ELSEVIER

WCPCG-2010

Quantitative usage of logical connectors in Iranians' EFL Essay writing and logical and linguistic intelligences

Ali Rahimi[a], Jamal-addin Qannadzadeh[b] *

[a] English Departemant, University of Kashan, Kashan 8731751167, Iran
[b] University of Kashan, Kashan 8731751167, Iran

Abstract

The role of logical/mathematical intelligence in SL writing has not clearly been discovered, and linguistic intelligence is claimed to be the key factor responsible for SL skills. This study attempts to investigate the relationship between quantitative usage of logical connectors, in terms of both token and type, in Iranians' EFL essay writing and their logical/mathematical and linguistic intelligences. The required data was supplied from a corpus of 300 essay-type compositions written by 100 sophomore English major students, as well as an intelligence questionnaire. The findings revealed that EFL students with higher logical/mathematical intelligence tend to use more logical-connectors in their essay writing.
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Keywords: Logical connectors; Logical/mathematical intelligence; Linguistic intelligence; Multiple Intelligences; EFL essay writing

1. Introduction

SL learning, including the writing skill, would seem to be basically a linguistic process, and it clearly requires some degree of intelligence responsible for such developments. But someone with a highly developed intelligence, as measured by conventional IQ tests, is not necessarily a successful SL learner (Smith, 2001).

Gardner's (1983) theory of Multiple Intelligences (MI) offers a cognitive explanation for the differences in adult SL communicative competence, which the traditional perceptions of intelligence do not. Linguistic intelligence, according to MI theory, plays an essential part in the process of language learning and communication (Gardner, 1983). In addition, some other types of intelligence can also be influential in the process of SL learning (Smith, 2001). However, logical/mathematical intelligence failed to be noticed, as much as the others, in the mentioned regard. "There may be aspects of logical/mathematical intelligence involved in second language learning, but these are less apparent than the other intelligences" (Smith, 2001, p. 15).

The writer's usage of cohesive devices, including logical connectors, is one of the important parts of writing skill. Considering the terms "logical connectors" and "logical/mathematical intelligence", it seems that the application of

* Rahimi. + 98-913-309-9535; +98-361-591-2777
E-mail address: rahimijah@yahoo.com

logical connectors may somehow be related to the level of logical/mathematical intelligence of the writer, since both of them are attributed to logic in their names.

If it is discovered that such a relation does really exist, then the important matter will be the fact that, not only linguistic (and some other specified types of) intelligence, but logical/mathematical intelligence also should be taken into consideration, as long as developing writing skill and the required aptitudes are concerned.

The main interest of this study is to find out whether there is any relationship, in any way, between the quantitative usage of logical connectors in advanced EFL learners' writing and logical/mathematical intelligence of them, and that whether it is more or less significant than linguistic intelligence.

2. Previous Research

No single empirical study has been found in the existing literature with regard to the relationship between the usage of logical connectors in SL writing and any type of intelligence. Nor is there a piece of research concerning the relationship between logical/mathematical intelligence and any category of cohesive devices in SL writing. The closest studies to the present research are those that investigate the relationship between EFL writing, in general, and MI theory, as well as those that study logical connectors in EFL writing. The followings review empirical studies on these two topics.

2.1. Research into EFL Writing Regarding MI Theory

There have been several studies on SL learning and proficiency regarding multiple intelligences. However, it is hard to find a single empirical study on the relationship between EFL writing and MI theory. The only paper on such topic that was found in the online literature has been carried out by Marefat (2007).

Marefat (2007) made an attempt to discover whether there is any relationship between students' MI profile and their writing skill. The participants of her study consist of 72 EFL students taking the writing course with her. Marefat (2007) used the participant's average scores on three essays, as an index of writing ability. To identify the intelligence profile of the participants, Marefat (2007) made use of MacKenzie's (1999) questionnaire. According to her, regression analysis revealed that kinesthetic, existential, and interpersonal intelligences made the biggest contribution to predicting writing score (Marefat, 2007).

In her article, Marefat (2007) cited an unpublished master's thesis by Yeganehfar (2005) who investigated the relationship between multiple intelligences and EFL proficiency in each of the four language skills. The participants were 30 English major students, who were asked to take part in an IELTS test. The results demonstrated that the participants' writing skill significantly correlated with their linguistic and spatial intelligences (Yeganehfar, 2005 cited in Marefat, 2007).

The different results of the two studies above may imply that, at least, one of them lacks the required validity. Such discrepancies may also originate from different participants or methodologies.

