness" is the degree of foreign accent perceived by NSs (Kennedy & Trofimovich, 2008).

Kang (2008) suggested native speakers can be a reliable source to evaluate ESL students' speech and a rating scale can be established for native raters to evaluate ESL participants' speech based on the three criterions proposed by Derwing and Munro (1997) and Kennedy and Trofimovich (2008).

Based on the standardized measurements for ESL students' speaking competence and the ideas of rating L2 oral performance in English by native speakers' perception (Kang, 2008), Lu's (2014) study demonstrated the positive correlation between the length of residence in an English immersive environment and English speaking comprehensibility as well as the positive correlation between length of residence and English speaking intelligibility by using the idea of evaluating perceived speech in the three factors (Derwing & Munro, 1997; Kennedy & Trofimovich, 2008). Lu also showed the weak positive correlation between the length of residence and accentedness of ESL students' speech. The findings suggested that some activities or linguistic interactions in ESL students' daily life unconsciously influence students' English speaking competence. The positive influence enhancing students' English speaking is possibly from the aspects of comprehensive input, interaction with oral corrective feedback and so on, which is motivating the PI to investigate their daily life time arrangements in details to find out what the critical linguistic interactions with native speakers are potentially enhancing their English speaking competence.

In terms of investigating ESL students' language using and learning experience or history, Freed, Dewey, Segalowitz and Halter (2004, p. 349-350) developed a language contact profile (LCP) quantitatively synthesizing demographics, life style and language using frequency, which inspired the current research to apply LCP into the study to examine Chinese ESL students' English use at Northern Arizona University. The PI modified Freed et al.'s (2004) LCP into a concise table breaking down the section "language using frequency" to "academic hours" and "social interaction hours" as a survey to investigate the participants' life style of English communication.

III. METHODOLOGY

A. Participants

The participants in this study were all Chinese students currently studying at Northern Arizona University (NAU). There are plenty of variables influencing participants' oral proficiency level, so in this case, the Chinese students' background was controlled by two measurable factors – the TOEFL oral scores that they used to apply for the first American academic institution and their lengths of stay in the USA. In total, ten Chinese students were selected for this study. They had different lengths of stay in the U.S. ranging from one to five years. They were divided into five groups, with two similar lengths of stay forming one group. The ten students' were asked to submit their TOEFL oral scores used to apply for the first American academic institution that they attended to the PI as a proof to secure that they had similar proficiency levels before they came to the USA. Therefore, their progress with oral English should be made after they came to the USA. The ten students' original TOEFL scores varied from 18 to 20 when they first came to the USA. Additionally, the ten participants were from different colleges or schools at NAU so as to remove the bias of the PI. The PI used the case numbers as pseudonyms for confidentiality. Students' related information for the study had been collected in Table 1.

TABLE 1
THE TEN CHINESE STUDENTS' RELATED INFORMATION FOR THE INVESTIGATION

	Early TOEFL iBT Oral Score/30 Points Scale	Length of Stay in the USA/year(s)	Current College at NAU
Case 1	19	1	Franke College of Business
Case 2	20	1	Franke College of Business
Case 3	19	1	College of Arts and Letters
Case 4	20	2	College of Arts and Letters
Case 5	21	3	College of Performing and Fine Arts
Case 6	20	3	College of Performing and Fine Arts
Case 7	21	4	College of Engineering and Science
Case 8	21	4	College of Engineering and Science
Case 9	22	5	College of Hotel and Restaurant Management
Case 10	21	5	College of Arts and Letters

B. Rationale

Study abroad in the United States provides an immersive language environment for ESL Chinese students. In Lu's (2014) study, there were ten Chinese ESL students who have been studying in the United States for different lengths, ranging from one year to five years. The participants were selected from the PI's acquaintance and they were different major programs at NAU. Since the previous literature have statistically demonstrated positive correlation between the length of residence and the comprehensibility as well as the positive correlation between length of residence and intelligibility, it is necessary to pinpoint the specific daily activities help increasing L2 speakers' comprehensibility and intelligibility. In this current research study, the PI named the scores of comprehensibility and intelligibility as "English speaking competence scores" for later use. Then, the same group of ten participants was invited to fill out the survey about their time arrangement to use English as their second language in a regular academic week. This survey is constituted by an instruction paragraph and a table investigating the length participant communicating in English in different contexts and registers. As it is shown in Table 2, there are nine scenarios investigated in the questionnaire.

TABLE 2
SURVEY FOR DATA COLLECTION/LANGUAGE CONTACT PROFILE

Items Investigated			Number of Hours (hrs)
Academic Hours	Class participation	Lectures	
		Smaller Sessions	
	Off-class academic communication		
Social Interaction Hours	Native speaker roommate chatting		
	Physical Education Service and/or club activities interaction		
	Hanging out for parties/dining/shopping with native speakers		
	Watching Anglophone movies/TV shows/YouTube videos		
	Telephone chatting/video chatting with native speakers		
	Religious Service using English		

The nine life settings generally covered most of the daily life situations in the study abroad context in which participants might have to communicate in English. To make the investigation more accurate, the PI asked the ten participants to respond to the survey based on their time arrangement of their last academic semester (i.e. spring 2014) because Lu's (2014) study was conducted in spring 2014. The data of "number of hours" using English in their lives should be reliable and representative because nobody of them was in a graduating semester when they might have unusually less credit hours in their academic times than any other semesters. In order to calculate the time slots more accurately, the data have been specified to one digit after the decimal (i.e. timing data in this study are round up to half an hour).

