
| RESEARCH ARTICLE

A Corpus-based Study on the Oral Logico-semantic Meaning-makings of Chinese EFL learners

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| ABSTRACT

Logico-semantics is an important grammatical resource for assessing a language user's meaning potential for clause complexing in Systemic Functional Linguistics. This study intends to explore the logico-semantic features on the part of Chinese EFL learners in speaking based on a corpus approach. The findings are indicative that extending is the most frequently used logico-semantic type, and elaboration is the least by Chinese EFL learners. Chinese EFL learners tend to use logical conjunctions more frequently than English native speakers, which the overuse of elaboration and extending reflects Chinese EFL learners' lack of KAL (Knowledge About Language) about written and spoken discourse and neglect of structural roles logico-semantic relations play. The study also shows that Chinese EFL learners at lower English levels use logical conjunctions more frequently than those at higher levels, which is attributed to the growth in the use of grammatical metaphors. The findings call for further research into the oral logico-semantics by Chinese EFL learners and expect to provide insights into pedagogical implications for teaching spoken English.

| KEYWORDS

Logico-semantics; Chinese EFL learners; spoken English; corpus-based study

| ARTICLE INFORMATION

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1. Introduction

Systemic Functional Linguistics (SFL) regards clauses as the central unit for grammar in meaning making. Clauses can be used independently, while they can also be linked to one another by means of logico-semantic relation to form clause complexes, representing sequences of figures (or moves) as textually related messages (Halliday and Matthiessen 2014: 428). The logico-semantic relations between clauses are thus significant to evaluate a speaker's capacity for organizing discourse (Rigaudeau-Mckenna 2005), which can indicate whether the language speaker is able to express or achieve coherence across intricately related thoughts (Halliday 1985, 1994; Halliday and Matthiessen 2014, 2004; Thompson 2014; Butt, Fahey, Feez, Spinks and Yallop 2000; Eggins 2004).

Numerous studies on logico-semantics to date have been carried out with concerns mainly about the logico-semantic distributions in different text types, especially English abstracts or essays written by learners (Rukmini 2010; Farrokhi and Ghandkaran-Shotorban 2014; Sulistyaningrum and Rasyid 2015; Juniar 2018; Ngongo 2018; Kurnia et al. 2020; Allagbé et al. 2021). In addition, some studies have been focused on the relationship between the use of logical markers and English writing quality or proficiency (Xu 2000; Chen 2002; Mo 2005; Song and Xia 2002; Bai 2021) and on the difference between the use of logical markers in writings by EFL and native English speakers (Milton and Tsang 1993; Granger and Tyson 1996; Altenberg and Tapper 1998; Luo 2003; Zhao 2003; Pan and Feng 2004; Deng 2006; Cheryl 2006; Liu 2008). Few studies have ever drawn attention to logico-semantic relation or logical markers in spoken English, which is also an important indicator impacting the production and comprehension of spoken language.

2. Literature Review

Dealing with logico-semantic relation, Halliday and Matthiessen (2014) map out the LOGICO-SEMANTIC TYPE system, which consists of two primary types, that is, expansion and projection, as Figure 1. shows.

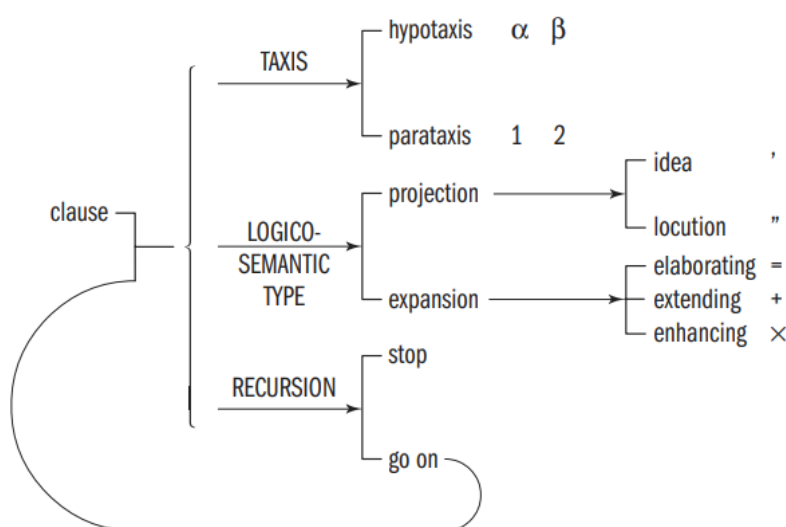


Figure 1. The systems of clause complexing (Halliday and Matthiessen 2014)

Expansion refers to the logico-semantic relation in which the secondary clause expands the primary clause by means of elaborating it, extending it or enhancing it. In elaboration, one clause elaborates on the meaning of another by further specifying or describing it, which involves three sub-types: exposition, exemplification and clarification. In extension, one clause extends the meaning of another by adding something new to it, and the added can be an addition, a replacement or an alternative, which includes three sub-types: addition, variation and alternation. In enhancement, one clause enhances the meaning of another by incorporating circumstantial features by reference to time, place, manner, cause or condition. It includes four sub-types: temporal, spatial, manner and causal-condition.