2.2. Research into Logical Connectors in EFL Writing

One of the first studies on "logical connectors" in EFL Writing is the work of Crismore (1980). He examined EFL students' mastery of meaning and use in reading and composing of five formal logical connectors in English (moreover, accordingly, hence, even so, and still) across school level and class type. The participants were 100 remedial and non-remedial students from a high school, a vocational college, and a university who had been asked to give a synonym for each connector and to generate a compound sentence using the connector. The results showed that the proportion of synonym and sentence errors according to connector type and student class level was not significant (Crismore, 1980). However, the proportion of total errors made by all class levels and the proportion of unattempted items by connector type and class level, as claimed by Crismore (1980), were significant. The order of difficulty of the five connector types – from the least to most difficult – was 1) still and hence, 2) even so, 3) accordingly and moreover (Crismore, 1980). He concluded that "although the development of trend was indicated for acquiring control, the students, in general, had not mastered the connectors needed for literacy by the time they were in college" (Crismore, 1980, p. 1).

Milton and Tsang (1993) carried out a different study by a corpus analysis of logical connectors in writing of EFL students who enrolled at one of the tertiary institutions of Hong Kong. They selected 25 single-word logical connectors for concordancing. Milton and Tsang (1993) used some of the techniques of corpus linguistics and analysis to study the students' overuse of logical connectors in their writings, the phenomenon that, according to Milton and Tsang (1993), is "a particularly persistent and disconcerting characteristic" in Hong Kong EFL students' writing (p. 215).

One of the main findings of Milton and Tsang' (1993) study is the existence of a high ratio of overuse of the entire range of logical connectors in the students' writing compared with published English; however, according to them, the discernible differences in the occurrence of connectors in various native-speaker corpora suggest that the frequency of such discourse markers is subject to factors like genre and variety of English. As Milton and Tsang (1993) claimed, the findings supply more empirical evidence to the idea that the EFL writing of Hong Kong students is characterized by a specific pattern of connector usage.

In another study, Granger and Tyson (1996) used International Corpus of Learner English (ICLE) to find out whether there is an overuse of logical connectors by EFL French learners. They adopted a bottom-up approach which is claimed to be favored by the research methodology. The results, according to Granger and Tyson (1996), revealed no overuse of connectors, in general; however, strong evidence of both overuse and underuse of some particular connectors had been observed. Granger and Tyson (1996) concluded that "learners should not be presented with lists of 'interchangeable' connectors but instead taught the semantic, stylistic and syntactic behavior of individual connectors, using authentic texts" (p. 17).

In contrast to Granger and Tyson's (1996) findings, Altenberg and Tapper (1998), who did the same research with different participants, found that Swedish learners tended to underuse connectors, in general, in their English essay writing (cited in Narita, Sato, & Sugiura, 2004).

Bolton et al. (2002), as well, conducted a corpus-based study of logical connectors in student writing. Their research focused on usage of logical connector in the English essay writing of university students in Hong Kong and in Great Britain, and presented results based on the comparison of data from the Hong Kong component and the British component of the International Corpus of English (ICE). As Bolton et al. (2002) pointed out, the study confined itself to the analysis of underuse and overuse of logical connectors and was especially concerned with methodological issues relating to the accurate measurement of these concepts. The results has been claimed to show that "both groups of students – native speakers and non-native speakers alike – overuse a wide range of connectors", and no evidence of significant underuse had been observed (Bolton, Nelson, & Hung, 2002, p. 165). The results also indicated that the overuse of connectors is not limited to non-native speakers, but is a significant feature of students' writing, in general (Bolton, Nelson, & Hung, 2002).

A similar research was done to investigate the usage of logical connectors in EFL writing. In their paper, Narita et al. (2004) reported on their quantitative analysis of 25 logical connectors in advanced Japanese university students' essay writing and compared it with the usage in comparable types of native English writing. They also presented a brief comparison of the Japanese learners' usage of logical connectors with that of advanced French, Swedish and Chinese EFL learners (Narita, Sato, & Sugiura, 2004). As they reported, they had selected two sub-corpora of the ICLE project to obtain comparable data on the usage of the adopted logical connectors by advanced Japanese EFL learners and English native speakers. The findings showed that Japanese EFL learners significantly overuse the 25 logical connectors in sentence-initial position and significantly overuse such connectors as for example, of course, and first, while they significantly underuse such connectors as then, yet, and instead (Narita, Sato, & Sugiura, 2004).

