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EFFECTS OF WEB-BASED COLLABORATIVE WRITING ON INDIVIDUAL L2 WRITING DEVELOPMENT

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This study investigated the effect of repeated in-class web-based collaborative writing tasks on second language writers' (L2) individual writing scores. A pre-test post-test research model was used in addition to participant surveys, class observations, and teacher interviews. Participants included 59 L2 writers in a writing class at a large U.S. university. The 32 participants in the experimental group engaged in four in-class web-based collaborative writing tasks, while the 27 participants in the control group engaged in the same four in-class web-based writing tasks but individually. A paired samples *t*-test revealed that both groups experienced statistically significant gains from their pre- to post-test scores. An independent sample *t*-test of pre- to post-test gains revealed that the participants in the collaborative web-based writing group experienced statistically significant writing gains in their individual writing over the participants in the individual web-based writing group. Participant survey results showed that the L2 writers valued the collaborative in-class writing tasks overall and that many participants in the individual group wished they had done in-class collaborative web-based writing. Three types of collaborative groups emerged. Pedagogical implications for technology-enhanced collaborative writing are discussed, and a Teaching Cycle for Web-Based Collaborative Writing is introduced.

Language(s) Learned in this Study: English

Keywords: Collaborative Learning, Computer-Assisted Language Learning, Language Teaching Methodology, Web-Based Instruction, Writing.

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INTRODUCTION

The field of second language (L2) writing continues to lack a comprehensive theory (Ferris & Hedgcock, 2014). Among the many evolving approaches, technology enhanced collaborative tools have taken L2 writing instruction into new and exciting spheres. Research has focused on many aspects including collaboration between novice and expert students (Lee, 2004); relationships between pairs of students (Storch, 2004); features of collaboration (Fung, 2010); the effect of the environment (Kessler, 2009); the effect of the context, tools, and participants on collaborative writing (Arnold & Ducate, 2006); teacher interference in collaboration (Kessler, 2009); the role of task-type (Aydin & Yildiz, 2014); and the use of online tools (Kessler, 2009; Kessler & Bikowski, 2010; Kessler, Bikowski, & Boggs, 2012; Lee, 2004). No research has been published to date, however, focusing on the possible individual English language learning gains via technology enhanced collaborative writing projects.

The current study seeks to fill this need. It specifically explores the extent to which in-class technology-enhanced collaborative writing helps students improve their individual writing gains in a U.S. undergraduate L2 writing class. It also explores learner and instructor attitudes towards collaborative

writing. This study responds to a call by Wigglesworth and Storch (2012) for more research on how learning within collaborative writing occurs, focusing on the role of technology, and to the question posed by Elola and Oskoz (2010) about "the extent to which learners' writing is enhanced when using these tools [social technologies]" in L2 collaborative writing (p. 51). It investigates the effect of repeated in-class web-based collaborative writing tasks on L2 writers' individual writing scores, as well as student and teacher perceptions of these writing tasks. These data sources, along with observations of collaborative writing sessions, are used to develop a Teaching Cycle for Web-Based Collaborative Writing. This pedagogical cycle outlines key factors that should be considered within the stages of preparation, collaboration, and reflection.

Second Language Writing and Computer Assisted Language Learning

Computer-assisted language learning (CALL) has evolved through various stages in both technology as well as pedagogical use of those technologies (Warschauer & Healey, 1998). CALL trends with L2 writing have provided us with technology and pedagogy that is more integrated and interactive as well as communication-centered. For decades, the benefits to L2 writing with the use of technology have been noted, as offering "a range of informational, communicative, and publishing tools, now potentially at the fingertips of every student," along with "the imperative for such use" (Warschauer & Healey, 1998, p. 58). As the potential for CALL expands with interactive social media and other tools, L2 speakers and writers can use interactive technologies as they form their identities and increase their ability to engage in self-directed learning (Blake, 2008). Yet, though collaborative writing within multimedia networked computing spaces has been available and advocated for more than a decade, many educators are reluctant to use class time for technology-facilitated collaborative writing, and little research has explored the potential benefits of these in-class activities on individual writing.

Researchers have noted, however, the benefits that CALL can bring to L2 writing in general. These include enabling students to produce higher quality essays due to the less-threatening and student-centered nature of computer classrooms (Braine, 1997), allowing students to receive multimodal practice with feedback, allowing for increased opportunities to engage in exploratory learning with large amounts of language data, and allowing students to engage in projects that meet the needs of a variety of learning styles (Warschauer & Healey, 1998). New technologies, as well as evolving pedagogies, also provide opportunities for students to engage in pair or small group collaborative writing (Warschauer & Healey, 1998). The area of CALL and L2 collaborative writing is one that is gaining increasing attention in recent years, as online collaboration allows learners to focus on a variety of writing skills (Lund, 2008).

BENEFITS OF COLLABORATIVE WRITING WITH TECHNOLOGY

Collaborative writing for this study refers to "an activity where there is a shared and negotiated decision-making process and a shared responsibility for the production of a single text" that results in collective cognition related to language learning (Storch, 2013, p. 3). Collaborative writing can be broken into the defining features of mutual interaction, negotiation, conflict, and shared expertise, as well as the facilitating features of affective factors, use of first language (L1), backtracking, and humor (Fung, 2010). Studies on how to group students have revealed a variety of options. The findings of Storch (2004) identify four different types of interaction between pairs: collaborative, dominant/dominant, dominant/passive, and expert/novice. Findings are inconclusive as to optimal grouping, with some noting the benefits of expert/novice students (Lee, 2004) and others concluding that scaffolding, and thus learning, can occur between peer equals via the contribution of complementary skills and knowledge (DiCamilla & Antón, 1997). In any case, a high level of mutual interaction (Dale, 1997) and negotiation (Fung, 2010) are crucial for successful collaborative writing, while the role of conflict between group members can be viewed as either positive or having a negative effect on the process (Storch, 2002).

Collaborative learning is based on Vygotsky's (1978) sociocultural theory, which suggests that learning moves from the sociocultural to individual level via collaboration. Given the support and interaction,

collaborative writing entails, as several researchers have pointed out, a variety of benefits (Storch, 2013). For example, writers are required to choose their language carefully as they discuss collaborative options (Storch, 2005), make meaning (Storch, 2013), and support or guide each other in the writing process (Hirvela, 1999). Collaborative writing, or pair writing, can lead to increased critical thinking (Kinsella & Sherak, 1998), understanding of audience (Leki, 1993), motivation (Kowal & Swain, 1994) and ownership (Storch, 2005) as students are able to better understand discourse structures, grammar, and vocabulary usage (Swain & Lapkin, 1998). Collaboration can also help students improve their writing in content, organization, and vocabulary over individual writing (Shehadeh, 2011). Collaborative writing can ultimately lead to higher quality writing (Storch, 2005).