Projection refers to the logico-semantic relation in which the secondary clause is projected through the primary clause, which makes it a locution in a verbal clause of saying or an idea in a mental clause of sensing. Compared with expansion, projection is considerably less frequently used (Halliday and Matthiessen 2014). Hence, this study, for the sake of exploring the oral logico-semantics of Chinese EFL learners, only focuses on the logico-semantic type of expansion.

Based on numerous studies conducted to explore the logico-semantic types deployed in English essays or abstracts (Rukmini 2010; Farrokhi and Ghandkaran-Shotorban 2014; Juniar 2018; Ngongo 2018; Kurnia et al. 2020; Nguyen et al. 2020; Allagbé et al. 2022), logico-semantic relation is found to be of great significance in determining the coherence and cohesiveness of the text (Ngongo 2018). Considering the taxi system, hypotaxis is used more frequently than parataxis in undergraduate students' English theses writing text and IELTS sample essays (Ngongo 2018; Nguyen et al. 2020), which is contrary to Kurnia et al. (2020)'s findings that researchers tended to use more parataxis than hypotaxis in research articles. In addition, in logico-semantic types, expansion is used more frequently than projection (Ngongo 2018). Enhancement is the most frequently logico-semantic type of expansion in research article abstracts (Farrokhi and Ghandkaran-Shotorban 2014) and analytical expositions by English learners (Juniar 2018). These studies attach importance to the major logico-semantic types but haven't fine-grainedly explored the sub-types of logico-semantics such as apposition, exemplification and so on.

In addition, studies on logical conjunctions are also extensively carried out, exploring the relationship between the use of logical conjunctions and writing quality or proficiency (Xu 2000; Chen 2002; Mo 2005; Song and Xia 2002; Bai 2021) as well as the difference in the use of logical conjunctions in writing by EFL and native English speakers (Milton and Tsang 1993; Granger and Tyson 1996; Altenberg and Tapper 1998; Luo 2003; Zhao 2003; Pan and Feng 2004; Deng 2006; Cheryl 2006; Liu 2008). Bai (2021) investigated the potential relationship between English majors' explicit logical connection awareness of English texts and their English writing proficiency, pointing out that explicit logical connection awareness has a significant correlation with English writing proficiency. In addition, taking corpus as research, through comparing compositions written by EFL with those written by native English speakers,

the use of logical connectors was found to be problematic for foreign language learners (Altenberg and Tapper 1998; Pan and Feng 2004; Luo 2003). Granger and Tyson (1996) also found that French English learners did not overuse logical conjunctions, which is contrary to Luo (2003), who carried out a contrastive study on the use of adverbial conjuncts in linguistic papers written by advanced English learners and native speakers, finding that the learners tended to employ more logical conjunctions than the native speakers. Though studies on logical conjunctions concern the specific logical conjunctions and particular types they belong to, they pay much attention to English learners' written compositions and less attention to spoken discourse. Moreover, most studies are based on Halliday and Hasan (1976), with a focus on the cohesion of text instead of clause complexes.

All in all, enormous studies into logico-semantics are carried out to focus on written English, few with attention to logico-semantics in English speaking. Moreover, in the aspect of spoken English, research on spoken second language has largely focused on spoken English fluency, accuracy and complexity (Zhang and Wu 2001; Zhou 2002; Polat and Kim 2014; Yu 2020; Yu, Peng and Zhou 2020; Liu and Ming 2020), as well as vocabulary (Zhen 2005; Wen 2006) as well as spoken chunks in English (Xu and Xu 2007; Wei 2007; Zhang 2004; Ding and Qi 2005; DeCock 1998; Qi 2010; Ding and Qi 2011). Few studies concern oral logico-semantics, not to mention productive studies on oral logical-semantics of Chinese EFL learners. Therefore, the current study seeks to study the features of logico-semantic meaning makings by Chinese EFL learners in speaking, hoping that it can contribute to existing knowledge of logico-semantics and provide insights into pedagogical implications for teaching spoken English in China.

3. Methodology

3.1 Research Questions

This study, taking a corpus-based method, aims to investigate the oral productive logico-semantics characteristic of Chinese EFL learners with reference to native speakers. That is, this study intends to firstly describe the logico-semantic types and frequencies by Chinese EFL learners and native speakers in spoken English and then, through cross-sectional comparison with native speakers, explore their distinctive features of logico-semantic types. Thus, this study mainly answers the following two questions:

1. What are the discursive features of logico-semantic types in the spoken discourse of Chinese EFL learners and native speakers?
2. What are the distinctive, productive features of logico-semantic types in spoken English by Chinese EFL learners in terms of grouping dimension and English levels compared with native speakers?