After each participant finished the survey, a follow-up interview was conducted to look into specifications of their response. Three sets of questions were delivered to the ten participants:

1. Is your life style consistent? How long have you kept your life style like which you responded in the survey?

2. To what extent you think you are an extroverted person or an introverted person? Rate yourself from 1 to 10. "1" refers to the extreme introverted characteristics and "10" stands for the extreme extroverted characteristics.

3. Do you have any additional time which is not been mentioned on the survey?

The three sets of questions are designed to qualitatively reinforce the survey and each set has different purposes. The first set of questions is trying to pinpoint if the time arrangement of using English is consistent. It is highly possible that ESL students might be subjective to have more exposure of authentic language communication in their daily lives as their language speaking competence developing and improving. It is also considerably probable that ESL students' speaking proficiency increase by having consistent authentic language exposure in their own ways of life. These two circumstances mentioned above have completely reversed casual logical lines to the research topic. The two situations could be named "hypothesis A" and "hypothesis B" respectively. In hypothesis A, students life style was like what they responded in the survey because their speaking English was improving. In this case, their life style was not consistent so their speaking competence was not directly associated with what they had reflected according to the survey. Thus, the developing English speaking proficiency caused more time of English using. In hypothesis B, it was the consistent ways

of life that provided them stable lengths of English using time. Therefore, their English speaking competence scores increase because the certain life styles reflected on the survey. In other words, the immersive language environment positively influenced the English speaking competence scores. The second set of questions was used to investigate the ten participants' personality, which may be potentially relevant to the development of English speaking competence. The third question was asked to cover the miscellaneous time arrangement of participants' life.

C. Data Analysis

Having obtained the data of English using hours, the PI utilized *SPSS* 22 and the instruction of statistics for applied linguistics (Hatch & Lazaraton, 1991) to calculate Pearson correlation coefficient between the English-using time slots in every scenario among the nine situations and their English speaking competence scores (i.e. native speakers perceived scores of comprehensibility and intelligibility). Thereupon, two tables of correlation matrixes can be presented to respectively show the inter-correlations between the competence scores and the nine kinds of English-using times and interrelationships between the nine times. In this research study, the independent variable is participants' English speaking competence scores and the dependent variables are the nine different English using hours. After observing the correlation coefficients, it is apt to figure out which scenarios of social or academic life might potentially strengthen the English speaking comprehensibility and intelligibility in an immersive language environment. When combining the follow-up interview, the PI could rationally get the inter-correlation between English speaking competence, way of life and personal characteristics of participants

IV. RESULTS

A. Descriptive Statistics

TABLE 3
TABLE OF DESCRIPTIVE STATISTICS FOR THE LANGUAGE CONTACT PROFILE

	Lec_T	SSs_T	Off_T	RM_T	PE_T	HO_T	V_T	Tele_T	Religious_T	Additional_T
N Valid	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Mean	4.65	6.30	5.90	5.20	1.50	3.55	6.80	1.15	0.00	0.85
Std. Error of Mean	1.81	1.26	2.00	2.53	0.45	1.23	0.57	0.45	0.00	0.85
Median	2.25[a]	6.50[a]	4.33[a]	1.50[a]	1.50[a]	2.00[a]	6.50[a]	0.67[a]	0.00[a]	0.85[a]
Mode	0.00	2.00[b]	2.00[b]	0.00	0.00[b]	0.00	6.00[b]	0.00	0.00	0.00
Std. Deviation	5.73	3.97	6.31	8.00	1.43	3.90	1.80	1.42	0.00	2.69
Variance	32.78	15.79	39.88	63.96	2.06	15.25	3.23	2.00	0.00	7.23
Skewness	1.08	-0.02	1.59	1.99	0.28	0.71	0.39	1.16		3.16
Std. Error of Skewness	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
Kurtosis	0.05	-1.72	1.99	4.10	-1.00	-1.22	-0.10	0.31		10.00
Std. Error of Kurtosis	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33
Range	16.00	11.00	20.00	25.00	4.00	10.00	6.00	4.00	0.00	8.50
Minimum	0.00	1.00	0.00	0.00	0.00	0.00	4.00	0.00	0.00	0.00
Maximum	16.00	12.00	20.00	25.00	4.00	10.00	10.00	4.00	0.00	8.50
Sum	46.50	63.00	59.00	52.00	15.00	35.50	68.00	11.50	0.00	8.50

Note. All data in the table is significant at 0.05 level and all statistics has been round up to two digits after the decimal. The subscript "a" denotes calculated from grouped data while "b" denotes multiple modes exist and the smallest value is shown. The shaded cell shows the kurtosis value of "religious hours" cannot be calculated in this case. "Lec_T" refers to the weekly lecture hours. "SSs_T" refers to the weekly hours of smaller sessions. "Off_T" refers to the weekly hours of off-class academic. "RM_T" refers to the weekly hours of roommate chatting. "PE_T" refers to the weekly hours attending P.E. classes. "HO_T" refers to the weekly hours of hanging out with native speakers. "V_T" refers to the weekly hours of internet Anglophone videos affinity. "Tele_T" refers to the weekly hours of Anglophone television programs affinity. "Religious_T" refers to the weekly hours of religious service.