Through technology, collaborative writing has developed in recent years. Tools that have been found to facilitate collaboration include wikis (Aydin & Yildiz, 2014; Elola & Oskoz, 2010; Kessler, 2009; Kessler & Bikowski, 2010), blogs (Sun & Chang, 2012), chats (Elola & Oskoz, 2010), and web-based word processing (Kessler et al., 2012). They offer many options, including writing from anywhere at any time and viewing or reverting to previous versions of the text. Teachers and researchers benefit from the ability to track students' collaborative processes using these tools as well (Elola & Oskoz, 2010). Offering tool options is beneficial, as different tools allow for different collaboration (Elola & Oskoz, 2010) while students develop their own distinct processes in web-based collaborative tasks (Kessler et al., 2012). Researchers have noted the importance of preparing learners to successfully engage in the collaborative writing process (Storch, 2005). Collaboration can be encouraged through modeling the discourse of the collaborators and training learners for collaboration (Fung, 2010). It is also important for teachers to consider their role in facilitating collaborative writing with the use of technology. Taking these factors into account, collaborative writing using technology can aid students in content development (Kessler, 2009) and revision (Kost, 2011) and can lead to increased individual autonomy (Kessler & Bikowski, 2010).

Few studies have investigated the potential impact of web-based collaborative writing on individual writing gains. Elola and Oskoz (2010) conducted a study similar to the present one in four respects: the form of writing was collaborative versus individual; the technology used to facilitate writing was web-based tools; one of the data collecting tools was a survey on perceptions of collaborative writing; and the aim of the research, which was a comparative study on individual writing and collaborative writing. Yet, their study included a small sample size (eight participants), focused on Spanish L2 writers, and did not include teachers' perspectives. Also, their study had the limitation of focusing only on one task (the argumentative essay). The authors thus call for research that compares "how learners work collaboratively and individually on a variety of tasks" (p. 65). A theoretical framework providing perspective for exploring collaboration through the lens of technology for L2 writers was thus used for this study.

THEORETICAL FRAMEWORK

Kessler et al. (2012) provide a theoretical framework to guide teachers in the development and analysis of collaborative writing projects. They note that as collaborative technology evolves, students' use of technology for learning will change, and teachers' use of technology (as they guide learning) will need to change as well. They note increased opportunities for flexibility and fluidity in the composing and writing process, opportunities for simultaneous many-to-many writing in varied locations and time, and increased attention to the collaborative process through collective scaffolding. All writers have access to revision histories and clear indications of which changes were made by whom. These new opportunities are in line with Storch's (2005) comment that a "re-conceptualization of classroom teaching" may be necessary in order for L2 students to be prepared for collaborative writing (p. 169). Educators can now monitor students' writing in real-time from a distance (e.g., through a wiki or web-based word processing), in addition to having increased opportunities for data-driven decision making in the classroom. Also, students and teachers alike increasingly find themselves becoming "co-constructers of content" in "co-

constructed participatory environments" as English language learners are surrounded by a large amount of information and language (Kessler, 2013, p. 307). Massive collaborative writing in Wikipedia, for example, not only includes the main encyclopedic entries for a topic, but often extensive talk-pages with meta-discussions (Kessler, 2013).

At the center of the learning context is the collaborative autonomous language learner—a learner who is able and willing to use language and appropriate communication strategies to "contribute personal meanings as a collaborative member of a group" as he/she negotiates the inherent tension between personal and group goals, where members also have their own priorities (Kessler & Bikowski, 2010, p. 53). Figure 1 displays the co-evolution of a collaborative autonomous pedagogy framework.

Figure 1. A framework for the co-evolution of collaborative autonomous pedagogy (Kessler et al., 2012).

This framework allows for the opportunity to explore learning within the context of evolving tools, collaborations, and pedagogical practice. While studies have been conducted in terms of exploring student behavior or perceptions in collaborative writing utilizing technology (Arnold, Ducate, & Kost, 2009; Elola & Oskoz, 2010; Kessler, 2009; Kessler & Bikowski, 2010; Kessler et al., 2012), on the role of task type in corrections (Aydin & Yildiz, 2014), and on the nature of collaborative writing (Kost, 2011; Li & Zhu, 2013), no studies have been found that investigate the potential impact of technology-facilitated collaborative writing on individual writing tasks for L2 English writers. As noted by Elola and Oskoz (2010), more research into the potential benefits of L2 collaborative writing is needed, particularly studies that "consider a diversity of writing tasks performed with the support of available social technologies" (p. 65). The current research study will add to this body of research and has the following research questions.

1. To what extent do in-class web-based collaborative writing tasks help second language English writers improve their overall performance in their individual writing?
2. What are the perceptions of teachers and second language writers towards web-based collaborative writing compared to individual writing in terms of perceived writing development and the writing experience?

METHODS AND MATERIALS

Participants and Course

Fifty-nine fully-matriculated, non-native English speaking students in a Midwestern, 15-week undergraduate writing class participated in this study. Students are placed in this course based on either (a) their successful completion of the intensive program in English, or (b) a score of 71 on the overall TOEFL iBT test and a score less than 24 in the writing sub-score. All the students in the four sections of the course chose to participate. Two sections were given the experimental treatment of four ungraded in-class web-based collaborative writing tasks in addition to their five out-of-class graded individual writing assignments and several in- and out-of-class individual writing tasks. This group consisted of 32 students ages 18-27, 19 males and 13 females, 31 Chinese L1 speakers and one Arabic L1 speaker. Academic majors included business (16), communication and media (2), education (1), engineering and computers (5), fine arts (1), nursing (1), and undecided (6). These participants had, on average, been learning English for 8.5 years (ranging from 2 to 16 years) and had been in the U.S. for 2 years (ranging from 1 to 3 years). Students reported their Google Documents experience at 3.48 out of 5.0 on a Likert scale and that they were fairly experienced with computers in general, with a mean score 3.81/5.0.