3.2 Corpus Introduction

Speaking ability is one of the basic skills in English and an important indicator of English proficiency (Wang and Yu 2011). Test for English Majors-Band 4 (TEM-4) Oral and Band 8 (TEM-8) Oral, as important means of testing the learning outcomes and skills of Chinese EFL learners in English speaking, are the main English oral tests in China. In the study, talking on a given topic in high-stake TEM-4 Oral and TEM-8 Oral were collected as the corpus to construct two learner corpora, named CTEM-1 and CTEM-2, respectively. The CTEM-1 is made up of the transcripts of the TEM-4 Oral Examinations taken by about 200 second-year English majors each year from 1999 to 2002, which contains 14,187 types and 253,171 tokens. The CTEM-2 is composed of the transcripts of the TEM-8 Oral Examinations taken by about 180 senior English majors in each year from 2003 to 2006, which contains 10,315 types and 193,096 tokens, as Table 1. shows.

Table 1. Corpus information of Corpus CTEM-1 and CTEM-2

Corpora	Level	Grade	Year	Topic	Corpora Size
CTEM-1	TEM4	grade 2	1999	one of your experiences in which you had a burning desire to learn something	62,685
	TEM4	grade 2	2000	the unforgettable birthday party you've ever had	62,270
	TEM4	grade 2	2001	a teacher of yours whom you find unusual	64,125
	TEM4	grade 2	2002	an embarrassing situation in which you got very angry	64,091
Total					253,171

	TEM8	grade 4	2003	spaceship Columbia shuttle accident	63,956
	TEM8	grade 4	2004	China's employment market challenged by more graduates	74,338
CTEM-2	TEM8	grade 4	2005	suggestions for the 2008 Beijing Olympics	54,802
	TEM8	grade 4	2006	should firecrackers and fireworks be allowed during the Spring Festival?	49,816
				Total	193,096

For the sake of fleshing out the productive situations of Chinese EFL learners' logico-semantics, a corpus about native speakers is taken from the Michigan Corpus of Academic Spoken English. We selected transcripts from the corpus by choosing "speaker attributes" as "native speaker, American English" and "transcript attributes" as "mostly monologue". In order to ensure the consistency of the size of these corpora, we randomly chose 20 transcripts and named as MICASE-1, which contains 207 532 tokens, and the detailed corpus information for each is shown below in Table 2.

Table 2. Corpus information of Corpus MICASE-1

	Topic	Corpora Size
1	Statistics in Social Sciences Lecture	16,748
2	Honors Intro Psychology Lecture	5,843
3	Graduate Population Ecology Lecture	5,369
4	Professional Mechanical Engineering Seminar	13,180
5	Historical Linguistics Lecture	12,841
6	Graduate Industrial Operations Engineering Lecture	11,098
7	American Literature Lecture	16,104
8	Labor Economics Lecture	12,560
9	Intro Programming Lecture	8,094
10	Twentieth Century Arts Lecture	6,246
11	Fantasy in Literature Lecture	13,545
12	Graduate Macroeconomics Lecture	8,736
13	Media Impact in Communication Lecture	9,900
14	Intro Communication Lecture	9,805
15	Structure and Reactivity II Lecture	4,622
16	Intro to Biochemistry Lecture	11,788
17	General Ecology Lecture	6,932
18	Race and Human Evolution Lecture	11,366
19	Intro Anthropology Lecture	11,653
20	History of the American Family Lecture	11,102
	total	207,532

3.3 Research Procedure

For data concordance, logical conjunctions are selected in this study in terms of Halliday and Matthiessen (2014: 463, 471, 477), as Table 3. shows. Then, the software AntConc 3.4.4 is drawn to concordance the logical conjunctions in the three corpora. As LOGICO-SEMANTIC TYPE system in Halliday's Functional Grammar discusses the relationships between clauses, we manually deleted concordance lines which do not connect clauses with conjunctions and checked different types of logico-semantic relations.

