

How Does the Use of Cohesive Devices in L2 Individual Writing Change After Writing Collaboratively or Independently?

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Abstract—This study looked at how completing collaborative or independent writing can affect the individual writing that students subsequently produce; specifically at how the use of cohesive devices in individual L2 student writing changes as a result of completing these two writing procedures under the same conditions. To do so, this large-scale study (n=128) looked at the use of cohesive devices in individual writing completed before (pre-test) and after (post-test) either collaborative or independent writing had been carried out. It also assessed examples of collaborative writing dialogue (n=94) to identify student deliberation about cohesion and the organization of the coauthored text; comparing the frequency of these to discussions about language use and mechanics of writing. Results revealed that there were very similar significant changes in the use of cohesive devices in the individual post-test writing of students from both writing groups and minimal student discussion about the use of cohesive devices in collaborative writing dialogue. Therefore, it is possible that the changes noted in the collaborative writing group (and the independent writing group) were possibly due to instruction and not due to the type of writing completed. On the other hand, students frequently engaged in discussions about language use and thus collaborative writing may be more conducive to learning about this aspect of writing.

Index Terms—collaborative writing, cohesive devices, second language writing

I. INTRODUCTION

Collaborative writing in second language learning (L2) has primarily been seen as an activity that can allow students to work together to resolve language issues in writing that normally could not be resolved by each individual learner. For example, by pooling linguistic resources, students may jointly be able to come up with the correct way to express their ideas in text (Swain, 2000). This view of collaborative writing in L2 is grounded in the socio-cultural approach to learning (Elola & Oskoz, 2023). However, there is another alternative view of collaborative writing in L2, that has not been fully explored, which is driven by a socio-cognitive/ interactionist perspective. From a socio-cognitive perspective, learning is seen as an individual, cognitive process that is facilitated by interaction with others (Philp et al., 2014). If learning is facilitated by interaction with others, then the process of writing collaboratively may also provide students with opportunities to learn. Viewed through a socio-cognitive/ interactionist lens, we can consider what L2 students learn from working with their peers while writing collaboratively by identifying student discussions about language use and other aspects of writing that could potentially facilitate learning, and by assessing how individual student writing changes after completing this interactive writing procedure. Viewed from a socio-cultural perspective, previous research conducted by Storch and Wigglesworth (2007), Wigglesworth and Storch (2009) and Dobao (2012) has looked at how writing produced collaboratively differs to writing produced independently and primarily focused on language use and on the mechanics of writing. Thus, these studies did not examine what individual students could learn from the process of writing collaboratively or examine how each student's own individual writing may develop as a result, nor did they examine the effects that collaboration can have on rhetorical aspects of text such as on cohesion and on the use of cohesive devices in writing.

To address these gaps in research, this study, which considers collaborative writing from a socio-cognitive/ interactionist perspective, looked at how individual student writing changed as a result of completing collaborative writing; comparing this to how individual writing changed after students completed independent writing under the same conditions; specifically looking at how the use of cohesive devices in individual writing changed after writing collaboratively or independently. It also examined examples of collaborative writing dialogue (n=96) to identify student discussions about cohesion and the use of cohesive devices that may provide evidence of students learning about how these devices are used. The frequency of these discussions was then compared to the number of discussions about language use and the mechanics of writing.

II. LITERATURE REVIEW

A. *The Characteristics of Collaborative Writing in L2*

Collaborative writing is defined as an interactive process in which participants work together while writing, contributing to the planning, generation of ideas, deliberations about the text structure, and editing and revision (Storch, 2013). This type of writing may be completed face-to-face in a physical learning environment or online. This study focuses on face-to-face collaborative writing. While writing collaboratively, learners suggest and counter-suggest ideas to be included in the writing that they will produce; reviewing these until agreeing upon how each idea should be expressed in their text (Storch, 2013). Deliberation about writing is external and explicit as each learner's thoughts and understanding about how language should be used in the coauthored text are brought out into the open to be reviewed, explained, or discussed (Storch, 2019). This externalized deliberation opens up opportunities to learn that are not provided by independent writing. For example, students may be able to notice how language is used by their peers as they make proposals for the coauthored text and have the opportunity to ask questions about its use. They may also be able to notice how a new word or grammatical structure is used by peers and can add this to their own language repertoire (Storch, 2005). In addition to this, peer interaction may potentially increase the feedback that learners receive as writing is being completed. For example, when making a proposal for the coauthored text, students can receive corrective feedback from peers on incorrect language use that may prompt learners to reconsider and possibly modify language use (Davison, 2021). Another characteristic of collaborative writing in L2 is that learners engage in discussions about language use and about other aspects of writing. These discussions, referred to as language related episodes, or LREs (Swain & Lapkin, 1998), may allow students to share knowledge with their peers. To date studies into the use of collaborative writing in L2 have identified LREs relating to language use or the mechanics of writing (see Dobao, 2012; Storch & Wigglesworth, 2007; Wigglesworth & Storch, 2009). To add to this, the present study will also assess discourse-related LREs associated with cohesion and the organization of text.