In 2006, Cheryl made another attempt to explore the usage of the largest category of logical connectors, conjunctive adverbials, in two corpora complied by him: a learner corpus consisted of 23 final papers contributed by 10 MA TESOL students from Taiwan, and the control corpus containing 10 journal articles from two International TESOL journals. When the analysis was based on word level, the findings revealed that student writers do not overuse the connectors very much (Cheryl, 2006). However, he concluded that more training on connector usage is needed for non-native students of all proficiency levels.

Some of the above studies have focused on the analysis of patterns of connector usage in EFL writing to attain empirical evidence supporting their supposition that EFL learners tend to overuse logical connectors in their English essay writing. Although a few similarities can be observed among the results of some of the mentioned studies, the disagreements are far more noticeable. As mentioned earlier, in addition to the difference of the participants,

different and specific methodologies of the similar studies can lead to dissimilar results and make the findings hard to rely on. Because such methodologies, as asserted by Bolton et al. (2002), have a direct impact on:

> the validity and comparability of the results attained. The methodological inconsistencies of previous studies may well explain why the results presented in this study tend to directly contradict those obtained by previous researchers in Hong Kong (Bolton, Nelson, & Hung, 2002, p. 180).

3. The Present Study

3.1. Participants

One hundred participants were involved in the study, based upon a convenience sampling procedure due to availability and practicality reasons. They were all sophomore BA students majoring at either English Translation or English Literature in the University of Kashan. All the participants' first language was Persian. The students' age range was between 19 and 24. Among the participants, 38 were male and 62 were female. All of them were taking the course of essay writing when participating in the study.

Students of the two majors mentioned above usually share the same courses in the second year of BA program, which mostly has to do with developing academic English language skills. The participants generally belong to the same category of English language learners, university students of English. Such students, according to an established convention in TEFL research, are presupposed as being advanced learners of English.

3.2. Instrumentation

Three essay-type, single-page compositions written in English by each of the 100 participants, as their assigned homework, were available for the study, forming a corpus of 300 essays, as the materials of the study. The topics of these compositions were similar to each other in terms of the genres they demanded: academic, personal essays whose notional styles were generally descriptive and argumentative.

The present piece of research made use of a questionnaire designed in 1999 by Walter McKenzie. McKenzie's (1999) questionnaire, or what he calls MI inventory, is available on the Internet at
http://surfaquarium.com/MI/inventory.htm

This questionnaire consists of nine separate, independent sections, each of which contains 10 items. Each item is a statement that describes one of the different personality traits or abilities. These nine sections are associated with the nine types of intelligence, in accordance to the last version of MI model proposed by Gardner in 1991. For this research, only two sections were needed to be used; those that are associated with the two intelligences in question, linguistic and logical/ mathematical. This two-section questionnaire, a copy of which is presented in the appendix, was translated to Persian and served as the instrument of the study. The validity of the English questionnaire was confirmed through the corroboration of two experts in the field. The validity of the Persian translation was confirmed by a specialist carrying out a back translation. The internal consistency reliability of the two 10-item sections of the Persian questionnaire turned out to be "Good", according to George and Mallery (2003, cited in Gliem & Gliem, 2003), with the Cronbach's Alpha coefficient of 0.81.

3.3. Procedure

The data required for this research consists of two parts. One concerns the quantitative usage of logical connectors in ESL compositions written by the participants, and the other consists of the levels of linguistic and logical/mathematical intelligences of the participants.

By 'quantitative usage' mentioned, it can be meant either the token number or the type number of the logical connectors used by the participants. By 'token number', it is meant the total number of logical-connectors, including the repeated ones, used in each of the compositions. Both of these two values were reflected on and taken into account in this study. In order to do this correctly, the raw numbers had to be transformed into relative values regarding the length of the associated compositions, since they were handwritten and, therefore, different in number of words.

The second modified quantity required for the research was type-token ratio of the logical connectors. The value of type-token ratio of logical connectors in each composition was determined by dividing the type number by the token number of the logical connectors in that composition. The highest value of type-token ratio of logical connectors, that is 1.00, shows that the participant has not repeated a same logical connector in his or her composition.

As the indices of each participant's quantitative usage of logical connectors, the average values of token rate and type-token ratio in the three compositions written by him or her was used.

For the present study, Celce-Murcia and Larsen-Freeman's (1999) list of logical connectors was adopted. The words hence, still, and nonetheless, as well as the phrase in spite of (that), which were absent in the mentioned list, were added, since they are viewed by most of the linguists as logical connectors. During the scanning the compositions for logical connectors, if one of the words existed in the mentioned list was seen somewhere in a paragraph, it would not immediately counted as a logical connector, but it would, first, be verified whether it serves the function of linking two successive clauses or sentences logically, as described by Celce-Murcia and Larsen-Freeman (1999). So, the compositions have to be scanned manually. In total, 85 words and phrases, each of which can serve as a logical connector, were taken into account for the present piece of research.