Table 3. Logical conjunctions

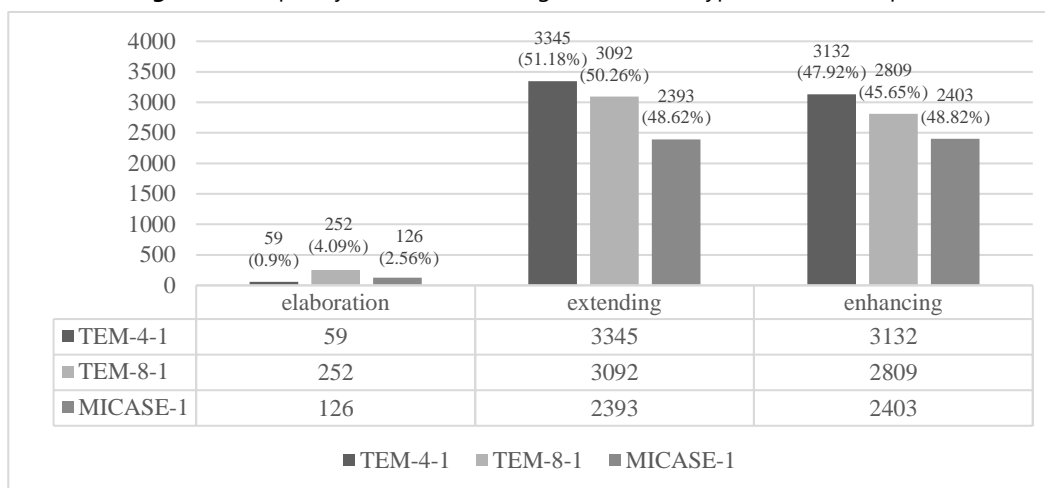
logico-semantic types	sub-types	Logical conjunction
elaboration	exposition	in other words, that is to say, namely
	exemplification	for example, for instance, in particular
	clarification	in fact, actually, indeed, at least
extending	addition	(both...) and, not only...but also, while, whereas, besides, apart from, as well as, (neither...) nor, but, (and)yet, however, furthermore. on the other hand, in addition, without
	variation	but not, not...but, instead of, rather than, only, except, except that, except for, other than
	alternation	(either...) or
	temporal	meantime, as, while, in (the course/process of), when as soon as, the moment, on, whenever, every time, (and)then, after, since, before, until/till
enhancing	spatial	and there, as far as, where, wherever, everywhere
	manner	by (means of), as if, like, the way, as
	causal-condition	(and) so, so, therefore, for, because, as, seeing that, considering, with, through, as a result, because of, in case of, in order that, so that, in order to, to, so as to, for the sake of, with the aim of, for fear of, if, provided that, as long as, in the event of, unless, but for, without, even though, even if, although, while, despite, in spite of, since

In data analysis, qualitative research and quantitative methods are combined in this study. Through corpora and AntConc, the study firstly describes the frequency distribution of logico-semantic types used by Chinese EFL learners in order to justify relevant distinctions. Moreover, the study makes a cross-sectional comparison of productive features between Chinese EFL learners and native speakers through Chi-square tests in order to justify whether there are significant differences in the use of logico-semantics among the three corpora, with 95% as the critical level of significance ($p < 0.05$). Then, the study discusses the possible reasons for the difference with reference to relevant studies.

4. Results

4.1 General Distribution of Logico-semantic types

After manual classifying and filtering, we normalize the logico-semantic frequencies as frequency per 10,000 words. The overall frequencies of logico-semantic types in the three corpora used by Chinese EFL learners and native speakers in speaking are shown below. See Figure 2.

Figure 2. Frequency Distribution of Logico-semantic Types in Three Corpora

As can be seen, extending, enhancing and elaboration account for 51.18%, 47.92% and 0.9%, respectively, in CTEM-1, and account for 50.26%, 45.65% and 4.09%, respectively, in CTEM-2. In MICASE-1, the frequency distribution of enhancing, extending and elaboration account for 48.82%, 48.62% and 2.56%, respectively. It is shown that the logico-semantic type extending occurs most frequently in the three corpora, while elaboration occurs least frequently.

In addition, the overall frequency of logical conjunctions employed in the three corpora shows a trend that among the three corpora and three English levels, the frequency of elaboration increases first and then decreases and that both extending and enhancing decrease continuously. That is to say, with the improvement in the English levels, the frequency of logical conjunctions decreases, especially the logical conjunctions of extending and enhancing. The finding also shows the use of logical conjunctions is correlated with English proficiency, which is in line with Xu (2004).

Then, to explore the more delicate sub-types of logico-semantic types, the study also counts the frequency of 10 sub-types, including exposition, exposition, clarification, addition, variation, alternation, temporal, spatial, manner, and cause-condition, as shown below.

Table 4. Frequency Distribution of Logico-semantic Sub-types

logico-semantic relations	sub-types	CTEM-1			CTEM-2			MICASE-1		
		Freq _{raw} ^a	Freq _{norm} ^b	%	Freq _{raw} ^a	Freq _{norm} ^b	%	Freq _{raw} ^a	Freq _{norm} ^b	%
elaboration	exposition	6	2	0.04%	27	14	0.23%	61	29	0.60%
	exemplification	39	15	0.24%	216	112	1.82%	63	30	0.62%
	clarification	104	41	0.63%	243	126	2.05%	137	66	1.34%
extending	addition	8448	3337	51.05%	5862	3037	49.36%	4414	2128	43.23%
	variation	17	7	0.10%	95	49	0.80%	25	12	0.24%
	alternation	3	1	0.02%	12	6	0.10%	255	123	2.50%
enhancing	temporal	3533	1396	21.35%	1456	754	12.26%	1037	500	10.16%
	spatial	68	27	0.41%	107	55	0.90%	288	139	2.82%
	manner	151	60	0.91%	319	165	2.69%	289	139	2.83%
	cause-condition	4178	1650	25.25%	3540	1834	29.81%	3371	1625	33.02%
Total		16547	6536		11877	6152		10210	4921	

^a Raw frequency

^b Normalized frequency (per 10,000 words)

As is shown in Table 4., in both the learner corpora and native speaker corpus, clarification is the most frequently used subtype of elaboration, while exposition is the least frequently used. As for extending, addition is the most frequently employed subtype,

while alternation is the least frequently employed. As for enhancing, cause-condition is the most frequently used sub-type, while spatial is the least frequently used sub-type. It is shown that in terms of subtypes of three major types, Chinese EFL learners and English native speakers are consistent in their preference for the use of logico-semantic types in speaking.