B. *The Learning Potential of Collaborative Writing*

The majority of studies that have assessed the potential of collaborative writing for L2 learning have looked at how writing that is produced collaboratively (in pairs or groups) compares to writing that individuals produce. Several studies have compared writing produced collaboratively and writing produced independently and have noted differences between them. Storch (2005) found that writing produced collaboratively was more accurate and linguistically complex, but more succinct than writing produced independently. In the studies carried out by Storch and Wigglesworth (2007), Wigglesworth and Storch (2009) and Villarreal and Gil-Sarratea (2019) there were higher levels of accuracy in the writing produced collaboratively, but no significant differences in terms of complexity and fluency. When comparing writing produced collaboratively by pairs or groups of students and writing produced independently, Dobao (2012) noted that writing completed by groups of students was more accurate than writing produced by pairs, and that paired writing was more accurate than individual writing. With a slightly different focus, McDonough, De Vleeschauwer and Crawford (2018) examined the writing of three groups of students who had either completed collaborative writing, independent writing, or students who had worked collaboratively during the pre-writing stage (relating to idea generation and planning), but who had completed writing individually. They also found that texts that were produced collaboratively were more accurate than those produced independently or by collaborative prewriting students. The common pattern highlighted by the previously outlined studies, that compared writing produced collaboratively to writing produced by individuals, is that writing that is completed collaboratively tends to be more accurate than writing produced by individual learners. While these studies seem to indicate that collaboration may have an effect on the accuracy of writing that is produced, they did not focus on the impact of collaboration on the rhetorical aspects of text, such as its effects on cohesion. It is important to examine this because student focus on correct language use while writing collaboratively may potentially distract their attention from other aspects of writing, such as cohesion. Weigle (2002) stresses that the necessity of devoting cognitive re-sources to basic language issues may mean that not as much attention can be given to higher-order issues such as content and organization; a point seconded by Van Gelderen, Oostdam and van Schooten (2011). It is also important to verify whether learners engage in discussions about the organization and cohesion of the coauthored text while writing collaboratively, or whether their discussions only focus on language use or on the mechanics of writing.

To date, only a very limited number of studies have investigated how individual writing changed as a result of completing either collaborative or independent writing. Some of these have looked at collaborative writing produced in a physical learning environment (as the present study does) and others at collaborative writing completed on-line. All of these studies employed a pre and post-test design to assess how the individual writing of students changed after completing collaborative or independent writing. Shehadeh (2011) compared the pre and post-test performance of two groups of students who had completed the same series of writing tasks either independently or collaboratively. Using a writing scale that assessed the content, organization, grammar, vocabulary and mechanics of the writing produced, this scholar found that the rating for content, organization and vocabulary increased by a significantly greater degree in the post-test writing of the collaborative writing group, but there were no significant differences in terms of grammar and mechanics of writing. In a similar study, Khatib and Meihami (2015) assessed the pre and post-test individual writing of

two groups of low-intermediate EFL students completed before and after collaborative or independent writing had been carried out. Employing the same rating scale used in the study carried out by Shehadeh (2011), they found that the rating of the content, organization, grammar, vocabulary, and mechanics of writing increased by a statistically significant greater degree in the post-test writing of students who had completed writing collaboratively than in the writing of their peers who completed independent writing.