According to Hatch & Lazaraton (1991), a normal distribution can be judged by calculating $-1.96 \leq \frac{skewness}{stand\ error\ of\ skewness} \leq 1.96$. That is, if a fraction can be clustered between -1.96 and 1.96 in the inequality above, it is reasonable to state that this dataset is statistically normally distributed.

Table 3 shows all English contact hours in the nine scenarios and miscellaneous scenarios. Among these data, the video watching time is normally distributed with skewness of 0.39 and standard error of skewness of 0.69. Also, the time attending smaller session can be counted as statistical normal distribution with skewness -0.02 and standard error of skewness of 0.69. By observing the corresponded histograms in Appendix A, the reported hours of the rest seven scenarios along with miscellaneous scenarios are positively skewed to different extent, demonstrating the fact that most of the ten participants did not spend much time in routine English contacts. According to the mean scores, the English video watching time has a mean of 6.80 and the time of attending smaller session has a mean of 6.30. These two activities obviously took the most time among the nine scenarios of English contact. In terms of standard deviation,

video watching time has a standard deviation of 1.80, which demonstrates that students' time devotion in English video watching deviates the least. On the contrary, the hours of roommate chatting deviate the most with a standard deviation of 8.00.

TABLE 4
DESCRIPTIVE STATISTICS OF COMPREHENSIBILITY, INTELLIGIBILITY AND PERSONALITY

		Comp	Intel	Char
N	Valid	10.00	10.00	10.00
	Missing	0.00	0.00	0.00
Mean		8.35	7.50	6.60
Std. Error of Mean		0.37	0.44	0.60
Median		8.67[a]	7.50[a]	6.67[a]
Mode		9.00	7.00[b]	4.00[b]
Std. Deviation		1.16	1.39	1.90
Variance		1.34	1.94	3.60
Skewness		-0.69	-0.08	-0.13
Std. Error of Skewness		0.69	0.69	0.69
Kurtosis		-0.42	0.59	-1.44
Std. Error of Kurtosis		1.33	1.33	1.33
Range		3.50	5.00	5.00
Minimum		6.50	5.00	4.00
Maximum		10.00	10.00	9.00
Sum		83.50	75.00	66.00

Note. All data in the table is significant at 0.05 level and all statistics has been round up to two digits after the decimal. The subscript "a" denotes calculated from grouped data while "b" denotes multiple modes exist and the smallest value is shown. "Comp" refers to comprehensibility. "Intel" refers to intelligibility. "Char" represents "characteristics" or "participants' personality" in this case.

Table 4 displays the descriptive statistics of these ten participants' comprehensibility, intelligibility and personality. The three groups of data are normally distributed based on the histogram of observation in Appendix B and statistical calculations.

B. Correlational Statistics

TABLE 5
CORRELATION MATRIX OF ENGLISH SPEAKING COMPETENCE SCORES AND TIME ARRANGEMENT

	Comprehensibility (c)	Intelligibility (i)
Lecture Hours (Lec)	**-0.86	*-0.73
Smaller Session (SSs)	**0.77	0.38
Off-Class Academic (Off)	0.01	0.34
Roommate Chat (RM)	0.33	0.35
P.E. (PE)	0.39	0.28
Hang Out (HO)	*0.73	*0.75
Videos (V)	*0.67	0.42
Telephone (Tele)	0.29	*0.66
Religious Service (Rel)	N/A	N/A

Note. * indicates that correlation is significant at the 0.05 level (2-tailed).
** indicates that correlation is significant at the 0.01 level (2-tailed).
N/A indicates that the data cannot be computed because at least one of the variables is constant.
The labels (i.e. abbreviations) are specified in the parentheses in the first column.
The arrangement order of the nine scenarios in the table corresponds to the sequence of the language contact profile.

The general *p* value of this research study is $p \leq 0.05$ so all the data that are significant at 0.01 level should be undoubtedly significant at 0.05 significant level in this study. By observing Table 5, seven pairs of significant correlations stand out to show the L2 speakers' English speaking competence is strongly associated with the time they spent in lecture classes ($r_{c\text{-Lec}}$ and $r_{i\text{-Lec}}$), smaller sessions ($r_{c\text{-SSs}}$), entertainments ($r_{c\text{-HO}}$, $r_{i\text{-HO}}$ and $r_{c\text{-V}}$) (i.e., hanging out with native speakers and watching English videos or movies) and English telephone communication ($r_{i\text{-Tele}}$). According to Table 5, the "lecture hours" is negatively correlated to comprehensibility and intelligibility but it is unreasonable to state that more lectures students take, the less comprehensible and intelligible their speech would be. A follow-up interview should be conducted to explain this negative correlation qualitatively. Also, the strength of correlations (r^2) can be calculated and placed in a descending order below.

Comprehensibility-related correlation strengths: $r^2_{c\text{-Lec}} > r^2_{c\text{-SSs}} > r^2_{c\text{-HO}} > r^2_{c\text{-V}}$

Intelligibility-related correlation strengths: $r^2_{i\text{-HO}} > r^2_{i\text{-Lec}} > r^2_{i\text{-Tele}}$

The coefficient of "religious service" does not exist because all participants put 0 in this item so *SPSS* regards the variable as a constant.

Compared to Table 5, Table 6 more specifically reveals how much the nine scenarios correlate to each other in terms of the length of time students spent on. The nine scenarios lay out horizontally and vertically in the columns of the table. The values inside the table display the inter-correlations between the nine scenarios.