In the 10 sub-types of logico-semantic relations, the frequency of logico-semantic subtypes used in CTEM-1 in ascending order is alternation, exposition, variation, exemplification, spatial, clarification, manner, temporal, cause-condition, addition, with alternation accounting for the least (0.02%) and addition accounting for the most (51.05%). The frequency of logico-semantic subtypes used in corpus CTEM-2 in ascending order is alternation, exposition, variation, spatial, exemplification, clarification, manner, temporal, cause-condition, and addition, with alternation accounting for the least (0.1%) and addition accounting for the most (49.36%). The frequency of logico-semantic subtypes used in corpus MICASE-1 in ascending order is variation, exposition, exemplification, clarification, alternation, spatial, manner, temporal, cause-condition, and addition, with variation accounting for the least (0.24%) and addition accounting for the most (43.23%).

It can be seen that whether for Chinese EFL learners or native speakers, addition is the most frequently used logico-semantic subtype in speaking. As shown in Table 5, the top 10 most used logical conjunctions “and”, “but”, and “then” all express the logico-semantic relation of addition. However, alternation appears least frequently in learner corpora, with 1 time and 6 times, respectively, while variation appears least frequently in native speaker corpus, with 12 times. Chinese EFL learners are found to have little tendency to deploy the logico-semantic type of alternation in speaking.

Furthermore, Table 5. indicates that except logical conjunction “for example”, all of the top 10 logical conjunctions belong to extending and enhancing, which proves that both English learners and native English speakers tend to use logical conjunctions, showing the relation of extending and enhancing in English speaking, for both English learners and English speakers, logical conjunctions “and”, “so”, “but”, “when”, “because”, and “as” showing the relation of manner are the frequently employed logical conjunctions. The findings are partly in line with Wu (2012), who pointed out that “and”, “but”, and “because” belong to the top 10 most frequently used logical conjunctions in Chinese students’ and American’ writings. It is worth mentioning that logical conjunctions “for example”, “at least”, “in fact”, “however”, which belong to the top 10 most frequently used logical conjunctions in writing, do not correspond to the top 10 logical conjunctions in speaking, which demonstrates that there lie mismatches between the use of logical conjunctions in writing and speaking by both English learners and native English speakers. For instance, “however” is extensively used in writing but less frequently used in speaking since English speakers tend to employ “but” to embody the relation of adversative addition.

Table 5. The top 10 Most Frequently Used Logical Conjunctions

rank	CTEM-1			CTEM-2			MICASE-1		
	logical conjunction	Freq _{raw} ^a	Freq _{norm} ^b	logical conjunction	Freq _{raw} ^a	Freq _{norm} ^b	logical conjunction	Freq _{raw} ^a	Freq _{norm} ^b
1	(both...) and	6404	2530	(both...) and	4323	2239	(both...) and	3259	1568
2	so	2610	1031	so	1936	1003	so	1626	782
3	when	2364	934	but	1085	562	but	1041	501
4	but	1919	758	because	976	506	if	969	466
5	because	1262	498	when	913	473	when	445	214
6	(and)then	367	145	as	314	163	because	411	198
7	after	300	119	for example	215	111	(and)then	290	139
8	before	150	59	although	180	93	(either...) or	255	123
9	since	114	45	however	164	85	where	226	109
10	as	111	44	so that	146	76	as	168	81

^a Raw frequency

^b Normalized frequency (per 10,000 words)

4.2 Distinctive Features of Logico-semantic Types Used by Chinese EFL Learners in the Grouping Dimension

The study takes the corpus MICASE-1 as the reference, exploring the difference between Chinese EFL learners and English native speakers in using logico-semantics in speaking. To investigate the difference between the three corpora in the use of logico-semantic types, the Chi-square test shows that there are significant differences (Pearson Chi-Square= 2506.875, Sig=0.000) among the frequency of logico-semantic types in the three corpora. In order to clarify whether there is some significant difference between

Chinese EFL learners at two English levels and native English speakers in using logico-semantics in speaking, the Chi-square Calculator is used, and the results are as follows. See Table 6. and Table 7.