A limited number of other studies have looked at the effect of completing collaborative writing on-line; comparing this to writing that is completed independently. A study conducted by Bikowski and Vithanage (2016) examined how individual writing changed as a result of completing four web-based collaborative or independent writing tasks. Using an analytic rubric, which assessed the content, organization, academic style and grammar of the writing produced, these researchers found that there was a significantly greater increase between the pre and post-test writing scores of students from the computer-mediated collaborative writing group than in the same writing of students from the independent writing group. The second study conducted by Hsu and Lo (2018) assessed changes in individual writing after pairs of students had completed collaborative writing online or independently over a period of 9 weeks. The researchers assessed the content and organization of writing produced, and complexity and accuracy. They found that there were significantly greater increases in accuracy in the individual post-test writing of students from the online collaborative writing group, but no significant differences between both writing groups in measures of complexity. They also found the ratings associated with the content of writing produced increased by a significantly greater degree between the pre and post-test writing of students from the computer-mediated collaborative writing group than in the writing of students from the independent writing group, but there was not a significant difference between ratings associated with organization.

The limited number of studies that assessed how individual writing changed as a result of completing either collaborative or independent writing all revealed more pronounced improvement in the writing of students who had carried out collaborative writing. While most of these studies noted significant improvement in the organization of individual writing after collaborative writing had been completed, none of these examined cohesion, nor did they identify possible discussions in collaborative dialogue that could have led to this change. To address this gap, the present study assessed how the use of cohesive devices in individual writing changed as a result of completing collaborative writing in an EAP program over a period of 8-weeks, comparing this to how the use of these changed in individual writing after completing independent writing. It also reviewed examples of recorded collaborative writing dialogue (n=94) to identify language related episodes associated with cohesion and the organization of text, referred to as discourse-related LREs (Fortune & Thorp, 2001). The frequency of these discourse-related LREs was then compared to the frequency of other LREs associated with language use and the mechanics of writing which have been identified in previous research carried out by Storch and Wigglesworth (2007), Dobao (2012), and Wigglesworth and Storch (2009).

In this study, the following research questions will be addressed:

1. Does carrying out collaborative writing affect the use of cohesive devices in the individual writing that students subsequently produce?
 - 1.1 If so, how does this differ to differences noted in individual writing after independent writing is completed?
2. Do students engage in LREs associated with the cohesion of written discourse?
 - 2.1 If so, do learners engage in these LREs to a greater or lesser extent than in LREs associated with language use or the mechanics of writing?

III. METHOD

A. Research Design

This quasi-experimental classroom-based study (n=128) employed a quantitative approach and followed a non-equivalent (pre-test and post-test) control-group design. It involved two groups of students; referred to as the collaborative and independent writing groups. Students from both groups completed an individual pre-test writing activity to establish the baseline linguistic competence of each writer (stage 1). Afterwards, students assigned to the collaborative writing groups completed a series of writing tasks collaboratively while students assigned to the independent writing groups completed the same series of writing tasks independently. During this period the dialogue of students who completed collaborative writing was recorded (stage 2). At the end of an eight-week period, students from both groups completed an individual post-test writing activity (stage 3). Because this research looked at changes in individual writing that may result from completing these two writing processes, and not at writing completed collaboratively, the writing produced by pairs of students was not assessed.

B. Setting and Participants

This study took place in an EAP program in a university in the United Arab Emirates. Other than varying the type of writing that was completed, no changes were made to any part of the EAP program to accommodate this study. Thus all students received the same instruction. All classes were taught by the same instructor and were composed of a 20-minute instruction phase that focused on composing and not on language use. This was followed by a 50-minute writing

phase in which students were instructed to complete each writing task, but not on how they should complete it. The final 10-minute review phase of each class was spent answering questions about the writing activity. Students attended two classes per week. The participants in the study also completed the same series of writing activities as other students who had completed the EAP program previously (i.e. descriptive, cause and effect and compare and contrast writing). Each writing activity was completed in one class. At the end of each class, completed writing would be submitted to the instructor who would return the writing samples to students with written feedback on each in the following lesson.

Students from 8 class groups were asked to take part. These were Arabic first language speakers, of similar age (19-21) and as a prerequisite for the EAP course, were required to have an IELTS 6.0-6.5 band score. Thus, all students taking part had an intermediate level of English. In one semester, four intact class groups took part; in the following semester four additional groups were included. Of the four class groups chosen in each semester, two were randomly chosen to be groups that completed collaborative writing and the others completed writing independently. The data of 128 students (n=128) was used with an equal number of students from the collaborative group (n=64) and the independent group (n=64). Participation was voluntary and student permission was requested for their data to be used. A similar number of students from both writing groups gave permission.

