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Patterns of computer-mediated interaction in small writing groups using wikis

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Abstract

Informed by sociocultural theory and guided especially by “collective scaffolding”, this study investigated the nature of computer-mediated interaction of three groups of English as a Foreign Language students when they performed collaborative writing tasks using wikis. Nine college students from a Chinese university participated in the wiki-mediated collaborative writing project. Analyses of data from the wiki “Discussion”, “Page”, and “History” modules on each group tab revealed that the three small groups displayed three distinct patterns of online interaction: collectively contributing/mutually supportive, authoritative/responsive, and dominant/withdrawn. These patterns were substantiated by the roles group members assumed and members’ task approaches in terms of equality and mutuality. Also, findings from semi-structured interviews suggested that the different patterns of interaction influenced the students’ perceived learning experiences. The collectively contributing/mutually supportive group reported the most learning opportunities. This study not only fills a gap in current collaborative writing literature but also makes a theoretical contribution to research on computer-mediated interaction in collaborative learning. Pedagogical implications on how to conduct computer-mediated collaborative writing are also addressed.

Keywords: computer-mediated communication; online interaction; interaction patterns; collaborative writing; second language writing; wiki; small writing groups

Introduction

Small group collaboration in second language (L2) classrooms has captured the attention of many language teachers and researchers. In the area of English as a Second/Foreign Language (ESL/EFL) writing, a significant amount of research on student collaboration in the past two decades has focused on peer response (e.g. de Guerrero & Villamil, 1994; Lockhart & Ng, 1995; Mangelsdorf, 1992; Mendonca & Johnson, 1994; Villamil & de Guerrero, 1998; Zhu, 2001), one form of collaborative work in which students provide feedback on each other's writing. Nevertheless, recently collaborative writing in which students are responsible for the co-construction of texts and joint decision making on various aspects of writing has begun to receive researchers' attention (e.g. Elola & Oskoz, 2010; Kessler & Bikowski, 2010; Storch, 2005). In particular, due to the increasing accessibility and implementation of computer-mediated communication (CMC) technologies in L2 writing instruction, collaborative writing via wikis has become an emergent topic of research interest.

A wiki, which allows users to post and edit texts and which tracks the history of text evolution through a detailed history page, provides a tool which supports many of the tenets of composition that are valued, including collaboration, continual revision, and communal knowledge formation (Purdy, 2009). Some research studies have addressed the roles of wikis for collaborative writing (e.g. Chao & Lo, 2009; Kessler, 2009; Lee, 2010; Mak & Coniam, 2008), and the process of students' text co-construction via wikis (e.g. Bradley, Lindstrom, & Rystedt, 2010; Kessler & Bikowski, 2010). However, little research has systematically examined the patterns of wiki-mediated group interaction in which students use multiple wiki modules to negotiate various aspects of writing and jointly construct texts in the EFL context. The present study was conducted to contribute to collaborative writing research by examining computer-mediated interaction in small collaborative writing groups of university-level EFL students in mainland China. Informed by sociocultural theory and guided especially by the construct of "collective scaffolding" (Donato, 1994), the study aims to provide valuable insights into the patterns of computer-mediated interaction in small group collaborative writing and explore the implications of interaction patterns for student learning.

Literature review

Collaborative writing and patterns of group interaction

Research on collaborative writing is underpinned by sociocultural theory (Donato, 1994; Storch, 2005; Vygotsky, 1978), particularly the notion that language and social interaction facilitate learning in the learner's Zone of Proximal Development (ZPD), defined by Vygotsky (1978) as "the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (p. 86). A related construct that is often cited to support collaborative writing is scaffolding (Donato, 1994; Storch, 2005), based on the Vygotskian premise of learning as a socially constructed process. Bruner (1985) described scaffolding as the gradual withdrawal of adult control and support as a function of children's increasing mastery of a given task. Bruner defined scaffolding as "the steps taken to reduce the degrees of freedom in carrying out some task so that the child can concentrate on the difficult skill she is in the process of acquiring" (Bruner, 1978, as cited in Mercer, 1995, p. 73).

Although scaffolding originally refers to expert-novice or adult-child interactions, several L2 researchers (Anton & Dica-milla, 1998; Donato, 1994; Ohta, 2000; Swain & Lapkin, 1998) have shown that scaffolding can also occur among peers when they collaborate via group work. More specifically, it has been found that collaboration with the "collective orientation to jointly constructed activity" (Donato, 2004, p. 287) allows students to reach higher levels of performance than they might achieve by working on their own. Focusing on traditional paper-based collaborative writing, Donato (1994) illustrated how learning took place in a social setting by examining "collective scaffolding". In "collective scaffolding", Donato noted, "the speakers are at the same time individually novices and collectively experts, sources of new orientations for each other and guides through this complex linguistic problem solving" (1994, p. 46). Ohta's (1995) findings supported the proposition that collaboration in the form of pair-work enabled the learners to acquire language by sharing their strengths in the ZPD. However, Kowal and Swain (1994), Storch (2002), and Watanabe (2008) found that students working in groups or pairs did not always work collaboratively or show any notable

writing improvement. The nature of interaction within small groups, therefore, deserves further investigation.

To better understand the nature of student interaction in collaborative writing tasks, one line of research (e.g. de Guerrero & Villamil, 1994; Lockhart & Ng, 1995) has examined the dynamics of students' face-to-face peer response tasks in which students provide feedback on each other's writing. This line of research has shown that there are different patterns of student interaction and that some patterns of interaction are more conducive to L2 writing development than others. For example, Lockhart and Ng (1995) examined ESL students' interaction during peer response by identifying four reader stances (i.e. how students approached peers and their texts): authoritative stance in which the reader dominates the talk by evaluating the peer text, interpretative stance in which the reader controls talk by conveying his/her reactions to peer text and allows the writer to respond, probing stance in which the reader gives the writer equal opportunity to talk about the text under review, and collaborative stance in which the reader allows the writer an opportunity to explain his/her intentions and express what and how to revise. The latter two stances, more collaboration-oriented, engaged students in a fuller understanding of the writing process.