Participants in the individual writing group engaged in the same five out-of-class graded writing assignments and several in- and out-of-class individual writing tasks as did the experimental group, but they participated in four ungraded in-class *individual* (instead of collaborative) web-based writing tasks. The individual writing group consisted of 27 students ages 18-24: 13 males and 14 females. First language backgrounds were Chinese (23), Nepali (1), Urdu (1), Portuguese (1), and Arabic (1). Their majors included art history (1), business (10), communications and media (5), engineering and computers (7), nutrition (2), psychology (1), and undecided (1). The average time the individual group participants had spent in the U.S. was 2 years (ranging from 6 months to 5 years) and the average time spent studying English was 6 years (ranging from 1 to 15 years).

While the sampling for placement into either the collaborative writing group or individual writing group was not completely randomized, registration was open to all students at that placement level and participants registered themselves without being aware of the study. All sections of the course at this level during the semester were in the study. Last minute changes in the course schedule required three instructors (two for the collaborative groups and one instructor for both sections of the individual writing group). All teachers were experienced writing teachers, with the collaborative group teachers having master's degrees, and the individual group teacher holding a doctorate. Throughout the semester, all teachers received equal and ongoing norming and training. The collaborative writing group teachers were trained on teaching collaborative writing with web-based tools, based on previously-published recommendations (Kessler et al., 2012; Storch, 2005), while the individual teacher was given training on individual in-class writing with web-based tools. The standardized syllabus, course materials, and rubrics for overall evaluation were used in all the classes.

Data Collection and Analysis

Both quantitative and qualitative data collection and analysis were used. A pre- and post-test research design with statistical analyses was used to measure individual learning. Testing-effect was minimized by assigning students different writing prompts for pre- and post-tests. The 30-minute pre-test asked students to write a paragraph comparing and/or contrasting their life now and five years ago, and the post-test topic was a persuasive paragraph on the writer's favorite product and why it was the best of its type in the market. These topics were chosen based on course content and planned in-class writing tasks. The choice to include different genres for the pre- and post-tests, as well as for the in-class writing tasks, was made based on recommendations by Elola and Oskoz (2010) to structure studies that compare "how learners work collaboratively and individually on a variety of tasks" (p. 65). Also, all participants took the same

tests (which were based on classroom learning) and the overall tests were comparable in terms of difficulty.

For both the pre- and post-tests, participants were not allowed to use online reference tools or discuss their writing with classmates while planning or writing. The highest score possible on the pre- and post-tests was 100 using an analytic rubric that included content, organization, academic style, and grammar. Both tests were scored using the rubric by two raters trained by the researchers; both raters were instructors in the program and had experience teaching this course within the last year. Norming for this study followed the norming procedures used for the course. Following examples of benchmark student texts (identified by the course coordinator), the two raters and coordinator discussed appropriate ratings and then moved to sharing their independently rated texts. The raters scored the majority of the texts independently and submitted their coded results to the researchers. Inter-rater reliability, examined by using paired samples correlation for comparison of the results, was high (r = .972 for the pre-test and r = .946 for the post-test).

A paired samples *t*-test was used to determine if there was a statistical difference between participants' pre- and post-test scores for each group. In addition, an independent samples *t*-test was conducted with participants' pre- and post-test score gains, to determine if there was a statistical difference between the collaborative and individual writing groups. Before the *t*-test was run, the data was checked to guarantee that it met the assumptions for the test (using the Shapiro-Wilk Test of Normality) and that there were no outliers. The effect size (Cohen's *d*) was calculated as the difference between the means of the web-based collaborative writing group and the web-based individual writing group divided by the pooled standard deviation.

Data also consisted of an anonymous online survey about participants' perceptions of their writing experience. For both groups, questions asked them to rate how well they liked their in-class writing experiences (1-5 Likert scale) and why (open-ended), how much it helped them write better (1-5 Likert scale) and why (open-ended), and how much their teachers liked the in-class writing tasks (1-5 Likert scale) and why (open-ended). Participants in the collaborative writing group were also asked to rate how well they worked together (1-5 Likert scale) and why (open-ended), if they recommend that teachers do group in-class writing activities in their classes (yes/no), and if they wished they had done more individual in-class writing (yes/no). Participants in the individual writing group were also asked if they wished they had done more in-class group writing tasks (yes/no).

An independent samples *t*-test was performed on the Likert ratings of the student perception survey to determine if there were statistically significant differences between the collaborative writing and individual writing participants' perceptions. For the open-ended questions, coding consisted of identifying and arranging comments on themes that emerged.

Qualitative data was collected and analyzed in order to add depth to the quantitative findings. Interviews and observations allowed for the triangulation of the data (Patton, 2002). Semi-structured interviews were chosen due to their increased flexibility over structured interviews (Patton, 2002) and so that we, as researchers, could come at "the same thing from a different angle" (Denscombe, 2002, p. 104). The interviews were conducted with teachers in the collaborative writing group, based on the call for research that explores "the role of language teachers during collaborative writing tasks" (Aydin & Yildiz, 2014, p. 173). Each interview lasted approximately 30 minutes and included questions regarding if and how the teachers thought the web-based collaborative writing tasks affected their students' writing; if their students were motivated when doing the web-based collaborative writing in class, and if not, if they had suggestions on improving student motivation for in-class web-based collaborative writing tasks; what their opinions were on the collaborative groups and if any students would have possibly performed better in a different group; what their thoughts were on how students were allowed to make their own choices on how they worked as a group with technology (e.g., work together at one computer, at separate computers,

etc.); if the web-based collaborative writing tasks affected their teaching; and if they had any general comments. The teachers' responses were recorded, transcribed, and analyzed. A two-cycle coding system was followed for analysis (Miles, Huberman, & Saldaña, 2014). Provisional coding was used for the first cycle, with the preliminary codes identified by the researchers based on the classroom context, the research questions, the conceptual framework, and the interview questions. This first cycle allowed for an initial summary of the data. The second cycle involved pattern coding, which allowed the summaries to be grouped into themes (see Table 1).