C. Collaborative Writing Procedure

Learners who completed collaborative writing worked in pairs. They were allowed to choose their own partner as previous research has noted that pairing students may have an impact on their interaction (see Mozafarri, 2017; Basterrechea & Gallardo-del-Puerto, 2023). A brief explanation was given to students on how collaborative writing would be completed, but learners did not receive training on how to complete this. Generally, students had a collaborative pattern of interaction (re Storch, 2002) with both learners contributing and engaging equally with the task. As an English medium university, peers primarily deliberated about writing in English although they would occasionally slip into the use of their own language. Arabic use was mainly associated with the use of discourse markers, such as well, or you know while conversing.

D. Collection of Data and Instruments

In this quantitative study, pre and post-test writing data was collected. This was analyzed to assess changes in the use of cohesive devices in individual writing completed before (pre-test) or after (post-test) either collaborative or independent writing had been carried out. Data relating to collaborative writing dialogue was also collected; specifically about the different types of language related episodes that students engaged in, and the ratio of those associated with language use, the mechanics of writing, or about cohesion and the organization of written discourse.

To ensure that the pre and post-test writing tasks were similar and that differences between them did not significantly affect the results, two writing tasks were selected that had previously been used as writing diagnostics (writing task A and writing task B, see Appendix A). These writing activities had the same level of difficulty and were selected because they were related to the same type of expository writing. To further minimize the difference between these, the use of both writing tasks was inverted during the two rounds of data collection. Thus, writing task A was used for the pre-writing task and then task B for the post-test in the first round of data collection (semester 1) and task B was used for pre-task writing and task A for post-test writing in the second (semester 2). For assessment, all writing scripts (n=256) were jumbled up by randomly assigning each a number from 1 to 256 (after the number that corresponded to each particular script had been recorded) and then reordering the scripts by number (1 to 256). By doing this, the assessors were not able to know whether the script had been completed by a student from the collaborative or independent writing group, nor whether this had been completed as a pre or post-test writing activity.

Student dialogue was recorded for each pair of learners who completed collaborative writing. Due to the time involved, one quarter of all collaborative dialogue was transcribed and subsequently analyzed (n=94) to identify discourse-related LREs associated with the organization of text and cohesion (re Fortune & Thorp, 2001) along with language-related and mechanics-related LREs that had been identified in previous research (see Dobao, 2012; Storch, 2007; Storch & Wigglesworth, 2007; Wigglesworth & Storch, 2009).

E. Measures of Cohesion and Assessment Procedure

Cohesion refers to the grammatical and lexical elements of a text which can form connections between different parts of the writing (Tanskanen, 2006). Halliday and Hasan (1976) have outlined five different cohesive devices that can be used to create cohesion in discourse. These are conjunction, reference, lexical cohesion, substitution, and ellipsis. As the last two of these are more characteristically found in dialogues and seldom used in formal written discourse (Yang & Sun, 2012), these are not examined in this study and not detailed in the table below.

TABLE 1
EXAMPLES OF COHESIVE DEVICES ASSESSED

Cohesive device	Example of use
Conjunction	First , students make an outline. Afterwards , they write the essay.
Reference	Essays sometimes have errors. They need to be checked thoroughly.
Lexical cohesion	Checking essays is tedious but reviewing them is important.

The initial assumption is that the use of cohesive devices will increase as writing develops, but changes in the use of the three different devices identified in this study may potentially occur at a different pace. Also Crossley, Kyle and McNamara (2016) found that while the use of cohesive devices in writing mostly increased over time as writing developed, measures of syntactic cohesion actually decreased. However, Yang and Sun (2012) stress that the more frequent and skillful use of cohesive devices, the more coherent and understandable the text is supposed to be. In this study, the measures shown in Table 2 below were used to assess how carrying out either collaborative or independent writing affected the use of cohesive devices in the individual writing that students subsequently produced. This was done by comparing the number of different cohesive devices in individual writing that students completed before (pre-test) and after (post-test) either collaborative or independent writing had been carried out and the degree of change between these two measures.

TABLE 2
MEASURES OF COHESION USED

Measure of cohesion
The number of cohesive conjunctions used per text (per 100 words)
Number of noun-reference pairs used per text (per 100 words)
The number of noun / synonym pairs per text (per 100 words)

The manual identification of cohesive devices was completed by two different assessors. Training was completed by both examiners to ensure that both were identifying the different types of cohesive devices in the same way. Each type of cohesive device was identified separately using three identical sets of scripts (one for each type of cohesive device). To avoid confusion, each examiner identified cohesive conjunctions on one set of scripts, noun/reference pairs on another set and noun/synonym pairs on another. There were high rates of inter-rater reliability between both assessors relating to the identification of the different cohesive devices in the writing samples (i.e. 81.3% to 87.5% simple percentage agreement) which indicated that the different types of cohesive devices were being identified consistently. To further ensure the reliability of this assessment, both assessors reviewed the examples of scripts where their rating differed and discussed these until coming to an agreement on the final rating of each (see Johnson et al., 2005) thus there was 100% agreement between both assessors.