The other part of data concerns the levels of linguistic and logical/mathematical intelligences of the participants. The 20 statements mentioned earlier from the McKenzie's (1999) questionnaire were taken up and, then, translated into Persian with the purpose of being sure about the clarity of the statements to be understood by the participants.

A single-page copy of the Persian questionnaire was handed out to each of the 100 participants. Each paper consists of two 10-item sections associated with the two types of intelligence in question. The participants were asked to complete each section by placing a '1' next to each statement that they felt accurately described them. If they did not identify with a statement, they should leave the space provided blank. After the filled-out questionnaires were gathered, the column of values in each section was added up.

Once the levels of linguistic and logical/mathematical intelligences of the participants and the values of average token rate and type-token ratio were all determined (a sample of these four sets of data is presented in Appendix D), five correlational computations were carried out. Two of them concern the correlations between the levels of logical/mathematical intelligence of the participants and a) the average token rate and b) the average type-token ratio of the logical-connectors used by them in their compositions.

The other two concerns the correlations between the levels of linguistic intelligence of the participants and the same two quantities mentioned above. In addition to these four correlations, the correlation between the levels of the logical/mathematical and linguistic intelligence of the participants was determined in order to find out whether (and to what extent) the effect, if any, of one of the above intelligences on the participants' quantitative usage of logical connectors in their English compositions is originated from the effect of the other. The lower this correlation value, the clearer the conclusion would be.

The values of all the above correlations were determined by means of Pearson Product-Moment Correlation formula. After determining all the correlational values, the degree of significance of the correlation between the logical/mathematical intelligence and the quantitative usage of logical connectors could be found out. Then, it was compared with that of linguistic intelligence.

4. Results

4.1. Results of Descriptive Statistics

The results of descriptive statistics for the average token rate and type-token ratio of logical connectors in the participants' EFL writing are shown below in table 4.1.

Table 4.1.: Results of Descriptive Statistics for the Quantitative Usage of Logical Connectors

	Mean	Standard Deviation	Maximum	Minimum	Range	Mode	Median
Average Token Rate	0.0196	0.0040	0.0281	0.0100	0.0181	0.0164	0.0199
Average Type-Token Ratio	0.7900	0.1733	1.0000	0.3600	0.6500	1.0000	0.7500

The results of descriptive statistics for the levels of logical/mathematical and linguistic intelligences of the participants are presented in table 4.1.

Table 4.1.: Results of Descriptive Statistics for the Quantitative Usage of Logical Connectors

	Mean	Standard Deviation	Maximum	Minimum	Range	Mode	Median
Logical Intelligence	5.79	1.6224	9	2	7	6	6
Linguistic Intelligence	5.86	1.9489	10	2	8	8	6

4.2. Results of the Correlations

Tables 4.3 and 4.4 present the results of the correlations between the indices of quantitative usage of logical connectors in the participants' compositions and their levels of linguistic and logical intelligences.

Table 4.3.: Results of the correlations between the quantitative usage of logical connectors and logical/mathematical intelligence

	Logical Intelligence	P-value
Average Token Rate	+0.6861	0.000
Average Type/Token Ratio	+0.0402	0.692

Table 4.4.: Results of the correlations between the quantitative usage of logical connectors and linguistic intelligence

	Linguistic Intelligence	P-value
Average Token Rate	+0.3220	0.001
Average Type/Token Ratio	+0.04127	0.000

The fifth correlational computation concerns the relationship between the two intelligences, as presented in table 4.5.

Table 4.5.: Results of the correlations between the logical and linguistic intelligences

	Linguistic Intelligence	P-value
Logical Intelligence	+0.0641	0.526

5. Conclusion

The present piece of research was the first attempt to investigate the relationship between the quantitative usage of logical connectors in students' EFL essay-writing and their logical/mathematical and linguistic intelligences. The main interest of this study was to find out whether the quantitative usage of logical connectors in EFL writing, in terms of either token rate or type-token ratio, was influenced by logical/mathematical intelligence, and that whether this influence was more or less significant than that of linguistic intelligence.

Based on the results of the study, Iranian university students majoring in English (as a foreign language) with higher logical/mathematical intelligence tend to use more tokens of logical connectors in their EFL essay writing, though they do not necessarily avoid repetition in using the connectors. The results also revealed that linguistic intelligence, which was claimed to be the main factor responsible for second or foreign language skills (Gardner, 1983), turned out to be less significant to the token rate of logical connectors in EFL essay-writing than the logical intelligence, though the students with higher linguistic intelligence possibly tend to avoid repetition in using logical connectors.