Storch (2002) and Watanabe (2008) examined peer interaction in collaborative writing tasks in which students worked on a common written product. Storch (2002) drew on two indexes that Damon and Phelps (1989) proposed to distinguish patterns of dyadic interaction: Equality and Mutuality. Equality "refers to the degree of control or authority over the tasks" (Storch, 2002, p. 127), including the extent of contribution to group writing and the degree of control over the direction of writing. Mutuality "refers to the level of engagement with each other's contribution" (Storch, 2002, p. 127), including the degree of reciprocal response and sharing of ideas. Storch (2002) identified four patterns of interaction in her study of ESL pair writing work: collaborative, dominant/dominant, dominant/passive, and expert/novice, and concluded that students in the collaborative pattern which was characterized by a moderate to high degree of equality and mutuality learned more than pairs who were observed in the other three patterns. The students in the expert/novice pattern showing a collaborative orientation also performed well, in which there was a moderate to low degree of equality and a moderate to high degree of

mutuality. More recently, Watanabe (2008) adopted Storch's (2002) taxonomy of interaction patterns and investigated how peers' language proficiency levels influenced adult ESL learners' interactional behaviors when working on collaborative writing tasks. Data showed that the higher- and the lower-proficiency peers could mutually provide opportunities for learning when they shared ideas and made equal contributions to writing. This study reinforces the positive impact of a collaborative pattern of interaction on students' learning/writing experience.

Computer-mediated collaboration and wiki-mediated collaborative writing

As Kessler and Bikowski (2010) stated, "the evolution of collaborative writing may be intrinsically connected with the iterations of technology since new developments provide new opportunities for collaboration" (p. 43). Ware and Warschauer (2006) and Warschauer (1997) reported that CMC empowered collaborative learning in the language classroom, because CMC resulted in more equal communication than face-to-face discussion. Also, CMC provides spaces for students to practice their literacy skills in a nonthreatening environment (Colomb & Simutis, 1996). In CMC environments, writing is moving in the direction of "a more social construction of the activity and interactivity of writing" (Pennington, 2003, p. 304). Ware and Warschauer (2006) argue that "asynchronous discussion formats, in particular, are believed to combine the interactive aspect of written conversations with the reflective nature of composing" (p. 111). Wikis,¹ as asynchronous CMC technologies, are increasingly implemented in L2 writing instruction and have begun to attract the attention of researchers interested in technology-mediated collaborative writing.

Mak and Coniam (2008) conducted a pedagogy-oriented project and examined collaborative, authentic writing among small groups using wikis to produce school brochures in a secondary school in Hong Kong. They found that wikis served as a powerful mediating tool for collaborative process writing, and that students produced longer texts with higher coherence. In a case study, Lee (2010) explored wiki-mediated collaborative writing in Spanish as a Foreign Language course at an American university. The results revealed that wikis afforded writing processes that involved collaboration and scaffolding at different stages, and thus had a positive impact on the development of students' writing skills. Kessler and Bikowski (2010) reported a study of 40 non-native speaker pre-service EFL teachers' collaborative construction of a class

wiki in an online course at a Mexican university. After analyzing different phases of group collaboration and individual language acts by using data from the wiki “Page” and “History” modules, the researchers found that the students benefited from opportunities to practice autonomous learning as they used language to contribute personal meanings and employed appropriate strategies for communication as collaborative group members in the wiki environment. Elola and Oskoz (2010) also found that wikis provided an effective interactional forum where Spanish learners reflected on and engaged with L2 collaborative tasks.

The literature on computer-mediated, including wiki-mediated, collaboration has paid attention to student interaction in terms of text construction and the benefits of wikis for collaborative writing. For example, Bradley et al. (2010) analyzed the patterns of interaction according to texts that different ESL student groups constructed based on data available from archives of wiki pages, and identified three distinct patterns of interaction: no visible interaction in which a full piece of text was posted by only one individual, cooperating in which text was processed by individuals working in a parallel fashion, and collaborating in which texts were jointly written by individuals, and individuals engaged with each other’s ideas.

In contrast to Bradley et al.’s study which analyzed the archived versions of wiki pages to reflect group members’ behaviors during construction of texts, and which did not include information concerning whether/how students engaged in joint problem solving regarding writing, the study reported below examined overall patterns of student interaction in wiki-mediated collaborative writing tasks by examining data from several wiki modules, including “Page”, “History”, and “Discussion” from three Chinese EFL collaborative writing groups. Interviews of students constituted another important data source. Analyses of these sources of data not only provide a fuller picture of students’ computer-mediated interactions² but also offer insights into students’ perceptions of their learning experiences. The following two research questions guided this study:

- (1) What patterns of group interaction can be found when Chinese EFL students work on their collaborative writing tasks using wikis? What are the characteristics of these patterns?
- (2) If there are differences in patterns of group interaction, do they influence the students’ perceptions of their learning experiences?

Methodology

The study adopted a case study approach to explore the EFL students' computermediated interaction when working on collaborative writing tasks in small groups. According to Johnson (1992), a case may be an individual, a class, or a "communicative interaction in a particular situation" (p. 76). The cases in the present study are the interactions of three small groups, with each interaction as a bounded system (Stake, 1995).

Participants

Fifteen Chinese EFL college students at a southwestern university in mainland China were recruited to participate in this study. They were divided into five selfselected groups composed of three members each. As this study was conducted in the summer, when no formal courses were offered for undergraduates at this university, and as participation in the study was voluntary, two participants from two different groups quit the study due to external reasons during the course of the study. Therefore, the two groups had to be excluded from this study, and only the three remaining groups consisting of three members each participated in the entire project. That is, a total of nine students in three groups constituted the participants for this study. All these participants had learned English as a foreign language for seven or eight years prior to the study, including one or two years' learning experience in College English, a compulsory English course for non-English majors in universities. They had been introduced to three main genres of writing: narration, exposition, and argumentation in their writing curriculum. Pseudonyms were used for the nine participants and their profiles are shown in Table 1.³

Data collection procedures

To collect the data for the study, the first author set up a Wikispaces site and created four tabs: "tutorials", "writing tasks", "writing groups", and "writing resources". Students were then invited to join the Wikispaces site and to work on their collaborative writing tasks by entering their respective writing group links (i.e. Group 1, Group 2,

Group 3) under the tab of “writing groups”. All the information on this wiki site was available to both authors and the participants.