Table 1. *Interview Themes and Definitions: Collaborative Writing Group Teachers.*

Theme	Theme Definition
Benefits of repeated in-class web-based collaborative writing	Statements or examples about specific ways that collaborative writing with technology aided students in their writing
Observations about students' collaborative processes	Statements or examples about student behavior as they worked on their web-based collaborative writing
Teacher processes that contributed to student success	Statements or examples about specific actions the teachers took that helped students as they engaged in web-based collaborative writing
Suggestions for future web-based collaborative writing tasks	Statements, examples, or suggestions about how web-based collaborative writing might be structured in the future

The final data collected included observations of the collaborative writing group participants during their in-class writing. While other studies have observed participants' online behavior (Kessler, 2009; Kessler et al., 2012; Strobl, 2014), the focus of this study was to observe student interactions in order to gain insight into web-based writing behavior. Each collaborative writing session was systematically observed by one of the researchers (four total observations) and video and audio recorded. Observations focused on technology use, student behavior, and group dynamics, using an observational chart to tally frequencies and guide comments (see Table 4 for a list of the behaviors observed). While observations provide an authentic setting for data collection, it is important that researchers be aware of how their observations may be distorted by their perspectives or experiences (Check & Schutt, 2012) and how their presence can affect participants' behavior (Becker, 2001). To minimize these concerns, the researcher sat in a separate observation room with a window, and the video was recorded via fairly inconspicuous wall-mounted cameras and microphones, though the participants consented to being observed and recorded.

In-Class Writing Tasks

The topics for the four in-class 45-minute writing tasks were based on the curriculum. The tasks for both groups were: (1) compare and/or contrast two attitudes towards money: those who spend freely and those who save, (2) compare and/or contrast how teaching is done in the U.S. and in another country, (3) discuss at least one cause of divorce, and (4) persuade a reader if the University should or should not require pre-academic English courses. Participants were given feedback on strengths and areas for improvement with their in-class writings. They were asked to apply the feedback on their future writing. Participants in both groups received identical writing directions, were told they could use online tools and could discuss ideas with classmates, and were asked to write using Google Docs. The teachers monitored the participants' in-class writing during the tasks, watching for communication breakdowns or difficulties with the task. Participants could ask questions and the teachers were freely available.

For the collaborative writing group, Google Docs offered the ability for a number of writers to write and edit simultaneously, offered teachers the ability to monitor the group writing process from a distant computer, allowed participants and teachers to monitor group members' writing and editing, and allowed students to view or revert to previous versions of the document. For the individual writing group, Google

Docs allowed writers the ability to refer to or revert to a previous version of the document and allowed teachers to monitor student writing.

Collaborative Writing Group

The collaborative group participants worked in nine groups of three or four students, based on Dobao's (2012) recommendations. There were four groups of three participants and five groups of four participants in total. Groups were formed by the teachers so that at least one student was strong in their writing organization skills (based on pre-test), grammar writing skills (based on pre-test), or comfort with technology (based on self-report). This choice was made based on the literature, which recommends that grouping students according to expertise allows them to experience increased confidence and greater contributions (Dale, 1997). Groups were trained on course material relating to the writing topics, on using Google Docs, and on collaborating in their writing. Their collaborative writing training included class discussions on setting group guidelines for working together, considering group members' feelings when changes are made, negotiating politely and respectfully, managing time in a group, utilizing each group member's strengths, using their L1, negotiating the writing process, and troubleshooting strategies for communication breakdowns.

Collaborative group participants discussed possible forms of collaboration and were given the opportunity to choose a configuration option. These options included discussing their writing while working at separate computers, chatting online for idea discussions while working at separate computers, or writing collaboratively at one computer.

Individual Writing Group

Individual group participants engaged in the same in-class writing tasks, but did so individually instead of in groups. They were trained on the writing process, Google Docs, and course material relating to the writing topics, as were the collaborative group participants.

RESULTS

Effect of Collaborative Writing Tasks on Individual Writing Scores

The first research question asked to what extent in-class web-based collaborative writing may help non-native English speakers improve their performance in their individual overall writing. Table 2 shows the mean overall scores and standard deviations for the individual and collaborative pre- and post-tests.

Table 2. *Pre-test and Post-test Data for Overall Writing Test Scores: Collaborative and Individual Writing Groups.*

Group	Pre-test score		Post-test score	
	Mean	*SD*	Mean	*SD*
Collaborative Writing Group (*N* = 32)	71.21	10.11	84.09	9.28
Individual Writing Group (*N* = 27)	79.95	11.99	86.51	11.84

Note. Highest score possible = 100

An independent samples *t*-test was conducted to determine whether collaborative writing resulted in greater individual writing gains. The difference in the means between the individual writing group pre-test scores (M = 79.95, SD = 11.99) and post-test scores (M = 86.52, SD = 11.84) was just under seven points (6.57), while the difference between the mean pre-test score in the collaborative writing group (M = 71.21, SD = 10.11) and post-test score (M = 84.09, SD = 9.28) was over 12 points (12.88). This difference in means was statistically significant at the .05 level [$t(26) = 2.3$, $p = .027$] with a moderate

effect size (d = 0.58). Thus, collaborative web-based writing participants experienced higher gains than individual web-based writing participants, although both groups show statistically higher pre- to post-test scores [individual writing (p = 0.003) and collaborative writing (p = 0.000)]. An independent samples t-test for the post-test scores between the two groups (individual writers M = 86.51, SD = 11.84 and collaborative writers M = 84.09, SD = 9.28) indicates that there is no statistically significant difference between these two groups of scores. In other words, the collaborative writing group started considerably lower than the individual writing group, but was able to reach the same relative scores by the end of the semester.

Participant Perceptions of Collaborative and Individual Writing

The second research question focused on the attitudes of students towards web-based collaborative writing in comparison with web-based individual writing in terms of perceived writing development and the writing experience. An anonymous survey, including Likert rating scales (0-5) and open-ended questions, was used (see Table 3). An independent samples t-test was performed on the Likert ratings between the two groups for questions one, two, and four, and none of them was statistically significant at the 0.05 level.

Table 3. *Perceptions of Collaborative Writing Group Participants and Individual Writing Group Participants of their In-Class Web-Based Writing Tasks.*

	Average survey ratings			
Questions	Collaborative Group (N = 32)		Individual Group (N = 27)	
	Mean	Stand. Dev.	Mean	Stand. Dev.
Questions with ratings 1.0 low/disagree to 5.0 high/agree				
1. How well they liked their in-class writing tasks	3.87	0.76	3.69	1.01
2. How well they thought their in-class writing tasks helped their writing improve	3.80	1.00	3.91	0.72
3. How well they worked in groups	4.07	1.06	NA	
4. How well they thought their teacher liked their in-class writing tasks	4.50	0.67	4.25	0.79
5. If they wish they had done more individual or group in-class writing	2.9/5.0 wished had done more individual writing		3.79/5.0 wished had done more group writing	
Question with ratings Yes/No				
6. If they would recommend in-class web-based collaborative writing tasks for future classes	87% Yes 13% No		NA	

Approximately two thirds of the collaborative writing group participants indicated that they liked or somewhat liked the in-class web-based group writing activities, with a mean rating of 3.87 out of 5.0. None of the participants gave ratings of not liking or somewhat not liking them. Positive comments included that the in-class web-based group writing helped them learn, that it helped them check their organization and grammar quickly, that Google Docs helped them plan, and that it helped them identify

grammar points to focus on. Comments reflecting concerns were that merging ideas is difficult and the group writing was "too much pressure and hustle." For the individual writing group, the majority of the participants also liked in-class web-based writing activities (*M* = 3.69/5.0); however, three participants (9%) disliked them. Positive comments included that the web-based individual writing tasks helped their writing improve and that they liked the opportunity to write more. However, some participants expressed concern that they found the in-class individual writing tasks to be "boring," that they needed more time, that they did not see the point in doing the individual in-class writing tasks or found them a "waste of time," and that they do not like writing in general.