F. Identification of Language-Related Episodes and Assessment Procedure

In this study language-related episodes that focused on the cohesion and organization of text (referred to as discourse-related LREs) were identified alongside language-related LREs and mechanics-related LREs that had been identified in previous research. Polio (2011) points out that by observing students interacting about writing, we can gain insight into what they are focusing on. Thus, by comparing the frequency of LREs relating to cohesion and the use of cohesive devices to those associated with language use or the mechanics of writing, we can gauge how much students are focusing on this aspect of writing and at the same time identify opportunities to learn about cohesion that may be provided by student interaction. The measures used in this study are shown in Table 3.

TABLE 3
LANGUAGE-RELATED EPISODE MEASURES USED

The number and ratio of LREs by type (per dialogue)
Number and ratio of language related LREs (relating to grammar and lexis)
Number and ratio of mechanics related LREs (relating to spelling and punctuation)
Number and ratio of discourse related LREs (relating to cohesion/organization of text)

The manual identification of the different types of LREs was completed by two different assessors and training was conducted prior to identification. After training, each assessor was given an identical set of the 96 samples of collaborative dialogue and identified the different LREs on each. These were highlighted according to a color code established on the assessment guide (see Appendix B). When this was completed, each assessor noted down the number of language-related, mechanics-related and discourse-related LREs for each sample in a table at the end of each. Assessors also noted down the number of discourse-related LREs that involved discussions specifically about cohesion and the use of cohesive devices and the number of those that dealt with the organization of text. The rate of inter-rater reliability for this assessment was acceptable; both assessors rated 79/94 examples in the same way and as a result there was 84% simple percentage agreement. As with the previous measure, both assessors then reviewed the samples where their rating differed and reviewed these until coming to an agreement on the final assessment of each (see Johnson et al., 2005).

G. The Reporting of Results

Firstly, descriptive statistics are presented followed by the associated tests of statistical significance. For measures of cohesion, a mixed model 2x2 multivariate analysis of variance (MANOVA) was employed to avoid using multiple t-tests which increases the risk of Type 1 error (Pallant, 2003). With this analysis, the interaction effect time * treatment on dependent variables is reported along with the main effects of time and treatment and the effect size of each of these. The Pillai's Trace multivariate test of significance is used. If a significant difference is found for the combined dependent variables, the individual univariate measures will be reported as well. Before carrying out MANOVA

analysis, the researchers verified that the assumptions of the test had been met (re Pallant, 2003). To assess whether differences in the frequency of the various types of LREs that students engaged in was significant, a paired t-test was used. Data relating to mechanical LREs did not meet the requirements of this test and thus the paired t-test only assessed the significance of the difference between the mean number of language-related and discourse-related LREs.

IV. RESULTS

In Table 4 we can see that there was an increase in the mean number of cohesive conjunctions and noun synonym pairs in the post-test writing of both groups. Surprisingly, there was also a decrease in the mean number of noun reference pairs in the post-test writing of both.

TABLE 4
THE USE OF COHESIVE DEVICES IN PRE AND POST-TEST WRITING

Measure	Writing group	Pre-test writing		Post-test writing	
		Mean	SD	Mean	SD
Number of cohesive conjunctions (per text per 100 words)	Collaborative	9.71	2.21	10.26	1.93
	Independent	8.89	2.16	9.51	2.23
Number of noun reference pairs (per text per 100 words)	Collaborative	6.98	2.51	6.27	2.34
	Independent	6.23	1.96	5.93	2.26
Number of noun synonym pairs (per text per 100 words)	Collaborative	1.58	1.00	1.80	1.18
	Independent	1.68	1.10	1.85	1.06

Using Pillai's trace, results revealed that the number of cohesive devices changed significantly over time in the individual writing of students from both groups. Associated univariate measures revealed a significant increase in the mean number of cohesive conjunctions over time and an unexpected significant decrease in the number of noun reference pairs. However, the effects size for both of these changes was small (see Cohen, 1988). The interaction effect between time * treatment on the number of cohesive devices in writing was not significant and thus there were no significant differences between the changes of either group. Therefore, the number of cohesive devices did not increase or decrease by a significantly greater degree in the post-test writing of either. There was also a significant main effect of treatment on the combined measures of cohesion in the writing of both groups. However, univariate measures revealed that there was only a significant difference between the mean number of cohesive conjunctions. The mean number of cohesive conjunctions in the pre-test writing samples of both groups differed. As there were parallel increases in these devices in the post-test writing of both, the mean number of these conjunctions in post-test writing also differed.