The timeline of data collection is displayed in Table 2. In the first week, students received a 3-hour face-to-face orientation, including a detailed introduction to this study, lectures on how to join the Wikispaces site, how to use a variety of resources on wiki, and how to use the “Edit”, “Discussion”, and “History” modules for group collaborative writing. Specifically, students were instructed to exchange ideas on “Discussion” before or when composing texts on “Page”, and to post rationales for textual changes after they revised or edited texts. The students were informed of the voluntary nature of participation and were invited to participate in the study. During the orientation, the students also formed the small groups themselves, and each group discussed their own ways to approach their collaborative writing tasks in the coming weeks.

Beginning in the second week, students were asked to work on the collaborative writing tasks using wikis. Before working on the collaborative writing task under their group wiki (accessed from the tab of “writing groups”) for each week, group members first went to the tab of “writing tasks” and learned what writing task they would perform for that week, and afterwards they entered their designated group link under the tab of “writing groups” and began their collaborative writing task. From Week 2 to Week 4, students completed a total of three writing tasks including narration, argumentation, and exposition, devoting approximately one week to each task. The prompts for the three writing tasks could be accessed under the tab of “writing tasks” in the Wikispaces. Every week, the students were reminded of the deadline via email and published writings on wikis were collected.

Table 1. Participants.

Group	Name (pseudonym)	Gender	English proficiency*	College years	Group member familiarity
Group 1	Wang	Male	Intermediate high	3	Lin and Zhao were classmates, but they did not know Wang before the study
	Lin Zhao	Female	Intermediate	2	
		Female	intermediate	2	
Group 2	Liu	Male	Intermediate	3	The three did not know each other before the study
	Zuo	Female	Intermediate	3	
	Xi	Female	intermediate	2	

Group 3	Li	Female	Intermediate high	3	The three members were classmates
	Chen	Female	Intermediate	3	
	Zhang	Female	Intermediate	3	

Notes: *As indicated in Note 3, participants' proficiency levels were determined by their scores on CET-4 and CET-6. This information was obtained from the semi-structured individual interviews.

Table 2. Data-collection timeline.

Week 1	Week 2	Week3	Week 4	Week 5
Orientation and self-learning (wikis)	Writing task 1 (narrative)	Writing task 2 (argumentation)	Writing task 3 (exposition)	Post-task interview
	Group	Group	Group	Individual
	All (9 students)	All (9 students)	All (9 students)	7 students – Group 1 (2) Group 2 (2) Group 3 (3)

In the fifth week, when participants completed their third collaborative writing task, the first author collected all the posts from “Discussion”, “Page”, and “History” modules on each of the three group wikis and held post-task interviews with seven students who were willing to be interviewed. These semi-structured individual interviews (see Appendix for the interview protocol) were conducted in a teacher’s office with four students, lasting about 25 minutes for each participant. All the face-to-face interviews were recorded using “Audacity”. The other three students received the same interview protocol via email and wrote responses to the interview questions and emailed them back to the first author.

Data analysis

To answer the first research question, we examined data from “Discussion”, “History”, and “Page” in each group wiki to identify students’ patterns of interaction. In our wiki-mediated collaborative writing task context, patterns of interaction refer to ways in which students negotiated the writing tasks as well as ways in which students acted upon their negotiated meaning through text construction. We drew from Storch’s (2002) research on patterns of dyadic interaction using Damon and Phelp’s (1989) two indexes: “equality” and “mutuality” and examined the data from the “Discussion”, “History”, and “Page” modules in each group tab

focusing in particular on how group members within each small group approached the writing tasks in terms of “equality” and “mutuality”. More specifically, we examined patterns of wiki-mediated interaction via focused analysis of each group member’s “Discussion” posts as well as secondary analysis of how members followed up on the discussion as revealed from “History”. We printed a total of 77 online posts on all three tasks from the three groups, and numbered each post sequentially beginning with the posts from Group 1 and ending with those from Group 3 (Posts 1–30 were from Group 1, Posts 31–41 were from Group 2, and Posts 42–77 were from Group 3). All the posts for each group were analyzed in terms of units of language functions, which refer to mediating functions of language occurring in the “Discussion” discourse, e.g. agreement, suggestion, apology, etc. The total number of language function units generated by each individual member was counted for each of the three groups. Focusing on qualitative analysis, the researchers followed the grounded approach (Glaser & Strauss, 1967) by analyzing the data in an iterative and holistic manner for each group and making comparisons of the data from the three groups. Three categories reflecting the interactions of the three groups emerged: collectively contributing/mutually supportive, authoritative/responsive, and dominant/withdrawn. The characteristics of the three patterns of computer-mediated interaction are displayed in Table 3.

Related to the different patterns of interaction are differing roles of students. Regarding the collectively contributing/mutually supportive pattern, there is no one clearly identifiable expert, but group members, acting as a collective, draw on their resources and scaffold each other’s efforts on the collaborative writing task. Regarding the authoritative/responsive pattern, one member plays the role of a leader, who actively engages with the other two members’ contribution and successfully takes authority over the tasks. Regarding the dominant/withdrawn pattern, two group members assume the role of leaders. Both members attempt to take control over the tasks, but neither offer reciprocal response to each other’s efforts.

Table 3. Characteristics of three patterns of computer-mediated interaction.