TABLE 6
THE CORRELATION MATRIX OF INTER-CORRELATION BETWEEN THE NINE SCENARIOS

	Lecture Hours	Smaller Session	Off-Class Academic	Roommate Chat	PE	Hang Out	Videos	Tele	Religious Service
Lecture Hours	1.00	**-0.77	-0.05	-0.19	-0.40	-0.60	-0.61	-0.16	-0.16
Smaller Session	**-0.77	1.00	-0.03	0.45	0.40	0.43	*0.72	0.10	N/A
Off-Class Academic	-0.05	-0.03	1.00	0.67	0.52	-0.08	0.20	0.53	N/A
Roommate Chat	-0.19	0.45	*0.67	1.00	0.52	0.30	0.60	0.64	N/A
PE	-0.40	0.40	0.52	0.52	1.00	0.23	**0.78	-0.07	N/A
Hang Out	-0.60	0.43	-0.08	0.30	0.23	1.00	0.60	0.41	N/A
Videos	-0.61	*0.72	0.20	0.60	**0.78	0.60	1.00	0.09	N/A
Tele	-0.16	0.10	0.53	*0.64	-0.07	0.41	0.09	1.00	N/A
Religious Service	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00

Note. * indicates that correlation is significant at the 0.05 level (2-tailed).
** indicates that correlation is significant at the 0.01 level (2-tailed).
N/A indicates that the data cannot be computed because at least one of the variables is constant.

The nature of symmetry of correlation matrixes determines it is only necessary to investigate the shaded half of the table and check their correlation coefficients. There are five pairs of correlations which are strongly correlated to each other at the $p \leq 0.05$ significant level. Among them, $r_{\text{Lec-SSs}} = -0.77 < 0$, while $r_{\text{SSs-V}} = 0.72 > 0$, $r_{\text{Off-RM}} = 0.67 > 0$, $r_{\text{RM-Tele}} = 0.64 > 0$ and $r_{\text{PE-V}} = 0.78 > 0$. The strengths of correlations (r^2) are placed in a descending order below.

$$r^2_{\text{PE-V}} > r^2_{\text{Lec-SSs}} > r^2_{\text{SSs-V}} > r^2_{\text{Off-RM}} > r^2_{\text{RM-Tele}}$$

TABLE 7
TEN PARTICIPANTS ENGLISH SPEAKING COMPETENCE SCORES AND THE CHARACTERISTICS SELF-EVLATION

	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8	Case 9	Case 10
Comprehensibility	6.5	6.5	9.0	7.5	8.5	8.5	9.0	9.0	10.0	9.0
Intelligibility	6.0	5.0	7.5	8.5	7.0	7.0	7.5	8.0	10.0	8.5
Characteristics	5.0	4.0	4.0	6.0	6.0	7.0	8.0	9.0	9.0	8.0

Note. Comprehensibility and intelligibility range from 1 to 10 and higher scores represent higher English speaking competence. All the data are round up to one digit after the decimal.

From Table 7, we can see the general tendency showing the fact that as scores of comprehensibility and intelligibility increase, the characteristic scores increase correspondingly. In order to visualize the tendency, Figure 1, a line chart, is composed based on the data shown in Table 7.

Figure 1. Line plot displaying tendency of comprehensibility, intelligibility and characteristics.

TABLE 8
THE CORRELATION MATRIX OF COMPREHENSIBILITY, INTELLIGIBILITY AND CHARACTERISTICS

	Comprehensibility	Intelligibility	Characteristics
Comprehensibility	1.00	**0.79	*0.70
Intelligibility	**0.79	1.00	0.71
Characteristics	*0.70	0.71	1.00

Note. * indicates that correlation is significant at the 0.05 level (2-tailed).
** indicates that correlation is significant at the 0.01 level (2-tailed).

Table 8 verifies that the degree of characteristics positively correlates to comprehensibility and intelligibility, which is also depicted in Figure 1.

TABLE 9
THE FOLLOW-UP INTERVIEW QUESTIONS SUMMARY

	Key Words in Self-Report Texts	Hypothesis Fit In	Miscellaneous Hours
Case 1	"consistent"	B	N/A
Case 2	"consistent"	B	N/A
Case 3	"consistent and stable"	B	N/A
Case 4	"consistent"	B	N/A
Case 5	"consistent"	B	N/A
Case 6	"almost consistent"	B	N/A
Case 7	"consistent in academic semesters"	B	N/A
Case 8	"mostly consistent"	B	N/A
Case 9	"stable after coming to the States"	B	N/A
Case 10	"stable and consistent"	B	8.5 hours of teaching

Note. The "key words" were excerpted from their interviews. N/A indicates that the participants claimed there were no additional hours using English in their daily life besides the nine scenarios.

Table 9 shows the participants' answers to question 1 and 3 for the follow-up interview. The column "key words in self-report texts" shows the critical words or terms excerpted from the interviews expressing the participants' attitude towards their personal evaluation on the relationship between life style and English speaking proficiency. Five out of ten participants directly claimed that their life styles were consistent after they came to the United States. The other five out of ten participants reported that their life styles were "almost consistent", "mostly consistent" or "consistent in a regular semester", which were regarded as "indirect claiming consistency". Therefore, it turned out to be all the participants' attitudes are supporting hypothesis B in their own cases. In this way, all the ten participants' English speaking competence gets improved mainly because of a consistent exposure in certain authentic language environment, so the internal validity of this study is supported and strengthened.