TABLE 5
MULTIVARIATE (MANOVA) ANALYSIS OF THE USE OF COHESIVE DEVICES IN WRITING

Use of cohesive devices	V	F (3, 124)	P	η_p^2
Time	.075	3.34	.021*	.075
Treatment	.075	3.24	.021*	.075
Time*treatment	.006	.270	.847	.006
Univariate use of cohesive devices		F (1,126)	P	η_p^2
<u>Mean # of cohesive conjunctions</u>				
Time		5.88	.017*	.045
Treatment		7.23	.008*	.054
<u>Noun reference pairs</u>				
Time		4.72	.032*	.036
Treatment		2.77	.098	.022
<u>Noun synonym pairs</u>				
Time		3.37	.069	.026
Treatment		.224	.637	.002

* Indicates $p < .05$

In Table 6 we can clearly see that students engaged in more LREs about language use than in LREs about discourse or the mechanics of writing. Of the 187 discourse-related LREs, 145 of these were associated with discussions about the organization of ideas within the text, and only 42 of these LREs were directly concerned with cohesion and the use of cohesive devices. We can also see that students engaged in a similar mean number of LREs relating to discourse and the mechanics of writing.

TABLE 6
NUMBER OF LREs IN COLLABORATIVE WRITING DIALOGUE (N=94)

Type of LRE	# of LREs (in all samples)	Mean	SD
Language related LREs	597	6.35	3.51
Mechanics related LRES	158	1.68	1.92
Discourse related LRES	187	1.99	1.95
D-LREs - organization of text	145	1.54	1.82
D-LREs - cohesion / cohesive devices	42	0.45	0.68
All LREs identified	942	10.02	5.81

A paired-samples t-test was conducted to compare the mean number of discourse-related and language-related LREs. There was a significant difference between the mean number of discourse-related LREs ($M=1.99$, $SD=1.95$) and language-related LREs ($M=6.35$, $SD=3.51$), $t(92) = 10.64$, $p = .001$. These results revealed that learners engaged in more LREs relating to the use of language than in discourse-related LREs associated with cohesion and the organization of text.

V. DISCUSSION

The results of this study revealed similar significant changes in measures of cohesion in individual writing produced after both collaborative and independent writing had been carried out over a period of 8-weeks. The changes in the use of cohesive devices were similar in the individual writing of students from both groups and thus there were no significant differences between these. From the results of this study, we can only conclude that the use of cohesive devices in individual writing did not differ after completing collaborative or independent writing and that neither had a greater impact on how cohesive devices were subsequently used. There are also indications that the significant changes noted in the post-test writing of both groups were most likely due to a factor common to both, such as instruction, and not due to the type of writing that was carried out. The reasons for this interpretation are explained below.

Analysis of collaborative writing dialogue revealed that there were very few student discussions about the use of cohesive devices that could have allowed them to learn about how these devices are used, and that could potentially have led to the significant changes in cohesion noted in the individual writing of students from this group. From a socio-cognitive perspective, students could have potentially learned about the use of cohesive devices from working with their peers and this potentially could have led to the changes noted. However, the limited number of student discussions about cohesive devices in this study suggests that this possibly is not the case. This does not mean that students cannot learn about the use of cohesive devices from their peers. In fact, a review of collaborative writing dialogue illustrated examples of students providing corrective feedback to their peers about the use of cohesive devices in their coauthored text and of them sharing knowledge about this facet of writing (as can be seen in the examples below). However, the limited number of these discussions in collaborative writing dialogue does not account for the significant change in the use of cohesive devices in the writing of this group.

One student providing corrective feedback to a peer on the use of cohesive devices

- S1 On the other hand
 S2 No, **not on the other hand**...
 S1 Okay
 S2 **Another** food...
 S1 **Another** kind of food

[From dialogue sample 51]

Students sharing knowledge about the use of cohesive devices

- S2 Moreover... write **moreover** or **secondly**...?
 S1 **Moreover is for adding information**
 S2 **Secondly**, types of meats with fresh...