Patterns of computer-mediated interaction			
	Collectively contributing/mutually supportive	Authoritative/responsive	Dominant/withdrawn
Equality	Group members make equal contributions to the group discussion of the writing tasks.	Group members have unequal contribution and degree of control. One member takes most control over the tasks.	Group members have an uneven contribution and degree of control. Two members take control over the tasks, and the third member's contribution is minimal and the member even withdraws from the writing tasks.
Mutuality	Group members are willing to offer and engage with each other's ideas through discussion and text construction.	The other two members acknowledge the leading role of the authoritative member, and they are responsive to the leader's behaviors. Group members fully engage with one another's ideas.	Group members are unwilling or unable to engage with one another's contribution. There is no reciprocal interaction and little mutual scaffolding.

To answer the second question regarding the participants' perceptions of their learning experiences, the first author transcribed the four face-to-face interviews and took a leading role in analyzing the transcripts and written responses to the interview questions by the other three participants. The analysis was informed by the constant comparative method (Strauss & Corbin, 1998) in which the data, transcripts and written responses in this case, were read and reread to derive categories rather than using predetermined categories and imposing them on the available data. Six major thematic categories emerged about the participants' perceptions of the benefits of wiki-mediated collaborative writing activities from the data. The researchers discussed the themes and the co-author verified the themes using data provided by the first author.

Results

Analyses of data indicated that the three groups demonstrated three distinct patterns of interaction: collectively contributing/mutually supportive, authoritative/responsive, and dominant/withdrawn. While it is possible that groups shift interaction patterns, the wiki "Discussion", "Page", and "History" data in our study showed that each group demonstrated a

consistent overall pattern of interaction throughout the collaborative writing tasks, although some variation in individual behaviors across tasks was noted. Also, participants who experienced different patterns of interaction reported different perceptions of learning experiences. The following section presents the interaction patterns and students' perceptions using illustrative excerpts drawn from the wiki modules and the interviews.

Different patterns of computer-mediated interaction

Collectively contributing/mutually supportive

Group 3 demonstrated a collectively contributing/mutually supportive pattern of interaction. The group consisted of three third-year female college students: Li, Chen, and Zhang. The three members made joint contribution to the discussion on the writing tasks, and they were also fully engaged with each other's contributions as revealed in the discussions and text construction. One important feature of Group 3's interaction was the relatively equal participation of each group member in the negotiation of meaning concerning various aspects of the writing tasks as reflected in the "Discussion" posts. Among a total of 52 units of language functions generated across the three tasks, Li contributed 18 (34.6%), Chen 14 (26.9%), and Zhang 20 (38.5%).

Excerpt I (Task 1)

- 43 Zhang: we'd better think of the topic with two aspects, advantages and disadvantages
- 44 Li: while I assume we can begin with the advantages – what and how the extra eye made our life colourful.
Do you?
- 45 Chen: I agree. Let's write some advantages first and then disadvantages.
- 46 Zhang: OK!

In this segment of the interaction, Zhang first put forward an idea and Li built on Zhang's idea by suggesting that the group focus on the positive aspects first. This suggestion was accepted by her two partners; thereafter, all the group members listed the advantages and disadvantages in their group "Page" module. Li wrote, "in the cinema, through the front one, we will share the twittering of birds, the sight of the rising sun [...] with the extra eye, other beautiful picture is going on at the same time". Chen added, "we can shelter it in daily life, and use it at special time, for example, searching for

thieves on bus”. Zhang added later, “maybe one would wrathfully complain, if owning an extra eye, he would pay additional money for its eyeglass. Once you lay on bed for a rest, your third eye was uncomfortable under a pressure for the gravity”. It is worth noting that all the group members contributed to the discussion of the writing and they extended on one another’s ideas using the asynchronous tools afforded by wiki. Excerpt 2 is yet another example of this pattern of interaction.

Excerpt 2 (Task 1)

54 Li: I think it’s a imaginative idea. An eye on the back of our heads, if so, will expand our sight largely. We will have an incomparable feel of our life. For instance...

55 Chen: For example, unless you close your eyes, you can see everything around you from all the directions. If we don’t like to see something, we usually face it with our back. But now how can we do, there [does] not exist the so-called back.

As shown in the above excerpt, there was a very smooth flow of collective thoughts. Li started the idea that an extra eye on the back of the head would bring about unbelievable situations, and then invited her group partners to add supporting sentences beginning with “for instance”. In response to Li’s invitation, Chen supplied a specific example to scaffold Li’s effort on thesis development.

The three partners in this group consistently engaged with one another’s suggestions. For instance, for Writing Task 2 which invited students to stage and support a position concerning the functions of arts and science (AWA practice-GRE issue essay, 2010), Chen posted in the “Discussion” module, “let us discuss the purpose of the art roughly”. Zhang and Li followed this suggestion. Zhang posted her response to the suggestion on “Discussion”, writing that “life is art and art is life. [...] Life becomes vivid with the beauty of art”. Li composed a paragraph on the value of art in the group “Page” module:

Excerpt 3 (Task 2)

Therefore, art works could always tell the contemporaneous social problems bluntly, which would make people upset. However, what art can do is much more than upsetting people. [...] art can enhance people’s life by adding beauty to our surrounding or bringing dreams and belief to us.

Apart from active negotiation of writing content, members of Group 3 were highly engaged with discussions on language points, as illustrated in the following excerpt.

Excerpt 4 (Task 1)

64Li: Isn't the English for “眼镜” glasses?

65Zhang: I thought the extra eye is singular, so I use “eyeglass” instead of “eyeglasses”.