V. DISCUSSION

In terms of the descriptive statistics, the data of comprehensibility, intelligibility and personality are all normally distributed shows the validity of participant selection in this study. The participants' lengths of residence and their English speaking competence are effectively stratified.

Since all of the ten students' cases fall into the scope of hypothesis B in terms of the logical line, it is reliable to reason their English speaking competence only influenced by the input from their daily life. The following discussion will be based on hypothesis B in this study.

The strongest negative correlations cannot be only interpreted statistically. In terms of the negative correlation between "Lecture Hours" with "comprehensibility" and "intelligibility" (refer to Table 4), as well as the negative correlation between "Lecture Hours" and "Small Session Hours" (in Table 5), it is unreasonable to state that more hours students attend lecture-formed classes, less comprehensible and intelligible their speech will be. Actually, an institutional regulation at NAU resulted in this negative correlation – the higher grade a student is, the less lecture-formed classes the student will attend (i.e. the more small sessions the student will attend as the student's degree progress moving on). So the discussion excluded these two negative correlations caused by institutional reasons, not caused by individual preference. Other correlations reveal that attending academic small sessions, hanging out with native English speakers and watching Anglophone movies and other videos with entertainment purposes positively related to ESL students' English speaking comprehensibility dramatically. Hanging out with native speakers and making phone calls with native speakers have positive correlation with English speaking intelligibility. These activities could be beneficial to English speaking intelligibility.

Kennedy and Trofimovich (2008) defined that the term "comprehensibility" focuses on how understandable EFL speakers' speech is and "intelligibility" emphasizes the clearness of EFL speakers' articulation. Therefore, it is apt to categorize these nine scenarios into three types based on the impact to ESL speakers. The first type is the activities with considerably large amount of input or mono-directional input, such as "attending lectures" "watching English videos or movies with entertainment purposes" and "religious service". The second type is the activities requiring high-quality output and appropriate feedbacks, such as "attending small sessions" "off-class academic discussion" and "making phone calls with native speakers". The third type is those activities involving interactions, consisting of "roommate chatting with native speakers" "attending physical education classes" and "hanging out with native speakers". The correlation strength comparison: $r^2_{\text{i-HO}} > r^2_{\text{i-Lec}} > r^2_{\text{i-Tele}}$ clearly reveals that the second-type activities requiring high-quality English output positively correlates to ESL speakers speaking intelligibility possibly because these activities provide adequate speaking opportunities to have their articulation and pronunciations practiced. The third type of activities also strongly related to ESL students' intelligibility because students can get instant feedback from native English-speaking interlocutors so that their wrong or inaccurate articulations can be corrected in a specific context, which is good for ESL speakers to improve intelligibility, with "lecture hours" excluded due to the negative correlation, "hanging out with native speakers" and "making phone calls with native speakers" contribute the most to build L2 speakers English speaking intelligibility. The first type, then, features intensive English input, strengthening ESL speakers' comprehensibility.

In Table 5, the significant positive correlation between "roommate chatting" and "native speaker telephone chatting" ($r_{\text{RM-Tele}}$ = 0.64) verifies the more talkative ESL speakers are, the more language speaking/using opportunities the speakers may obtain. The reasonable linguistic inference behind the strong positive correlation between "watching English videos and movies" and "attending small sessions" ($r_{\text{V-SSs}}$ = 0.72) could be that a comprehensive input in an English immersive environment can potentially improve the English speaking competence in daily life.

Figure 1 and Table 7 shows the strong and obvious positive correlation between an extroverted personality and the English speaking competence scores (comprehensibility and intelligibility). The results implies that ESL students, who tend to be extroverted, are more easy to improve their English speaking competence in an English immersive environment because more opportunities of authentic English exposure will be created by actively fitting themselves in the native English speakers community.

VI. CONCLUSION AND IMPLICATION

According to the results and discussion above, it is apt to conclude that the length of residence positively correlates to Chinese ESL students' English speaking competence in terms of comprehensibility as well as intelligibility. That is, the longer a Chinese ESL student stays in an English immersive environment, the more possibilities the student will improve English speaking competence. The ESL students' general life style of using English was broken down to nine model scenarios according to the language contact profile, which comprehensively improve the ten participants' English speaking by offering comprehensive input, corrective feedback and requiring ESL speakers' output.

Some specific time devotions are all positively related to ESL speakers' English speaking comprehensibility and intelligibility. "Attending small sessions", "hanging out with native speakers" and "watching English movies and videos with entertainment purpose" are positively correlated to ESL speakers improve comprehensibility. "Hanging out with native speakers" and "making phone calls with native speakers" might help ESL students' intelligibility.

An explicit implication of descriptive and correlational statistics is that all Chinese ESL students devote relatively more time on attending smaller sessions and watching English videos online and the two are positively correlated with comprehensibility and intelligibility. Besides that, more implicit pedagogical implication can be presented.

The conclusion of this research study pedagogically implies that ESL instructors may fully use these critical activities to enhance English speaking competence. In ESL speaking classrooms, more task-based activities related to "attending small sessions", "hanging out with native speakers", "making phone calls with native speakers" and "watching English movies and videos with entertainment purpose" could be introduced and stimulated to let students practice English speaking in these contexts. The ways of implementation can be varied, such as scenario introducing by video clips, reciprocal practicing in small groups, backing-up practice by making friends with native English speakers in real life and recording videos mocking conversations in these scenarios, etc.