Table 6. Difference Between CTEM-1 and MICASE-1

logico-semantic relations	sub-type	CTEM-1	MICASE-1	Difference
elaboration	exposition	6	61	-55***
	exemplification	39	63	-24***
	clarification	104	137	-33***
	total	149	261	-112***
extending	addition	8448	4414	4034***
	variation	17	25	-8
	alternation	3	255	-252***
	total	8468	4964	3504***
enhancing	temporal	3533	1037	2496***
	spatial	68	288	-220***
	manner	151	289	-138***
	cause-condition	4178	3371	807
	total	7930	4985	2945***
	Total	16547	10210	6337***

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 7. Difference Between CTEM-2 and MICASE-1

logico-semantic relations	sub-type	CTEM-2	MICASE-1	Difference
elaboration	exposition	27	61	-34**
	exemplification	216	63	153***
	clarification	243	137	106***
	total	486	261	225***
extending	addition	5862	4414	1448***
	variation	95	25	70***
	alternation	12	255	-243***
	total	5969	4964	1005***
enhancing	temporal	1456	1037	419***
	spatial	107	288	-181***
	manner	319	289	30*
	cause-condition	3540	3371	169***
	total	5422	4985	437***
	Total	11877	10210	1667***

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

As shown in Table 6 and Table 7, in terms of the total frequency of logical semantic types used in the three corpora, Chinese EFL learners tend to use logical conjunctions more frequently than English native speakers. As for the three major logico-semantic types, all of them show significant differences between Chinese EFL learners and native speakers. The frequency of extending and enhancing in CTEM-1 is significantly more frequent than that in MICASE-1 ($p < 0.001$ ***), while the frequency of elaboration in CTEM-1 is significantly less frequent than that in MICASE-1. In addition, the frequency of elaboration, extending and enhancing in CTEM-2 is significantly more frequent than that in MICASE-1.

Moreover, among sub-types of elaboration, exposition, clarification and exemplification are significantly less frequently used in CTEM-1 than that in MICASE-1, while exposition is significantly less frequently used in CTEM-2 than that in MICASE-1 and exemplification and clarification are significantly more frequently used in MICASE-1. Among sub-types of extending, the frequency of addition is significantly higher in CTEM-1 and CTEM-2 than that in MICASE-1, while the frequency of alternation is significantly lower in CTEM-1 and CTEM-2 than that in MICASE-1. There is no significant difference found in variation between CTEM-1 and MICASE-1. Furthermore, among sub-types of enhancing, the frequency of temporal is significantly higher in CTEM-1 and CTEM-2 than that in MICASE-1, while the frequency of spatial is significantly lower in CTEM-1 and CTEM-2 than that in MICASE-1. There is no significant difference in the use of the logico-semantic type of manner in CTEM-2 and MICASE-1, while the logico-semantic type of manner is significantly less used in CTEM-1. In terms of cause-condition, there is no difference between CTEM-1 and MICASE-1, while it is significantly more frequently used in CTEM-2 than in MICASE-1.

4.3 Distinctive Features of Logico-semantic Types Used by Chinese EFL learners in English Levels

Corpus CTEM-1 and corpus CTEM-2 represent two English levels, which signify two different proficiencies of English. Numerous studies have tried to investigate the relationship between the use of logical conjunctions in writing and English proficiency (Xu 2000; Chen 2002; Mo 2005; Song and Xia 2002; Bai 2021). This study attends to the difference between English majors at two different levels in using logical conjunctions in speaking. The frequency distribution and Chi-square test results are shown in Table 8.

Table 8. Difference in the Logico-semantic Types in CTEM-1 and CTEM-2

logico-semantic relations	sub-type	CTEM-1			CTEM-2			Difference
		Raw	Standard	Percentage	Raw	Standard	Percentage	
elaboration	exposition	6	2	0.04%	27	14	0.23%	-21***
	exemplification	39	15	0.24%	216	112	1.82%	-177***
	clarification	104	41	0.63%	243	126	2.05%	-139***
	total	149	59	0.90%	486	252	4.09%	-337***
extending	addition	8448	3337	51.05%	5862	3037	49.36%	2586***
	variation	17	7	0.10%	95	49	0.80%	-78***
	alternation	3	1	0.02%	12	6	0.10%	-9**
	total	8468	3345	51.18%	5969	3092	50.26%	2499***
enhancing	temporal	3533	1396	21.35%	1456	754	12.26%	2077***
	spatial	68	27	0.41%	107	55	0.90%	-39***
	manner	151	60	0.91%	319	165	2.69%	-168***
	cause-condition	4178	1650	25.25%	3540	1834	29.81%	638***
	total	7930	3132	47.92%	5422	2809	45.65%	2508***
Total	16547	6536		11877	6152			

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

As we can see in Table 8., to count the frequency of three major logico-semantic types used in corpus CTEM-1, elaboration appears 59 times (per 10,000 words), accounting for 0.9% in the total frequency of logico-semantic types; extending appears 3345 times, accounting for 51.18%; enhancing appears 3132 times, accounting for 47.92%. As for corpus CTEM-2, elaboration appears 252 times (per 10,000 words), accounting for 4.09% in the total frequency of logico-semantic types; extending appears 3092 times, accounting for 50.26%; enhancing appears 2809 times, accounting for 45.65%.