66 Li: I mean using “glass” rather than “eyeglass”.

67 Zhang: There exists the word “eyeglasses” and I found it in Jin Shan Ciba (Chinese English e-dictionary).

68 Li: Oh, I got it.

69 Chen: I also found the word “eyeglass” in “Longoes” (the other e-dictionary).

In Excerpt 4, the three partners discussed the use of “eyeglass”. Li questioned Zhang’s use of “eyeglass” and suggested using “glass”. Zhang misunderstood her, thinking Li suggested using the plural form “eyeglasses”, so Zhang defended herself saying the extra eye is singular. Then Li pointed out substituting “eyeglass” with “glass”. Zhang further defended herself by looking up the vocabulary in the e-dictionary and later the group reached a consensus after Chen found “eyeglass” in her e-dictionary, as well. As shown in this excerpt, peer assistance was co-constructed, and small group work provided the learners with opportunities to pool their linguistic and social resources together in meaning negotiation geared toward co-construction of texts.

In addition, the three members assumed the role of expert alternately on different occasions. There was no clearly identifiable expert or leader, but rather, the members collectively drew on the resources and mutually scaffolded the collaborative writing tasks. In the beginning of the group work, Zhang uploaded an animated picture of a ringing bell signifying “Go, Go!” on their group “Page” to establish the group identity and encourage the group members. During Writing Task 2, Li uploaded a Chinese essay entitled “Relationship between Art and Science” to the “Discussion” module to facilitate the group’s brainstorming on the task, for the students felt this topic was too abstract for them, and it was hard for them to start composing, as later revealed in the interview. As the due date of the second task was approaching, Chen suggested discussing and negotiating the revision of their writing in Chinese using QQ, a popular chatting tool in China. All the members in the group served as facilitators in the collaborative process.

Moreover, in the process of completing the collaborative writing tasks, group members were highly involved with recursive ways of writing. The group “History” page revealed that all three members were active at the revising stage. They engaged with each other’s texts through a range of revision and editing efforts:⁴ addition, deletion, reordering, rephrasing, and correction.

As a whole, members in Group 3 were willing to offer and engage with each other’s ideas, and they made equal contributions to meaning negotiations and text construction.⁵ “Collective scaffolding” is the most salient trait for the collectively contributing/mutually supportive pattern: the students were “at the same time individually novices and collectively experts” (Donato, 1994, p. 46). They jointly pooled their knowledge and co-constructed the resolutions to writing problems. The role of expert was quite fluid (Ohta, 1995; Storch, 2002; Swain & Lapkin, 1998). There was no clearly identifiable expert, but instead, group members collectively pooled their resources and together scaffolded the collaborative writing tasks.

Authoritative/responsive

Group 1 demonstrated an authoritative/responsive pattern of interaction. This group consisted of a third-year male college student, Wang, and two second-year female college students, Lin and Zhao. Throughout the writing process, Wang assumed the role of the expert and steadily led the writing direction; Lin and Zhao seemed to acknowledge Wang’s authority, and both of them were responsive to his ideas. The roles of the three members were demonstrated in the data from the group “Discussion”. Among a total of 45 units of language functions this group generated, Wang contributed 24 (53.3%), in contrast to 14 (31.1%) and 7 (15.6%) that Lin and Zhao contributed, respectively. “Discussion” posts also revealed that Wang monitored the writing process and identified directions toward problem solving, as exemplified in Excerpt 5:

Excerpt 5 (Task 1)

2 Wang: Hi, everyone! In my opinion, our have-done jobs seem just like a patchwork, not a real essay. [...] So I’d like to integrate them into a formal article. Do you mind my revision? Please reply me immediately! Time is running out. Thank you....

With the due date approaching, Wang tried to complete the group’s assignment. Also, he made an effort to involve the other two members in the interaction and provided appropriate assistance when needed, as illustrated in the following two excerpts.

Excerpt 6 (Task 1)

14 Wang: Can somebody do a formal edition of our work, such as the size of word? I have tried but in vain.

Excerpt 7 (Task 1)

4 Zhao: But I find the EDIT is out of use. Can you tell me what's wrong?

5 Wang: I haven't met with that problem. But I think the reason may be your Internet Explorer need updated.

However, Wang was not always the expert. He once mistakenly revised a phrase used by Zhao and expressed a sincere apology when Zhao corrected him, as shown in Excerpt 8.

Excerpt 8 (Task 1)

15 Zhao: 'as far as I am concerned' is a kind of set structures. So I don't agree with deleting 'am'.

16 Wang: Sorry, it's my fault. You're right. I should have been more serious. Sorry again.

The above excerpt indicates that Wang was authoritative without necessarily being authoritarian (van Lier, 1996) since he was open to others' ideas.

The two female students were very responsive to Wang throughout the study. They not only followed Wang's suggestions, but also occasionally initiated new writing perspectives. During Writing Task 1, Wang posted on the group "Discussion" module, "I strongly advise you to write some advantages and disadvantages of having an extra eye on the back of head". Responding to his suggestions, Lin posted the pros of an extra eye in the "Page" module. Not just passively doing what she was asked to, Zhao took the initiative to write a paragraph when the group was working on Writing Task 2. Wang expressed his appreciation of her work in the "Discussion" and recommended using the paragraph as "the primary outline or structure of our essay".

Moreover, like Group 3, members of Group 1 negotiated language points and solved language problems by pooling together their linguistic resources, as exemplified in Excerpt 9. The interaction occurred when they worked on Writing Task 3 for which the participants were asked to describe trends in cinema attendance based on a graph provided to them (Longre Inc., 2010).

Excerpt 9 (Task 3)

26 Wang: According to the data given above, we can conclude a lot of facts happened last year.' Where we can indicate it's last year? Would you please inform me of that? thank you.

29 Lin: Dear julio, I'm really sorry for I have made a few mistakes as you said above. And I said last few years. not last year.

30 Wang: Oh, you mean "in the previous years"?

For Writing Task 3, the participants were required to write an exposition about cinema attendance according to a graph. Wang initiated the discussion by asking Lin how she could find from the graph 'last year'. Lin responded by saying that she was wrong with the language and she should have used "last years". Then Wang corrected her by proposing the phrase "in the previous years".