Regarding writing improvement, the majority of the collaborative writing group students (67%) felt that the web-based collaborative writing helped their writing improve (*M* = 3.80/5.0). Participants noted that it helped with writing speed and fluency, organization, identifying areas for future writing development, and offering writing practice. One student commented, "I have learnt how to organize my essays and control my writing speed, and it also let me know that what's the weak part of myself." Three participants, however, rated the activity two out of five because of time limitations, preference for teacher feedback, preference for working individually, and concern with self-confidence. Stated one participant, "Writing is interesting, but my English is not good—make me feel bad." A majority (*M* = 3.91/5.0) of the individual writing group participants felt that the in-class web-based individual writing tasks helped or really helped their writing improve, and just under a third took a neutral position. Positive comments were that the individual web-based writing tasks helped them improve their writing in grammar and organization, through writing fluency, through increased practice, through experimenting with different organization types, and through increased opportunities for teacher feedback. Negative comments included that the in-class writing tasks were "boring" and "useless."

The majority of collaborative group participants indicated they worked well in their groups (*M* = 4.07/5.0). Seventy-one percent indicated that they worked well or very well together as groups, while 6% of them said they did not. Benefits that participants noted included learning from each other, experiencing less stress, having "great discussions and teamwork," everyone working hard and being willing to share ideas and workload, feeling a sense of accomplishment, learning to like writing more, working through disagreements, working with Google Docs to help with proofreading and revising, and engaging in a "new way" of writing. Concerns about group writing included members not listening or not being open to others' ideas, managing time constraints with merging different opinions, and feeling that it was difficult. One participant simply noted that he/she is "a loner." Suggestions for future considerations included that the participants would like to choose their group members, that teachers should put students with similar personalities in groups, and that teachers should make suggestions as to how each member can contribute to the group work in order to build their confidence.

Overall, participants in the collaborative group disagreed with the statement that they wished they had done more in-class web-based individual writing (*M* = 2.9/5.0), yet 40% strongly agreed or agreed with the statement. For the individual writing group, the preference was that they wished they *had* done in-class web-based group writing (*M* = 3.79/5.0): over half (58%) wished they had, 4% did not want to, and just under 40% were neutral.

Observations of Collaborative Writing Group Students

The four in-class web-based writing tasks with the collaborative writing group were observed and video recorded. The teachers circled the room and checked student writing and group dynamics in Google Docs, providing writing support and answering questions. These observations revealed that the groups collaborated in different ways, which could have led members to perceive the collaborative writing process differently. Table 4 includes the types of group behaviors and how many times each behavior was observed in a group. The number of occurrences is marked using a code: behavior was never observed (0), behavior was observed once (1), and behavior was observed twice or more (2+).

Table 4. *Behaviors Observed in the Nine Groups during the Four Collaborative Writing Tasks.*

	Group								
	1	2	3	4	5	6	7	8	9
Behaviors observed									
Group members work on one computer together	2+	2+	2+	0	2+	2+	2+	2+	2+
Group members work on different computers	2+	2+	2+	2+	2+	2+	1	1	0
Members switch between using 1 and 3-4 computers	2+	2+	2+	0	2+	2+	2+	2+	0
Group members get together to outline writing	2+	2+	2+	0	2+	2+	2+	2+	2+
Group members get together to proofread writing	2+	2+	2+	0	2+	2+	2+	2+	2+
Group members write different sections	1	0	2+	2+	2+	2+	2+	2+	0
Group members use their L1	0	2+	2+	2+	1	2+	2+	2+	2+
Group members avoid L1	2+	0	0	0	2+	0	0	0	0

Many behavior types were observed more than twice during the four collaborative sessions by the same group, while some groups did not engage in certain behaviors. For example, groups 4 and 9 engaged in a limited number of behaviors; group 4 members tended to work more independently, while group 9 worked together the majority of the time. These observations can provide insight into why and how web-based collaborative writing may be successful, as well as providing areas for future research. Another behavior observed was groups using online resources (e.g., thesauri or dictionaries), usually with one group member taking responsibility for accessing resources while other members discussed, typed, and asked questions.

Three types of collaboration emerged across all nine groups. Three of the nine groups could be described as *Explicit Collaborators*, in that they collaborated throughout the writing process, from brainstorming and planning for 10-15 minutes to writing and editing for organization and grammar, with periodic collaborative checks to ensure that the plan was being followed or revised as needed. Five groups could be described as *Budding Collaborators*, in that participants initially appeared to have more difficulties managing time and the collaborative process, but that they improved with each collaborative session. In the first sessions, they followed the stages of collaborative brainstorming and planning, but these stages lasted longer for them than for the *Explicit Collaborator* groups. After planning, they had a tendency to work more independently and then try to merge their writing before the class period was over. When participants in these groups first started collaborating, a couple of students looked uncomfortable and were sitting out of the group. However, as time progressed, the group started communicating more, with the quiet students being invited into and fully participating in the group. In the words of their teacher, everyone began “developing a system of their own.” Slight teacher intervention with these groups in-person and inside their Google Docs appeared to help them communicate better and write together.

One group did not appear to work together as well and could be termed *Resistant Collaborators*. Group members appeared to be unmotivated in the tasks and struggled to listen carefully and communicate

clearly. This led to apparent concerns regarding group trust. The teacher pointed out in the interview that maybe these students should not have been put together, as this group of students all had more reserved personalities and appeared to be less interested in writing. Teacher intervention had less of an impact with this group.