Importantly, the research study implies an effective immersive language learning strategy in study abroad context based on the statistics. The implication is aimed to answer the questions below.

1. Are extroverted people easier to improve English speaking competence in the United States?
2. Is participating social interactions when study abroad the only indispensable way to improve English speaking?
3. How many hours are needed to devote to social interactions with native speakers to improve English speaking?

TABLE 10
DESCRIPTIVE STATISTICS FOR THE FOUR CRITICAL ACTIVITIES

	Attending small sessions (SSs)	Hanging out with native speakers (HO)	Watching English videos and movies (V)	Making phone calls with native speakers (Tele)
N	10.00	10.00	10.00	10.00
Range	11.00	10.00	6.00	4.00
Minimum	1.00	0.00	4.00	0.00
Maximum	12.00	10.00	10.00	4.00
Mean	6.30	3.55	6.80	1.15
SD	3.97	3.90	1.80	1.42
Skewness	-0.03	0.71	0.39	1.16
Kurtosis	-1.72	-1.22	-0.1	0.31

Ideally, it could be true that extroverted ESL speakers will have more chances of exposure in authentic language environment than introverted people, so extroverted students might be easier to improve English speaking competence in an English immersive environment.

Then, statistics in Table 10 provides a quantitatively detailed perspective to answer the question about effective time planning when study abroad. The positive correlations between English speaking competence scores and the four critical activities reasonably prove that more time devotion in these four activities, the better comprehensibility and intelligibility of ESL speakers' speech will be. Among the four activities, the ten participants' time devotions varied the most on SSs and HO (SD_{SSs} = 3.97, $Range_{\text{SSs}}$ = 11; SD_{HO} = 3.90, $Range_{\text{HO}}$ = 10). The time devotions varied less on V and Tele (SD_{V} = 1.8, SD_{Tele} = 1.42). The data of skewness of SSs and V are near "0", so the data (the time that the ten students spent on the two activities) are almost normally distributed. Therefore, the mean scores of the two activities could be the most appropriate time devotions for these two activities. So the PI recommend that "SSs = 6.30

hours/week" and "V = 6.80 hours/week" may be a minimal effective time planning for effectively improving English speaking competence for ESL speakers. In terms of Tele, the data are distributed in a slightly positive skewness, so the recommended time should be slightly less than the mean ($Mean_{Tele}$ = 1.15). Also considering that most Chinese students do not have adequate chances to make phone calls with English native speakers, excepting contacting customer services, the PI recommend Tele = approximate 1 hour/week to practice telephone English speaking register and to potentially improve intelligibility. The data distribution of HO shows similar pattern with the data distribution of Tele, but HO have a larger kurtosis and SD than Tele. Thus, a reasonable analysis is that the time planning for hanging out with native speakers could be influenced more by individual differences, more specifically, personal characteristics. So the recommended time planning for hanging out with native speakers would be around two to three hours (minimum < recommended time < mean). Considering the time availability of an academic semester, the time for hanging out could be arranged during the weekend.

To summarize the recommended time planning for the four critical activities, the data of conclusion are presented in Table 11.

TABLE 11
RECOMMENDED HOURS FOR EFFECTIVELY IMPROVING ENGLISH SPEAKING COMPETENCE IN AN ESL CONTEXT

|	Attending small sessions	Hanging out with native speakers	Watching English videos and movies	Making phone calls with native speakers
Time Recommended [Hour(s)]	6.30	2.00 to 3.00	6.80	approximate 1.00

Note. All the data is round up to two digits after the decimal and measured in hour(s) in Table 11.