Generally, the three members in Group 1 interacted with each other in quite a harmonious atmosphere. Compared with that in the collectively contributing/ mutually supportive pattern, the members' contribution in the authoritative/ responsive pattern was not equal, and the degree of collectiveness was not as high as that in the collectively contributing/mutually supportive pattern. Some linguistic features such as pronouns members of Group 1 used revealed that group members regarded their writing process as the combination of each individual's efforts rather than as a truly collective unit. They tended to use the second person pronoun (you) when addressing other group members, especially in Writing Task 1, as reflected in comments such as "I have already corrected some errors in grammar. Hope to do you a favour" (Lin), and "I am sorry to take you trouble" (Zhao). Interestingly, however, they were less likely to use "you" in Writing Task 3, although the overall pattern of interaction remained consistent.

Overall, the data from group "Discussion", "Page", and "History" modules showed that one member, Wang, took most control over the tasks and led the writing activities at multiple stages and he also contributed the largest proportion of the group writing.⁶ The two other members acknowledged the leading role of Wang and they were responsive to Wang's leadership. Although contribution and the degree of control were not equally distributed, all the participants fully engaged with one another's ideas.

Dominant/withdrawn

Group 2 demonstrated a dominant/withdrawn pattern of interaction. This group consisted of one third-year male college student, Liu, one third-year female college student, Zuo, and one second-year female college student, Xi. In sharp contrast with Group 1, in which the male led the writing tasks, Liu barely interacted with his peers and had little contribution to the group discussion or writing. The two female students dominated the writing activities, but failed to engage with each other's ideas. The data from the group "Discussion" showed that Xi tried to take control over the task by assuming the role of the leader. Xi contributed 8 (61.5%) units out of a total of 13, and Zuo and Liu contributed 3 (23%) and 2 (15.5%), respectively. Also, Xi's attempts to lead the group discussion were illustrated in the following three posts.

36 Xi: Search more information is important, but now we should decide to agree or disagree with it (Task 2).

38 Xi: Guys, we need to pay more attention on the third assignment. Due to some reasons we didn't have enough discussion and time to complete our work. But now let's turn to a new leaf (Task 3).

40 Xi: Hey guys, if you have any question or idea, please just tell me. And I am eager to know where are you now (Task 3).

However, most of her posts were ignored. Although there were a few responses from the other two members on the group "Discussion", these responses did not seem to build on Xi's ideas. For example, in response to Post 36, Liu wrote: "I don't agree absolutely, as one coin has two sides" (Post 37).

Coincidentally, Liu's disagreement was also made after a previous post by Xi

35 Xi: "Is Mr. Liu wrote the paragraph 3? I just wonder what the view of life you had mentioned is. I am thinking about the man do not want this extra eye at last. He would be happy when sometimes he does not figure out everything". (Task 1)

Xi had different ideas from Liu regarding Task 1, but she did not successfully engage her partner in the interaction. After Post 37, Liu did not contribute again to the group task. He responded, disagreed, and then withdrew.

The other group member, Zuo, did not dominate in the "Discussion" posts as Xi did; however, she was very active in text contribution on "Page" and she also dominated the revision of texts, making a large portion of the textual changes (i.e. correction, deletion, and rephrasing).

It was clear from the "History" and "Page" records that Zuo and Xi individually composed approximately half of the texts,⁷ and Liu's contribution was barely detected. The two female students participated in writing actively, but they seemed to have no

joint construction. The group members had little concerted investment in revision and editing. Interestingly, there were some occurrences that Zuo and Xi revised each other's texts, but the revised texts were later changed back to the original by the initial author. This showed that the two members were reluctant to accept the contributions of each other. Therefore, there was no sign of pooling together resources toward joint problem solving.

Taken together, Group 2 displayed nonreciprocal interaction and little scaffolding. The salient features of the interaction pattern were unbalanced contribution and low level of mutual acceptability. Two participants took control over the writing tasks, but they were unwilling or unable to engage with each other's contribution. The third participant contributed little and even withdrew from the writing tasks. There was no collective scaffolding discovered in this loosely-knit group (Donato, 1988).

Perceived learning experiences

Post-task interviews yielded some interesting insights about students' perceptions of their experiences during the collaborative activities. The interviews were conducted with 7 students, Wang and Zhao from Group 1, Xi and Zuo from Group 2, and Li, Chen, and Zhang from Group 3. Six major categories about students' perceived benefits of collaborative writing were identified. The results are briefly presented in Table 4 and discussed in the following section. The number of participants who held the viewpoint in each category is provided for each group in Table 4.

Group 1

As indicated in Table 4, Group 1 expressed quite a few positive perceptions of their experiences of the wiki-mediated collaborative writing activities. Members of Group 1 commented on five of the six perceived benefits of wiki-mediated collaborative writing. Zhao acknowledged the writing inspiration and interesting perspectives her group members provided. This perception was shared by Wang, who commented, "It was really a great experience. I have never collaborated with others on writing; I found the group work broadened our writing perspectives and enable us to solve the problems jointly."

Table 4. Participants' perceived learning experiences.

Learning experiences	Group 1 (N: 2)	Group 2 (N: 2)	Group 3 (N: 3)
Gaining more writing perspectives	2	1	3
Developing language skills	1	0	2
Learning writing strategy	0	0	1
Enhancing learning motivation	1	0	2
Preparing for computer-based tests	1	0	1
Fostering cooperative spirits	2	0	0

Zhao maintained that the activity enriched her writing experience and enhanced her intrinsic writing motivation: “It is a fresh and exciting experience to read and write in English on the computer. This is a great learning opportunity. Also, I felt a sense of achievement when we completed a long article with brilliant ideas”. Zhao added that the activities honed her skills on computer-based tests. She stated that “I developed my skill at writing on the computer [...] This enabled me to get prepared for the upcoming online English Tests”. Her positive view of using wiki was partly influenced by her positive interaction with her peers, especially the leader, Wang. Zhao reported that at the beginning of the project, she encountered a technological problem about editing on wiki, and she sought help in the wiki group “Discussion”. Wang, assuming an authoritative role, pointed out the resolution for her so that she was able to conduct her work smoothly later.