Teacher Perceptions of In-Class Web-Based Collaborative Writing Tasks

Comments from the semi-structured interviews with the collaborative writing group teachers were coded according to the themes that emerged and were categorized in the form of a table for ease of reference (see Table 5). Themes focused on teachers' perceptions on how the in-class web-based collaborative writing tasks benefited students and on facilitation suggestions. Each teacher's idea was marked in terms of the emerging themes as follows.

Table 5. *Interview Themes Expressed by the Teachers of the Collaborative Writing Group.*

Theme	Comments
Benefits of repeated in-class web-based collaborative writing	Web-based in-class collaborative writing helped students: • Improve their individual writing and notice it improving • Experience increased interest in and motivation for in-class writing • Form greater bonds with classmates • Stop, think, and plan before writing • Be more comfortable with and skilled at individual peer-review activities • Learn how to share their writing and solicit input • Establish their own systems and enjoy the writing process
Observations about students' collaborative processes	The collaborative process: • Benefited from flexibility with technology: While some groups edited everything together, other groups edited each other's writing individually. The technology allowed for flexibility and student experimentation. • Became easier and more effective with practice: Four sessions were an effective number. • Requires support: One group did not collaborate as well together, likely due to personality differences and a lack of mutual trust.
Teacher processes that contributed to student success	Processes that likely contributed to success: • Group training on collaboration and technology • Close monitoring of group behavior and students' writing by circulating the room and by checking groups' Google Docs, so that students felt a teacher presence, teachers could troubleshoot, and teachers could answer questions • Supporting quiet or less-participatory students and groups through the collaborative process • Keeping the same groups of students during whole term • Keeping the groups to no more than four students • Fully incorporating the collaborative writing tasks into the course in terms of helping students see the value, helping them take ownership of group writing, and helping them provide useful critiques for each other

Suggestions for future in-class web-based collaborative writing tasks	Teachers should consider: • Providing students a clear rationale at the beginning of the course for their specific expertise they can offer to their group • Allowing students to choose a topic from a list, if time permits • Identifying the personality types of students and using that information for group placement • Having students reflect more on how they actually collaborated, for example via presentations or in writing, after each collaborative writing task and/or at the end of the course

Table 5 emphasizes the importance of the teacher's role in facilitating in-class web-based collaborative writing tasks. Teachers can more fully prepare themselves for this role by being aware of the advantages these tasks offer. For example, one teacher noted that the in-class web-based collaborative writing sessions "helped them [the students] stop and think about what they were going to write, and even in peer review they feel comfortable criticizing each other, because they have a bond." This teacher noted how in-class collaborative writing supported students in other collaborative in-class activities as well as promoting increased critical thinking and class rapport. Teacher preparation can also include considerations regarding how to manage the in-class collaborative process. Another teacher discussed how students approached the in-class writing: "They were trying to figure it out the first time they did it. After they'd done it twice or three times they had their own system down, they did it because they had to, but they enjoyed the process more, and they may not have liked the process at the beginning, but later they started enjoying it." This comment illustrates the importance of teachers supporting students through the process as well as helping them see the long-term goals and benefits. A third point raised by both teachers was the role of the web-based word-processing software in helping them support collaborative student writing. Google Docs allowed teachers to offer feedback from a distance, making the process less disruptive and less invasive. Observations revealed that teachers, in particular, facilitated self-reflection. Teachers stated that this was based on training discussions regarding the collaborative writing process and writing development.

DISCUSSION

This study investigated the possible impact of in-class web-based collaborative writing tasks on students' individual overall writing scores, explored student perceptions of both tasks, and explored teacher perceptions of in-class collaborative writing. Both the collaborative writing group and the individual writing group experienced gains in their pre- to post-test writing scores. An independent samples *t*-test, however, revealed that the group which engaged in collaborative web-based writing showed statistically significant higher mean gains from their pre- to post-test scores than did the group that engaged in individual web-based writing, an increase that had a moderate effect size. In a meta-analysis, Zhao (2003) found that the use of technology in language learning courses, over courses with no technology, had a large effect size (d = .81). While learners in the present study did not experience an effect size as large as that found by Zhao, a moderate size is nevertheless indicative that in-class collaborative writing with technology is an activity that warrants class time as well as further research. Exploration into possible impacts of in-class web-based collaborative writing in other contexts in addition to university-level (e.g., high school contexts) is warranted, though it would be anticipated that the effect size may be smaller with younger populations. Research has found that the magnitude of effect sizes for quality in computer-based writing decreases as grade level decreases (Goldberg, Russell, & Cook, 2003).

It should be noted that both groups received similar and fairly high scores on their post-test (collaborative group M = 84.09; individual group M = 86.51), indicating a possible ceiling for final scores that can be

achieved in one semester. The learning gains experienced by the collaborative writing group were due to their lower pre-test scores (*M* = 71.21) compared to the individual writing group (*M* = 79.95). This indicates that collaborative web-based writing may be particularly beneficial for students at lower proficiency levels. More research into which populations of students may benefit the most from in-class web-based collaborative writing and in what areas benefits are experienced is warranted.

Survey results showed that participants in both the individual and collaborative writing groups overall liked the in-class web-based writing activities and thought they helped their writing improve; however, participants in the individual group indicated that they wished they had done group writing in class (average score 3.9/5.0) at a higher Likert scale rate than participants in the collaborative group indicated that they wished they had done more individual in-class writing (average score 2.9/5.0). The majority (87%) of collaborative group participants recommended in-class collaborative writing tasks for future classes. We concur with Elola and Oskoz (2010) that collaborative writing should not supplant individual writing in class, as is supported by the individual writing gains of both groups in this study. Rather, in-class web-based collaborative writing allows students to further develop their own individual writing.

Insight into the possible reasons for the success of the web-based collaborative writing can be gleaned from the framework by Kessler et al. (2012) on the co-evolution of collaborative autonomous pedagogy. Arnold and Ducate (2006) concur that the collaborative learning experience can be affected by context, tools, and participants. The framework by Kessler et al. posits that as technology evolves, both students' and teachers' use of technology should change as well. In this case, teachers monitored participant groups, but allowed them flexibility in their use of technology and language learning tasks. The learning context was chosen carefully, by using the Google Docs web-based word processing application to facilitate collaboration, provide multiple learners the opportunity to work on one document, and facilitate teacher monitoring and periodic input. In this case, the technological tools helped mediate communication (Thorne, 2003) in a way that paper-based writing or standard word processing software could not have done. If the behavior of the students had been determined by the tool, teachers, or task, the power of this environment and the collaborative experience would have been diminished and would have led to frustration as well as decreased collaboration. These web-based collaborative writing tasks, however, were motivating to most participants, particularly for students who likely would have been reluctant to write individually. Thus, in this context, the tool plays a crucial role in learning (Kessler & Bikowski, 2010).