Firstly, as for elaboration, Table 8. shows that the frequency of exposition, exemplification and clarification in CTEM-1 is significantly less than that in CTEM-2 ($p < 0.001$ ***). Secondly, as for extending, the frequency of addition is significantly higher in CTEM-1 than that in CTEM-2 ($p < 0.001$ ***), while the frequency of alternation is found to be significantly less in CTEM-1 than that in CTEM-2. The frequency of variation does not show a significant difference between the two corpora. Thirdly, as for enhancing, the frequency of temporal and cause-condition is significantly higher in CTEM-1 than that in CTEM-2 ($p < 0.001$ ***), while the frequency of spatial and manner is significantly less in CTEM-1 than that in CTEM-2.

5. Discussion

5.1 KAL about spoken and written language in logico-semantic meaning making

From the perspective of grouping dimension, Chinese EFL learners tend to use logical conjunctions more frequently than English native speakers in speaking, which is consistent with Deng (2006), who draw the conclusion that Chinese EFL learners do not use logical conjunctions less frequently or with less variety than native speakers in their writing. Instead, in most cases, they employ logical conjunctions more frequently than native speakers.

As for the three major logico-semantic types, Chinese EFL learners at lower levels tend to use logico-semantic type of elaboration less frequently than native English speakers in speaking, while Chinese EFL learners at higher levels tend to use logical conjunctions of elaboration more frequently than native English speakers. With respect to the overuse of logical conjunctions of elaboration, the research finds that logical conjunction "for example" is more frequently employed by Chinese EFL learners in speaking, which is consistent with Pan and Feng (2004) and Wu (2012), who found that "for example" was one of the top ten most frequently used logical conjunctions by Chinese EFL learners in writing. However, instead of the logical conjunction "for example", native English speakers are more likely to use the noun "example" to express exemplification.

(1) Foragers are generally bands composed of family members, so people have prescribed tasks within the band, and that's an example of a kin-ordered mode of production. (MICASE-1)

(2) Let me give you an example of that. (MICASE-1)

In examples (1) and (2), it can be found that native English speakers tend to deploy the clauses "that's an example of ..." and "give an example of ..." to replace "for example" in speaking, which instantiates the feature that by the spoken language, the unit of organization is the clause (Halliday 2008) and that compared with written discourse there are more short and congruent clauses in speaking to achieve efficiency of communication (Chen and Li 2005). Furthermore, the findings provide more evidence for the claim that there is a stylistic uncertainty in the use of logical conjunctions by Chinese EFL learners (Deng 2006). Spoken language is rather explicit in showing the semantic relationships among its various components involving grammatical intricacy, while written language is implicit with lexical density (Halliday 2008). Some Chinese EFL learners fail to differentiate spoken English from written English, treating spoken English as a replica of the written form, thus leading to the overuse and underuse of some logical conjunctions. They lack language awareness, which refers to a person's sensitivity to and conscious awareness of the nature of language and its role in human life' (James and Garrett 1992), and it is also called knowledge about language (KAL).

5.2 Neglect of structural roles by logico-semantics

As for the logico-semantic sub-types of extending, Chinese English learners tend to overuse logical conjunctions of addition but underuse alternation. As for addition, "and" and "but" are the most frequently used logical conjunctions by both Chinese EFL learners and native English speakers in speaking, but Chinese EFL learners use them significantly more frequently than native English speakers. The overuse of "and" confirms the conclusion of Chen (2002) that Chinese EFL learners often ambiguously use logical conjunction "and" in writing, thus making it difficult to identify the logico-semantic relation between the clauses. The same phenomenon also happens in speaking. Logical conjunction "and" is deemed as the first choice by Chinese EFL learners when they do not know which logical conjunction is appropriate in interaction.

(3) That has a very important meaning, and so I think our city should lifted the ban. (CTEM-2)

(4) The air has been badly polluted, and if we still fire some fireworks during the festival, the air will be even worse. (CTEM-2)

Examples (3) and (4) show that even in clause complexes connected by the relation of cause-condition, Chinese EFL learners are inclined to use "and", which is considered to be redundant and misused. It can also demonstrate that Chinese EFL learners lack logical connection awareness, which is the ability and awareness to actively use logical conjunctions to make logico-semantic connections between sentences or paragraphs and between clauses in clause complexes in English (Bai 2021). That is to say, in order to pursue cohesion at the level of text, the logico-semantic relations between clauses are ignored structurally. In other words, logical conjunctions are used between clauses that do not express that logico-semantic relation in order to achieve ostensible discourse cohesion and coherence.