Group 2

In Group 2, Xi and Zuo agreed that wiki-mediated collaborative writing could be a useful activity for learning. Zuo believed this activity could provide more writing perspectives. As she said, “I believe there are advantages of wiki-mediated collaborative writing, that is, more perspectives can be introduced”. Xi stated that “I think wiki-mediated collaborative writing can [be] a useful way to practice our writing”. Interestingly, however, Xi did not point out whether she believed that she learned through the writing activities. Zuo, unlike Xi, candidly pointed out that she learned little during this project, although she believed collaborative writing could foster learners’ cooperative spirit if conducted appropriately. Note that writing perspectives was the only potential benefit perceived by members of Group 2.

Zuo offered some possible reasons for Group 2's unsuccessful interactions, stating that "the members did not know each other and not everyone was ready to cooperate, so we did not take advantage of wiki in this activity". She added that "Students tended to be lazy during the summer break. We three actually set a writing schedule during the orientation, but unfortunately we were not able to implement it". Zuo also perceived that the English proficiency levels of their group members were relatively low. She remarked, "If all the group members' English levels are not high, it is difficult to identify and correct mistakes in writing".

Xi also expressed her dissatisfaction with her group's work, commenting that "I have to say our group interaction was bad. When we start our work, I failed to find and discuss with my partners". Xi additionally commented on the inconvenience of wikis. "[...] wiki is not so convenient for writing. We need a computer and Internet.[...] traditional writing merely requires a pen and paper, which means we can write wherever we would like to", Xi claimed. From the posts of this group, it seemed that Xi's viewpoint was related to her poor technological skills and the little assistance she received from her peers. For example, she posted in the wiki "Discussion" to ask her partners for help about the location of the writing tasks, but unfortunately this post received no response.

Group 3

All three students participated in the interview and the members acknowledged that wiki-mediated collaborative writing provided many learning opportunities and reported five of the six perceived advantages identified in Table 4. Regarding her group's work, Chen exclaimed that "This is novel and fun activity! Three heads are better than one" and that "We gain more perspectives and we learned from each other. [...] there was no specific division of labor, but the group work was magically harmonious." This viewpoint was echoed by the other two members. Zhang recalled some interesting ideas that her partners had come up with during the writing process, which broadened each other's perspectives.

Two participants maintained that they definitely learned language through using language and discussing language points. Li and Zhang coincidentally shared the same comments that they were forced to read and write in English using wikis and their English writing skills were improved. Li

particularly commented that “we paid more attention to writing accuracy and grammar when we worked on the joint writing”.

Zhang stated that she had an impetus to learn after she realized her colleagues’ good command of English. She said that “I am impressed by the complex sentences and vocabulary my colleagues applied. It motivated me to study my Vocabulary 5500 harder”. In other words, Zhang indicated that she was motivated to learn by the perceived language skills of her peers. Li also commented on her strong motivation to write on wikis, saying that “We feel motivated to enter the Wikispaces and check what have been changed”.

Moreover, Zhang expressed that she learned writing strategies from her peers, stating that “It was great to know they were using a good e-dictionary named Lingoos and I learn to use it like them”. In addition, like Zhao in Group 1, Zhang applauded the positive impact of the wiki-mediated collaborative writing activities on the upcoming online tests. She said, “I get familiarized with working on computers. I believe I will be comfortable taking an online test. I will have no technology anxiety”.

Examining students’ perceived learning experiences against the identified patterns of interaction indicate some noticeable connections between interaction patterns and students’ perceptions of learning. Group 3, displaying a collectively contributing/mutually supportive pattern, reported numerous types of learning occurrences. Group 1, displaying an authoritative/responsive pattern, also identified many learning opportunities, especially the social-affective aspects of learning. However, Group 2, displaying a dominant/withdrawn pattern, mentioned few learning opportunities.

Discussion

The analyses of data indicated that the three EFL groups demonstrated three distinct patterns of interaction while working on collaborative writing tasks using wikis, and the patterns of computer-mediated group interaction influenced students’ perceptions of their learning experiences. The participants in this study were from the same cultural, linguistic, and educational backgrounds, but not all students worked collaboratively in the assigned work, as reflected in the different interactional patterns. Nor did all the students report positive learning experiences. These findings highlight the importance of the nature of interaction for possible learning opportunities, which

support Donato's (1988) and Storch's (2002) position that patterns of interaction may have implications for second language learning and writing development.

In line with Storch (2002), the results of our study suggest that group members can scaffold one another's performance when they make joint efforts to conduct the group work and actively engage with one another's contributions, as observed in the collectively contributing/mutually supportive and authoritative/responsive patterns in this study. As Peterson (2009) pointed out, when learners engage in interactions in which they support and engage each other, a feature of both the collectively contributing/mutually supportive and authoritative/responsive patterns in this study, their mutual assistance facilitates the "creation of zones of proximal development that enable them to perform activities they could not undertake alone" (p. 305). The finding concerning interaction patterns also suggests that although equality and mutuality have been used as two important indexes for understanding collaborative learning and writing, the existence of high mutuality in group interactions may be more important than a relationship which emphasizes high equality. In this study, although Group 1 did not exhibit a high degree of equality, it demonstrated a high degree of mutuality, which contributed to the positive learning experiences according to the students.

Further, the online small group interactions witnessed in the study demonstrated a few characteristics similar to those in face-to-face interactions, as patterns similar to the collectively contributing/mutually supportive and authoritative/responsive patterns observed in this study were also found in the previous studies examining face-to-face interactions (e.g. Storch, 2002; Watanabe, 2008). At the same time, our study also points to certain unique features of online interactions. Unlike the face-to-face interactions of some pairs displaying the dominant/passive pattern in Storch (2002) and Watanabe (2008), group members, in the CMC context, can have the alternative to be absent and withdrawn, which may be more detrimental than passive to student learning. Members' lack of participation may become a serious obstacle for online collaborative learning/writing, and thus, members' presence may be more important for online collaborative learning/writing. Given this, the teacher's structuring and evaluation of each member's individual work in the computer-mediated collaborative writing tasks become indispensable to promote positive interactions and support learning.