Additionally, participant engagement in the collaborative process with others likely led to increased individual learning. Vygotsky (1978) emphasizes the importance of collaboration in learning. Learner grouping was done systematically so that each member had a skill to offer. The groups consisted of members who were each stronger in one of the following areas: grammar, organization, or technology. Accordingly, this collaboration allowed development to occur first between people at an interpsychological level, which then led to better development of individuals at an intrapsychological level (Vygotsky, 1978). Learning potential can be maximized by giving students opportunities to interact with peers who have different abilities and skills.

Another benefit of the web-based collaboration was through increased involvement in the writing process. These in-class web-based collaborative writing tasks required students to brainstorm and plan and later jointly edit their writing—practices which could have been transferred to their individual writing. Research suggests that collaborative writing leads to learners experiencing increased critical thinking (Kinsella & Sherak, 1998) that allows them to reflect upon their writing in a different manner and understand areas of development (Hirvela, 1999). Collaborative writing also allows for opportunities to build confidence, as editing is done by the group for the group. Reflecting on writing as the product of the group instead of only an individual creation could help learners with their critical analysis while maintaining a sense of ownership (Spigelman, 2000). The use of web-based word processing allowed all learners to view, edit, and thus feel ownership over their texts in ways not possible with paper-based

collaborative writing tasks.

The collaborative process also allows for more opportunities to self-reflect (Hirvela, 1999), which can lead to increased learning. In this study, reflection was facilitated via technology and assisted the learners in analyzing their writing as readers, allowing them to see how well they performed compared to fellow group members and identifying areas for improvement. This form of interaction can elicit a healthy sense of competition among group members as well, leading to better performance in individual writing. Hubbard (2004) notes the importance of learner training with new technologies. Due to their training, these participants were able to reflect on their writing without worrying about the technology.

In class, web-based collaborative writing provided these second language writers with an opportunity to improve their individual writing; however, participants raised important concerns that provide insight for educators. Some collaborative group participants struggled with merging different ideas offered by group members. This could be because they preferred to work alone (Storch, 2005) or they could have been unsure in the collaborative process. This pressure could have led the participants to omit important aspects of writing in order to focus on idea-generation and merging. Ongoing learner training on time management and the steps of the writing process is thus crucial so that students understand that in technology-facilitated collaborative writing the process is at least as important as the product.

Another area of concern raised by some collaborative group participants was that they preferred the instructor rather than their peers to correct their mistakes. These learners could have felt uncertain about their peers' editing skills (Leki, 1990) or the groups could have missed opportunities to engage in effective communication. Fung (2010) identified the defining features of collaboration as mutual interaction, negotiation, conflict management, and shared expertise. Some participants in this study appeared to have experienced a lack of trust in their groups that led to decreased appreciation for the collaborative writing tasks. Ineffective group communication using web-based tasks could be minimized by adjusting the amount of teacher interference (Kessler, 2009) and increasing learner training in areas such as conflict management or negotiation, in addition to increasing teacher monitoring of collaborative groups (Storch, 2013). Communication in technology-enhanced environments can be more challenging for some learners and thus can require more training. This study highlights many practical implications that allow educators to utilize in-class web-based collaborative writing tasks in order to help students improve their individual writing, yet it does include some limitations.

LIMITATIONS AND PEDAGOGICAL IMPLICATIONS

Pedagogical implications for in-class web-based collaborative writing tasks should be considered along with the limitations of the current study. While different teachers conducted the classes, the course used the same textbook, a standardized syllabus, and standardized rubrics and norming sessions in order to mitigate possible teacher difference effects. The realities of classroom research led to the limitation of having three teachers involved in the study. This limitation was mitigated through consistent communication between all teachers and the standardization of the course content, assignments, materials, etc. As Dörnyei (2007) notes, practical considerations are a reality in classroom-based research. The lower pre-test scores of the collaborative writing compared to the individual writing group were another reality of classroom research and should be kept in mind while interpreting the results. However, keeping these factors in mind, these findings do emphasize the potential power of web-based collaborative writing with lower-proficiency students. The limited L1s in the collaborative group—compared to a slightly more diverse L1 pool in the individual writing group —as well as differences in average number of years studying English could also have influenced the pre- and post-test writing score results. However, in both groups, the overwhelming majority of learners shared the same L1 (Chinese) and many other similar characteristics regarding English language learning.

The following pedagogical implications can thus be considered in light of the research situation. These

implications fall under three main stages: the preparation stage, the collaborative writing stage, and the reflective stage. Together, these stages can be combined into a Teaching Cycle for Web-Based Collaborative Writing.

1. The Preparation Stage

Prepare Yourself for the Technology

Interactive software allows teachers to monitor students' progress and contributions in collaborative writing only if teachers are familiar with the features of the technology (e.g., accessing group documents, leaving comments, viewing revision histories, etc.) to aid with troubleshooting as well as potentially guide student use. Teachers can also circulate the room periodically.

Prepare Students for Technology

With web-based word processing software, preparation includes students being able to use basic features as well as features that allow for more flexibility (e.g., simultaneous group writing and editing, revision history, group viewing, etc.). Students should be given an opportunity to use the tools before they start collaborative, graded assignments. They also should understand expectations and policies regarding social media use during class time.

Group Students Carefully

Teachers can consider creating groups based on skills and students' language proficiency level, in addition to student characteristics such as motivation, extroversion/introversion, and comfort with technology. Teachers can inform students of their grouping rationale directly, including the strengths of each group member, or can ask students to self-assess with each member offering their potential individual contributions to the group. Alternatively, students can choose their own groups, based on guidelines provided by the teacher or collectively created (e.g., choosing group members based on expertise).

Prepare Students for Collaborative Writing Tasks

Teachers can lead discussions on options for ways to collaborate using technology, on how groups can choose a topic, on which online resources are available and when they might be useful, on how to manage group communication to maximize individual input, on listening to others' ideas, and on polite language options (e.g., disagreeing, making a clear and direct point, etc.). Groups can be led to reflect on what type of group they would like to be, based on the findings of this study: *Explicit Collaborators, Budding Collaborators,* or *Resistant Collaborators*. Students can be asked to form individual goals on what collaborative skills they would like to personally develop during the writing tasks. Before groups start writing together, rapport-building and trust-building activities are recommended.