[From dialogue sample 86]

To illustrate this point, out of the 942 LREs identified in all samples of collaborative writing dialogue in this study ($n=94$), only 42 of these were concerned with the use of cohesive devices. This means that out of the mean number of 10.02 LREs per collaborative writing dialogue, only 0.45 of these involved discussions about cohesion. From a socio-cognitive/ interactionist perspective, the individual, cognitive process of learning may be facilitated by interaction with others (Philp et al., 2014) however the limited number of student discussions about cohesion in collaborative writing dialogue suggest that another factor, such as instruction, was responsible for the significant change in the use of cohesive devices in the post-test writing of the collaborative writing group. Further support for this interpretation is provided by the similar changes in cohesive devices in the post-test writing of both groups. For example, in the writing of both, the use of cohesive conjunctions increased significantly while there was an unexpected decrease in the use of noun reference pairs in the two. The similar pattern of changes in the use of cohesive devices in the writing of both groups seems to suggest that these were due to a factor common to both (e.g. instruction) and not due to the type of writing completed. This unusual pattern of changes in post-test writing also suggests that the use of cohesive devices may not increase uniformly as writing develops as noted by Crossley et al. (2016).

The results of this study revealed that students deliberated about language use far more frequently than about discourse and rhetorical aspects of text, and that there was relatively little deliberation about the use of cohesive devices in writing. Polio (2011) points out that by observing students interacting about writing, we can gain insight into what they are focusing on. In this study, students clearly seemed to focus on language use. There was a statistically significant difference between the mean number of language-related LREs ($M=6.35$) and discourse-related LREs ($M=1.99$). More importantly, most of the discourse-related LREs involved discussions about the organization of text ($M=1.54$) rather than about cohesion and the use of cohesive devices ($M=0.45$). Student interaction in this study suggests that learners primarily focus on language use rather than on cohesion and the use of cohesive devices in writing. Even though previous studies completed by Storch and Wigglesworth (2007), Wigglesworth and Storch (2009) and Dobao (2012) did not identify discourse-related LREs, these studies also revealed that students primarily engaged

in lexical L-LREs and grammar-related F-LREs associated with language use rather than engage in LREs about the mechanics of writing. This may explain why there were significant differences in the accuracy of writing produced by pairs or groups of students than in writing produced individually in these studies, and in others carried out by McDonough et al. (2018) and Villarreal and Gil-Sarratea (2019). The frequency of discussions about language use in this study also suggests that completing collaborative writing could potentially allow students to learn about correct language use and perhaps have an impact on the accuracy of subsequent individual writing that students produce. However, this possibility needs to be verified through further investigation. Further investigation is also needed to clarify why students seem to focus on language use and less on rhetorical aspects of text.

VI. CONCLUSION

The results of this study revealed that there were significant changes in the use of cohesive devices in individual writing completed before and after both collaborative and independent writing had been carried out. These changes were similar and thus there were no significant differences between these. The similar pattern of changes in the use of cohesive devices and limited student discussions about the use of these during collaborative writing suggest that these changes were due to a factor common to both groups, such as instruction, and not due to the type of writing produced. However, analysis of collaborative writing dialogue revealed that students engaged extensively in discussions about language use and thus it is possible that collaborative writing may be conducive to learning about this facet of writing.

APPENDIX A. WRITING TASKS COMPLETED

Writing task A

Some people say that childhood obesity is increasing in many countries around the world. What are the possible causes of this increase and what can be done to deal with this problem?

Writing task B

Some people say that young people do not do as much exercise as they did in the past. What are the possible causes of this problem and what can be done to deal with this issue?

APPENDIX B. IDENTIFICATION OF LRES

An LRE is counted as an exchange between to students about the topics below. A comment without response is not counted/ highlighted as an LRE. Off topic discussions also not counted as an LRE. Use the color below to highlight each type of LRE on the sample of CW	
Highlighting	Description of LRE
Lexis related LRE	An exchange in which students discuss the use of lexis.
Grammar related LRE	An exchange in which students discuss the use of grammar.
Mechanics related LRE	An exchange in which students discuss the use of spelling or punctuation
Discourse related LRE	An exchange in which students discuss the use of cohesion or deliberate about the organization of their ideas in writing

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