VII. LIMITATION

The research study is possibly limited by the sample size. Even though the participants were widely selected from the PI's acquaintance from different colleges of NAU, they cannot represent the entire Chinese ESL population in Arizona, or even the United States. This study can be a pilot study for larger sample size and the investigation can be carried on in the similar way. Also, there should have been an objective and reliable measurement to evaluate ESL students' personality (extroverted and introverted) rather than self-reporting, because self-reporting is a completely subjective approach which might potentially influence the internal validity of the study. In addition, the correlational statistics cannot demonstrate the causal relationship among these variables in this study, so future studies could apply other statistical methods testing causation to test these variables in a new scope.
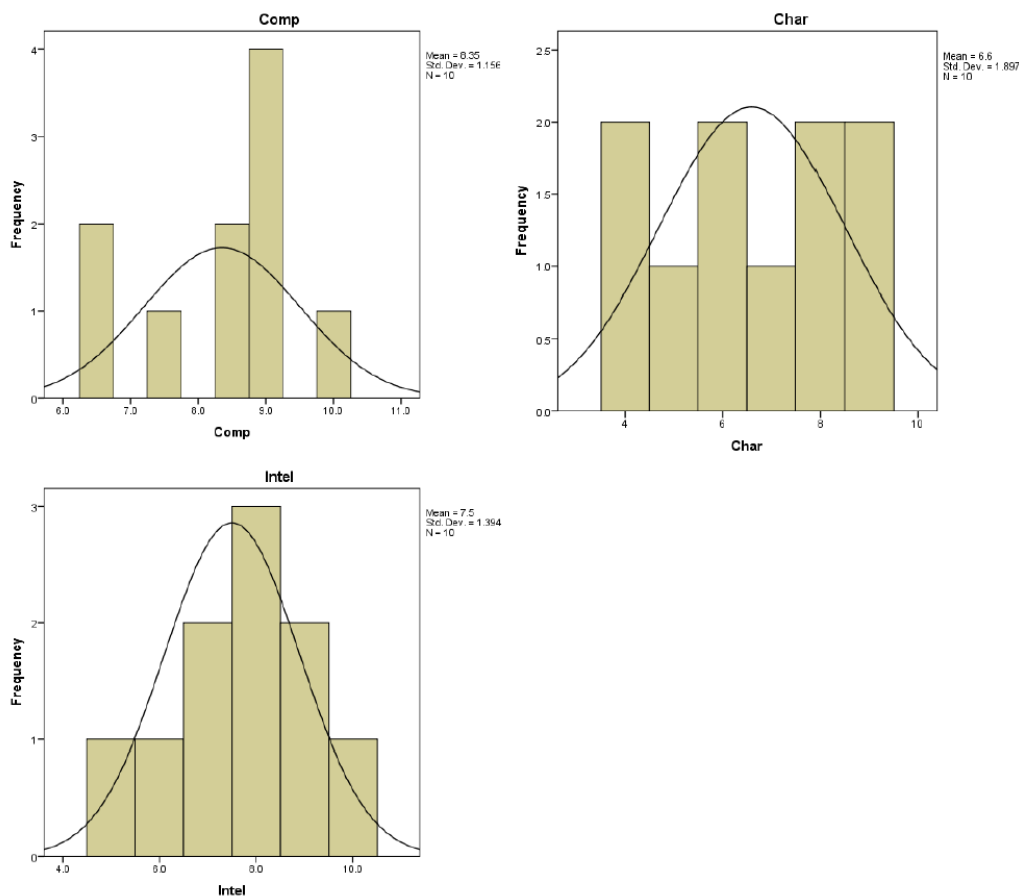
Eventually, the recommended hours should be only used for referential purpose. A follow-up empirical study can be conducted to pre-test and post-test the influence and effect of the time planning in an English immersive environment. Students should be categorized into a control group and an experimental group to see if there is a significant improvement on their English speaking competence in terms of comprehensibility and intelligibility. The idea could be practiced only to verify the influence of in-class instruction time and the English speaking competence because the off-class interactions are hard to control in an experimental environment.