2. The Collaboration Stage

Promote Collaboration and Communication

Students appreciate collaboration for many reasons, including that it helps them work on their writing as a group, it teaches them to write under time pressure and thus manage their time, it helps them focus on the writing process and their own writing, and it helps them produce a better written product. Groups can be reminded of the three types of groups—*Explicit, Budding,* and *Resistant Collaborators*—in order to assess their own collaboration progress in real time.

Help Introverted or Independent-minded Individuals Succeed in Collaboration

Teachers can help students who are more introverted, or who prefer to work independently, to collaborate successfully by giving them time to become comfortable with their teammates and the learning context and by leading class discussions on collaborating with individuals with varying learning styles. Being

patient and realizing that any personality type can fit into the collaborative situation will allow teachers to be creative in their teaching methods.

Help Learners Reflect on their Writing as Readers

Collaborative writing, particularly with web-based word processing, can help learners become aware of their writing needs as they consider their writing compared to that of their classmates. This ability for second language writers to analyze their own writing as a reader is an important skill to develop (Ferris & Hedgcock, 2014). Participants can also be encouraged to consider their own needs regarding grammar and/or content and organization. Individual e-journaling or blogging assignments can encourage students to reflect on their contribution to the collaborative effort and their own writing needs.

Assist Learners with Planning and Time Constraints

Teachers can help L2 writers merge different ideas in a limited amount of time by practicing group brainstorming sessions, allowing students extra time for initial collaborative sessions, and requiring groups to plan before writing. Many groups struggle with decisions as to which content to include vs. eliminate. Students can be led to understand that collaborative writing is worth the extra effort, that it can help them learn how to plan their individual writing, and that the process is at least as important as the final product.

3. The Reflection Stage

This final stage is added based on participant and teacher recommendations and on classroom observations, though it was not utilized in this study. Not all participants thought that their writing improved due to the in-class web-based collaborative writing tasks. This could be due to their lack of reflection on their development as writers and collaborators. Teachers can help L2 writers recognize their development through reflective activities such as discussing or presenting their collaborative experiences. Collaborative e-journals would give teachers an opportunity to identify internal conflicts in addition to providing students with a means of evaluating their group collaboration progress (*Explicit, Budding,* or *Resistant Collaborators*). Realizing these aspects earlier in a term would help the teacher suggest strategies to avoid conflict. Teachers can guide learners in noticing how editing and proofreading in collaborative writing can facilitate peer review activities as well, in terms of their overall writing and in building rapport.

The following teaching cycle was created based on the three stages of pedagogical development suggested by the current study (see Figure 2).

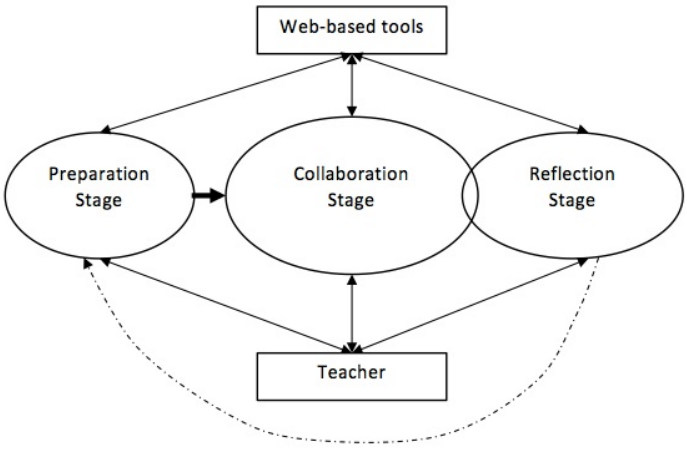

Figure 2. Teaching cycle for web-based collaborative writing.

Figure 2 demonstrates the importance of both the teacher and the tools in supporting learners as they engage in web-based collaborative writing. It also explicitly points out the importance of web-based collaborative writing being a process. The overlap between the collaboration and reflection stages underlines the importance of continued reflection in the process. The dashed arrow from the reflection to the preparation stages emphasizes the cyclical nature of learning in collaborative projects. These three phases are important for teachers as well as learners during web-based collaborative writing tasks.

Future research into how teachers can support the Teaching Cycle for Web-Based Collaborative Writing is needed, including identifying strategies and best practices that can guide all types of learners through full collaboration. Additionally, research comparing in-class collaborative writing with and without the use of technology can further inform educators regarding the benefits and challenges that various technologies offer the collaborative writing process. Studies that can explore which types of students most benefit from web-based collaborative writing are also needed, as are studies that examine in which areas students might experience the most benefits (e.g., grammar, organization, idea development, etc.), and under which conditions various technologies are most useful for students and educators. The framework of Kessler et al. (2012) for the co-evolution of collaborative autonomous pedagogy reminds us that as technologies evolve, students' use of new tools and teachers' implementation of new technologies in the classroom need to evolve as well. Future research will be needed into how new technologies (e.g., with automated writing evaluation or speech recognition) may impact L2 collaborative writing.

CONCLUSION

This study is the first of its kind investigating the potential effects of web-based collaborative writing on individual writing with English L2 writers. It focused on 59 undergraduate second language writers who were part of a U.S. university English writing class. Students in the collaborative writing group completed four in-class collaborative web-based writing tasks in addition to other class writing assignments, while the individual writing group participants completed four identical in-class individual web-based writing tasks. The web-based collaborative writing participants experienced statistically significant greater learning gains in their individual writing scores than did the individual writing group participants, though both groups experienced statistically significant gains from pre-test to post-test.

The majority of collaborative writing group participants liked the in-class web-based collaborative writing tasks. They thought the tasks helped them improve their personal writing, and recommended the use of these tasks for future classes. Overall, participants in the individual group also liked the web-based writing tasks, but many wished they had been able to write collaboratively. Collaborative group participants worked in one of three ways: *Explicit Collaborators, Budding Collaborators,* and *Resistant Collaborators*. Concerns raised by participants focused on time pressure, the amount of teacher intervention, and affective group dynamics. In order to realize the potential of web-based collaborative writing tasks, a three-stage Teaching Cycle for Web-Based Collaborative Writing is thus offered: (1) preparation, (2) collaborative writing, and (3) reflection. As technologies continue to become more interactive and individualized, CALL-based collaboration among L2 writers has the potential to provide increased benefits and expanded creativity for both students and educators.

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