5.3 Diversity and negative transfer of native language in logico-semantic meaning making

As for the logico-semantic sub-types of enhancing, Chinese EFL learners tend to overuse logical conjunctions, showing the relation between temporal and underuse logical conjunctions of spatial. Considering the diversity of logical conjunctions, native speakers

show more diversity, but Chinese EFL learners are inclined to depend on a few logical conjunctions. "When" and "then" are the most frequently used logical conjunctions by both Chinese EFL learners and native English speakers, while the former one uses "when" more frequently than the latter one because native English learners use "as" rather than "when" to show the logico-semantic relation of temporal, with 37 times by Chinese EFL learners and 110 times by native English speakers. The overdependence on logical conjunction "when" implies that of all the logical conjunctions realizing the same relation, Chinese EFL learners tend to depend on the most frequently used or familiar one no, matter in writing or speaking (Chen and Wu 2006; Luo 2003).

In addition, Chinese EFL learners at higher levels tend to overuse the logical conjunctions showing the relation of cause-condition, while there are no distinctions in the use of logical conjunctions of cause-condition between Chinese EFL learners at lower levels and native speakers. In terms of specific logical conjunctions, the overuse of "so" is also confirmed in the study focusing on English writing by Wu (2012), Pan and Feng (2004), Deng (2006), Luo (2003), and Zhao (2003), which is attributed to misuse in the two aspects. For one thing, some Chinese EFL learners use both "because" and "so" together to express causal relation which is influenced by negative transfer from mother tongue (Chen and Wu 2006), as shown in example (5). For another, Chinese EFL learners use "so" to connect the clauses which express addition or other relations, as shown in example (6). Chinese English EFL learners have become dependent on the logical conjunction "so" in speaking, which is more of a mantra than a way of expressing logico-semantic relations (Chen and Wu 2006).

(5) Because I can't go to school so, she told me the lessons in the hospital. (CTEM-1)

(6) I began to observe him. So I went to an educated man who has kept going to this corner for three years. (CTEM-1)

5.4 Logical metaphor

From the perspective of English levels, in general, Chinese EFL learners at lower levels use logical conjunctions more frequently than those at higher levels in speaking; the logical conjunctions used by Chinese English at lower levels are mostly limited to a few simple and common logical conjunctions (Xu 2003). Considering the three major logico-semantic types, Chinese EFL learners at lower levels tend to underuse logical conjunctions, signifying the logico-semantic relation of elaboration in speaking. Furthermore, in extending, Chinese EFL learners at the lower level are inclined to overuse logical conjunctions of addition but underuse the logical conjunctions of alternation. Logical conjunction "and" is significantly less frequently used by Chinese EFL learners at the higher level. Besides, in enhancing, Chinese EFL learners at lower levels tend to overuse logical conjunctions of temporal and cause-condition, which is consistent with Crowhurst (1987), who concluded that there were significant decreases in grades for causal and temporal logical conjunctions. In temporal, the frequency of logical conjunctions "when", "then", "after", and "before" by Chinese EFL learners at lower levels is significantly higher than that by Chinese EFL learners at higher levels. In cause-condition, the logical conjunction "so" and "because" is found to be significantly more frequently used by Chinese EFL learners at lower levels.

Learning a language means learning how to mean in that language, that is, learning the resources for making meaning in context (Matthiessen 2006). With the improvement of English level, Chinese EFL learners grasp more resources to make meaning, one of which is grammatical metaphor, a vital step in the path of language development (McCabe 2021) where logical relation is realized inside a clause rather than between clauses (Jin 2018; Halliday 1998). With the improvement of English proficiency, English learners have the tendency to use verbalization inside a clause to express logico-semantic relations instead of using logical conjunctions between clauses. For example, the verb phrases "lead to" and "result in" are used to reflect cause-effect relationships. Chinese EFL learners at higher levels get a better grasp of these verbalizations and put them into practice in speaking, reducing the use of logical conjunctions to some extent.

6. Conclusion

The study, taking a corpus-based method, explores the discursive and distinctive features of logico-semantic types employed by Chinese EFL learners in speaking. It draws the following conclusions: 1) in general, extending is the most frequently used logico-semantic type, and elaboration is the least frequently used logico-semantic type by both Chinese EFL learners and native speakers. 2) From the perspective of the grouping dimension, that is, Chinese EFL learners and native speakers, Chinese EFL learners tend to use logical conjunctions more frequently than English native speakers. There is a difference in the use of three major logico-semantic types between Chinese EFL learners and native speakers. 3) From the perspective of the English level, Chinese EFL learners at a lower English level use logical conjunction more frequently than those at a higher level. Learners at lower levels tend to overuse logical conjunctions of addition, temporal and cause-condition but underuse the logical conjunctions of exposition, exemplification, clarification, variation, spatial and manner in speaking.

As shown above, compared with native English speakers, Chinese EFL learners are found to misuse, underuse and overuse logical conjunctions in speaking, which is partly relevant to the stylistic uncertainty, English proficiency and other factors. In essence, it is rooted in the lack of daily practice by Chinese EFL learners. In order to develop advanced foreign language learners, "language in context" is rather important (Matthiessen 2006). To cultivate oral logico-semantic ability is not to focus on the logical conjunctions themselves but to employ them in context.

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