APPENDIX A. HISTOGRAMS WITH NORMAL CURVES OF CONTACT HOURS IN THE NINE SCENARIOS AND MISCELLANEOUS SCENARIOS
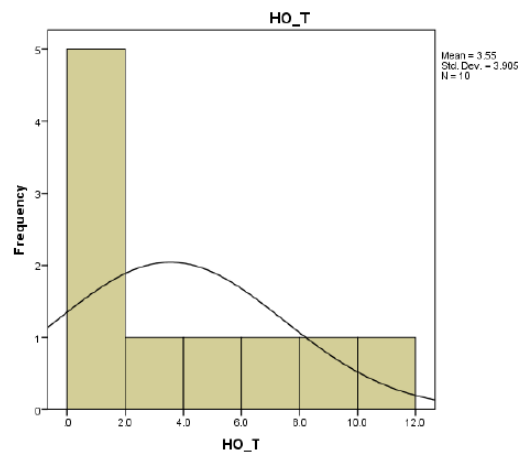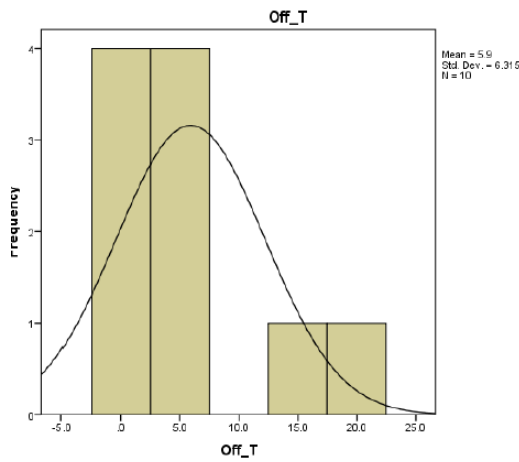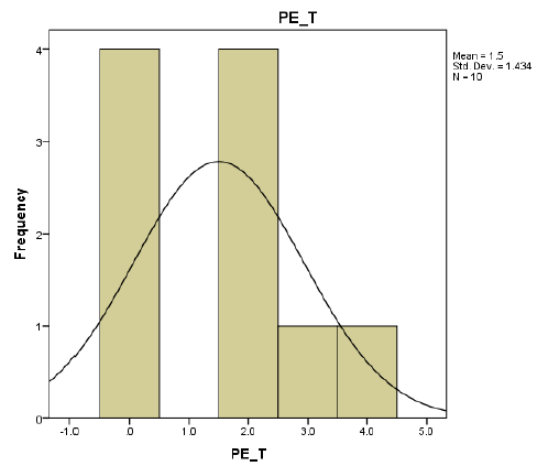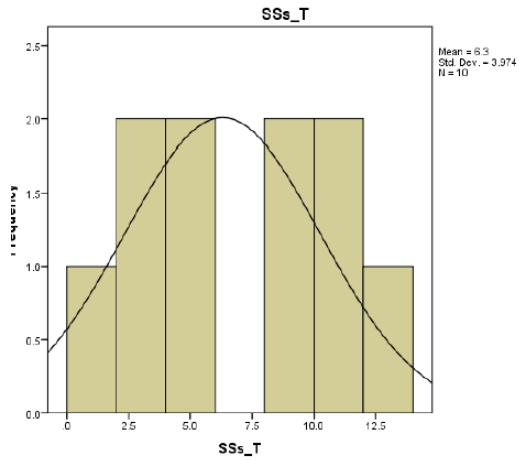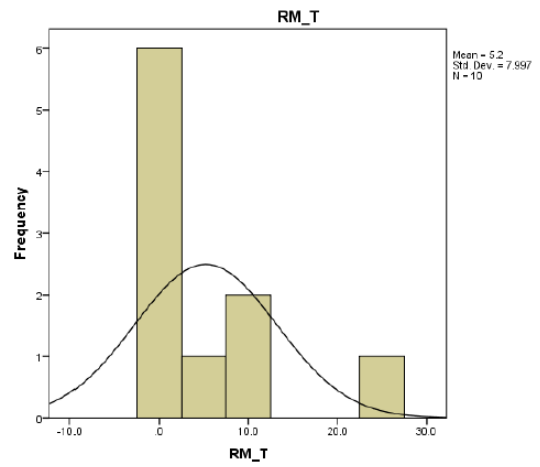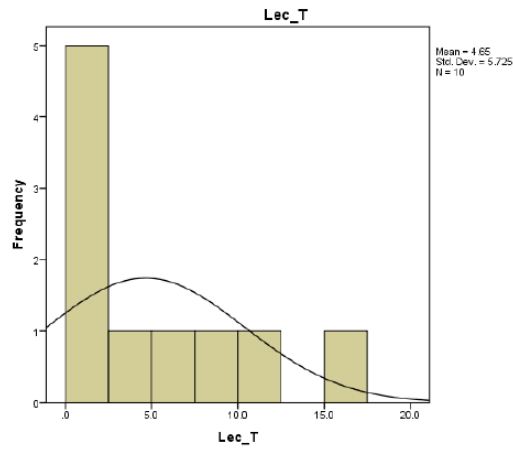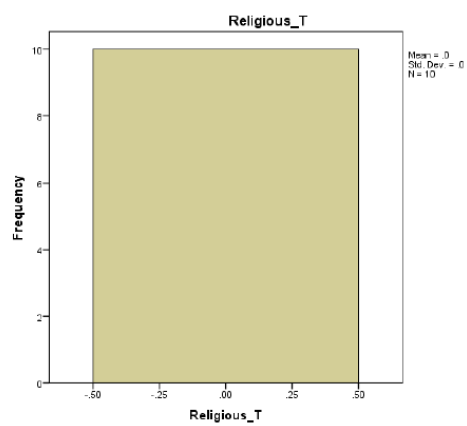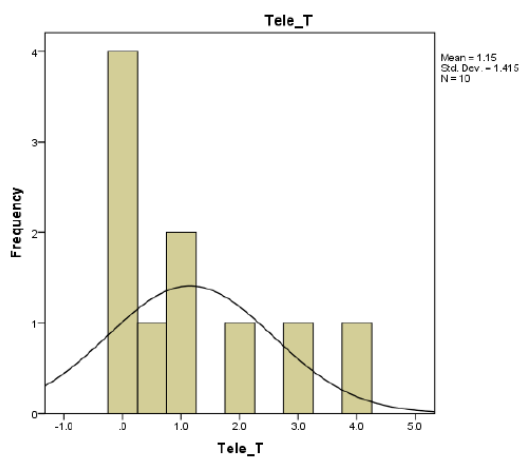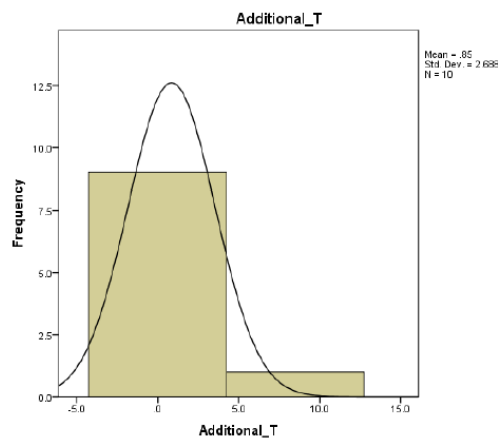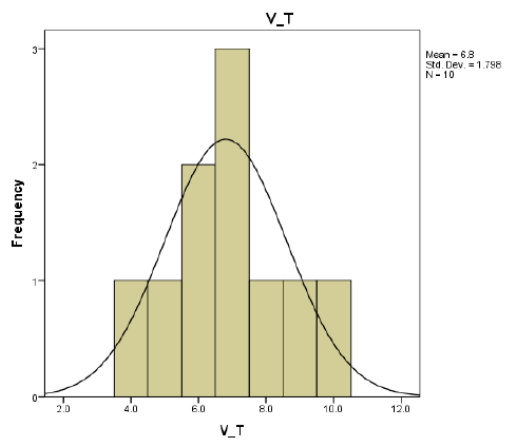
APPENDIX B. HISTOGRAMS WITH NORMAL CURVES OF COMPREHENSIBILITY, INTELLIGIBILITY AND CHARACTERISTICS

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