The role of logical/mathematical intelligence in SLL, which was thought to be less apparent than that of the other intelligences (Smith, 2001), was proved to be more significant.

Acknowledgment

References

Bolton, K., Nelson, G. & Hung, J. (2002). Corpus-based study of connectors in student writing [Electronic Version]. *International Journal of Corpus Linguistics*, 7 (2), 165-182. Retrieved April 1, 2009, from http://call2006.fltrp.com/pdf/Programme&Abstracts.pdf

Celce-Murcia, M. & Larsen-Freeman, D. (1999). *Grammar book: An ESL/EFL teacher's course (2 nd ed.)*. Boston, MA: Heinle & Heinle.

Cheryl W. C. (2006). The use of conjunctive adverbials in the academic papers of advanced Taiwanese EFL learners [Electronic Version]. *International journal of corpus linguistics*, 11(1), 113-130. Retrieved April 25, 2009, from www.benjamins.com/jbp/series/IJCL/11-1/art/05che.pdf

Crismore, A. (1980). *Student use of selected formal logical connectors across school level and class type.* Retrieved April 5, 2009, from http://www.eric.ed.gov/ERICWebPortal/recordDetail?accno=ED203306

Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences*. New York: Basic Books.

Gliem, J. A. & Gliem, R. R. (2003). Calculating, interpreting, and reporting Cronbach's Alpha reliability coefficient for Likert-type scales [Electronic Version]. *Midwest Research to Practice Conference in Adult, Continuing, and Community Education*. Retrieved April 5, 2009, from https://scholarworks.iupui.edu/.../344/Gliem%20&%20Gliem.pdf

Granger, S. & Tyson, S. (1996). Connector usage in the English essay writing of native and non-native EFL speakers of English [Electronic Version]. *World Englishes*, 15 (1), 17-21. Retrieved April 5, 2009, from http://www.eric.ed.gov/ERICWebPortal/recordDetail?accno=EJ526097

Marefat, F. (2007). Multiple Intelligences: Voices from an EFL writing class [Electronic Version]. *Pazhuhesh-e Zabanha-ye Khareji*, 32, 145-162. Retrieved April 1, 2009, from http://www.magiran.com/magtoc.asp.mgID=5328&Number=32&Appendix=0

McKenzie, W. (1999). *Multiple Intelligences inventory*. Retrieved April 1, 2009, from http://surfaquarium.com/MI/inventory.htm

Milton, J. & Tsang, E. S. (1993). *Corpus study of logical connectors in EFL students' writing.* Retrieved April 4, 2009, from http://www.corpus4u.org/upload/forum/ 2005062 204300650.pdf

Narita, M., Sato, C. & Sugiura, M. (2004). *Connector usage in the English essay writing of Japanese EFL learners* [Electronic Version]. Tokyo: Nagoya University. Retrieved April 5, 2009, from http://oscar.gsid.nagoyau.ac.jp/paper/naritaSatoSugiura2004.pdf

Smith, E. (2001). *Implications of multiple intelligences theory for second language learning* [Electronic Version]. Post-Script, 2 (1). Retrieved April 5, 2009, from http://www.edfac.unimelb.edu.au/research/resources/student_res/postscriptfiles/vol2/vol2_1_smith.pdf

Appendix

The 20-item English Questionnaire:

Name:

Please complete each section by placing a "1" next to each statement you feel accurately describes you. If you do not identify with a statement, leave the space provided blank.

SECTION 1	
	Foreign languages interest me
	I enjoy reading books, magazines and web sites
	I keep a journal
	Word puzzles like crosswords or jumbles are enjoyable
	Taking notes helps me remember and understand
	I faithfully contact friends through letters and/or e-mail
	It is easy for me to explain my ideas to others
	I write for pleasure
	Puns, anagrams and spoonerisms are fun
	I enjoy public speaking and participating in debates
TOTAL:	

SECTION 2	
	I am known for being neat and orderly
	Step-by-step directions are a big help
	Problem solving comes easily to me
	I get easily frustrated with disorganized people
	I can complete calculations quickly in my head
	Logic puzzles are fun
	I can't begin an assignment until I have all my "ducks in a row"
	Structure is a good thing
	I enjoy troubleshooting something that isn't working properly
	Things have to make sense to me or I am dissatisfied
TOTAL:	