The study indicates that not all students are able to take advantage of using computers to engage in collaborative work, although computers allow students to contribute at their own time and pace

(Colomb & Simutis, 1996), and although CMC affords opportunities for students to participate more equally than face-to-face discussion (Warschauer, 1997). In addition, the study suggests that a variety of learner factors⁸ may influence the dynamics of computer-mediated interactions: group member familiarity, language proficiency, technology skills, and motivation. The factors have been identified as those that influence student interaction in previous studies examining ESL students' collaborative writing.

Conclusion

Small groups are now widely used in the language classroom, but computer-mediated collaboration is a relatively new instructional strategy. This study examined the nature of EFL small groups' computer-mediated interactions when group members composed jointly in the Wikispaces site. Three distinctive patterns, namely, the collectively contributing/mutually supportive, authoritative/responsive, and the dominant/withdrawn were identified. Interviews of students suggest that from the students' perspective the collectively contributing/ mutually supportive pattern and the authoritative/responsive pattern afforded more opportunities for learning than the dominant/withdrawn pattern.

This study represents an initial effort to document what interaction patterns small EFL groups demonstrate during wiki-mediated collaborative writing activities, and how the patterns of interaction relate to students' perceptions of learning opportunities and experiences. The study contributes to an understanding of how collaborative writing may operate in CALL projects in the wiki environment. While sound pedagogical implications can only be drawn with a better understanding of online collaborative writing, several issues may deserve writing instructors' consideration when teachers employ wiki-mediated collaborative writing activities. First, there is a need to organize a well-structured training session for students on how to use wikis for collaborative writing. Although an orientation on how to use wiki modules was provided for the participants in this study, some students still experienced difficulty in jointly completing the wiki-mediated writing tasks. Therefore, it is necessary for instructors in the training session to include a collaborative writing task in which students can practice using different wiki modules. Also, instructors need to help students come up with the detailed

schedules for collaborative writing activities and also monitor their collaborative writing process on wikis. Moreover, the results of the study indicated that the lack of presence by group members is detrimental to wiki-mediated collaborative writing activities, so evaluation of individual work needs to be emphasized so as to facilitate equal contribution and reciprocal interaction. In addition, students' language proficiency and member familiarity need to be taken into account when small groups are formed.

Some limitations of the study need to be acknowledged. This study was conducted in the summer, when there were no formal EFL course offered for the undergraduates; therefore, this study was not classroom-based and the findings may not be readily transferred to the classroom context. Secondly, the number of participants in this study was limited. Since two students did not finish the study due to external reasons, the two groups in which they were members could not be included for the study, restricting the number of participating groups to three, each with three students. Participant attrition may pose a particular challenge to studies such as this one because absence of data from one member may affect the usability of data from a group. Thus, both the number and the structure of small groups in collaborative writing research need to be carefully planned and, in studies focusing on interaction in collaborative writing groups, ample groups should be included so as to reveal more perspectives of the dynamics of group interaction.

With the development of emerging computer-based technologies for instruction and learning, the research of small group interaction in computer-mediated collaborative writing deserves further investigation. Future study can continue to examine students' interaction patterns in wiki-mediated collaborative writing with a larger sample size and in other learning contexts. One interesting area of research along this line of inquiry concerns the impact of cultural contexts on student collaboration. Research can also further explore what factors influence the ways students collaborate in wikis for purposes of language learning and writing development. Equally importantly, future research can investigate how the students transfer the knowledge and skills they have gained from wiki-mediated collaborative writing to subsequent individual production of online writing. With a deepened understanding of these issues, writing instructors are in a better position to integrate technology effectively into their writing classes and help enhance students' writing skills in the CALL context.

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Notes

1. Wiki has four defining features: “Page”, “Edit”, “Discussion”, and “History”. “Page” documents the final product of the group writing after multiple revisions and edits. “Edit”, attached to “Page”, allows each group member to write and revise writing on “Page” as many times as he/she wishes. “History” reveals every revision saved, or any change the “Page” has gone through. “Discussion” allows each writing group to discuss and interact throughout the writing process.
2. Because of space constraint, this study focused on data from wiki “Discussion”, a data source which has not been systematically examined in the previous literature; information about texts composed and revisions made as revealed in the wiki “Page” and “History” modules are included as secondary source of data in this paper.
3. Students’ language proficiency levels are determined by their performances on College English Test Band 4 (CET-4) and College English Band 6 (CET-6), the two popular nationally accredited exams. Those who have passed the CET-4 are considered to have the intermediate level of English proficiency, and those who have passed the CET-6 are considered to have the high intermediate level of English proficiency.
4. Discussion of revision and editing is beyond the scope of this article. We only report the general observation here.
5. Throughout the study, members of Group 3 jointly constructed texts consisting of 2121 words: 830 words (39.1%) were written by Li, 592 (27.9%) by Chen and 699 (33%) by Zhang.
6. Members of Group 1 constructed texts consisting of 2645 words, and 1571 words (59.4%) were written by Wang.
7. Group 2 members constructed texts consisting of 2595 words, and 1221 words (47%) were written by Zuo and 1235 words (47.6%) by Xi.
8. Examination of factors influencing computer-mediated interaction is not within the scope of this paper, but students revealed quite a few factors which they perceived to have impacted their wiki-mediated collaborative writing experiences.

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Appendix

Interview protocol

- (1) How do you view your English proficiency and computer technology skills?
- (2) What do you think of wiki-mediated collaborative writing?
- (3) According to your experience, what are the advantages and disadvantages of writing collaboratively on Wiki compared to the traditional individual writing on paper?
- (4) How do you like your group work? Do you enjoy it? Why or why not?
- (5) What suggestions do you have to better the activity of wiki-mediated collaborative writing?