



Explaining dynamic interactions in wiki-based collaborative writing

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Abstract

This article reports a case study that examined dynamic patterns of interaction that two small groups (Group A and Group B) of ESL students exemplified when they performed two writing tasks: a research proposal (Task 1) and an annotated bibliography (Task 2) in a wiki site. Group A demonstrated a collective pattern in Task 1, but switched to an active–withdrawn pattern in Task 2. In contrast, Group B exhibited a dominant–defensive pattern in Task 1, but switched to a collaborative pattern in Task 2. These patterns were substantiated by group members’ ongoing task approaches in terms of equality and mutuality, reflected via the analyses of language functions, writing change functions, and scaffolding occurrences over the course of joint wiki writing. The dynamic interactions within small groups were explained from a sociocultural theory perspective. Participants’ emic perspectives from interviews and reflection papers supplemented with wiki discourse revealed that three sociocultural factors help account for the variations of interaction patterns: dynamic goals, flexible agency, and socially constructed emotion. This study reinforced the role of sociocultural theory in exploring and explaining peer interactions in the online writing task environment. Implications of the study for research and pedagogy are also discussed.

Keywords: Collaborative Learning, Computer-Mediated Communication, Sociocultural Theory, Writing

Language(s) Learned in this Study: English

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Introduction

Wiki-based collaborative writing has been increasingly implemented in second language (L2) classes due to the potential of wikis to promote and support collaboration (e.g., Kessler, 2009; Lee, 2010; Mak & Coniam, 2008). Wikis are web sites that allow users to jointly create and edit the web contents. With its distinctive features of user editability, detailed page histories, and independence of time and space, wiki technology encourages collaboration and continual revision (Purdy, 2009) and also affords extended collaborative writing practice (Storch, 2013). Wiki applications (e.g., Wikispaces, PBworks) have four characteristic modules: *edit* enables the users to freely change or revise the page in terms of texts, images, or hyperlinks; *history* reveals all the changes the page has gone through with color coding of deleted and inserted texts; *discussion* allows the users to communicate and negotiate page contents and revisions via asynchronous messaging; and *comment*, embedded in the editor toolbar, enables the users to provide feedback and comments or raise questions regarding specific texts in pop-up boxes.

The current body of research on wikis in the L2 context has largely addressed students’ wiki writing processes (e.g., Elola & Oskoz, 2010; Kessler & Bikowski, 2010; Lund, 2008), wiki writing products (e.g., Elola & Oskoz, 2010; Kuteeva, 2011), and perceptions of wiki-based collaborative writing (e.g., Chao & Lo, 2011; Li & Zhu, 2013). Several studies (e.g., Bradley, Lindström & Rystedt, 2010; Kost, 2011; Li & Zhu, 2013) have identified that different patterns of interaction emerge when students work on wiki writing projects. The interaction patterns (i.e., the ways in which learners participate in the task and form

relationships with each other) are associated with their use of language in the wiki communication (Li, 2013; Li & Zhu, 2013), their revision behaviors in the wiki page (e.g., Kost, 2011), and the level or nature of contributions to wiki writing (e.g., Bradley et al., 2010). However, little research to date has investigated what interaction dynamics may occur when small groups of students work across writing tasks and what factors may account for dynamic interactions during collaborative wiki writing. Given the increasing role of collaborative wiki writing in English as a Second Language (ESL) classrooms, it is of vital importance to investigate how students work together over wiki writing tasks and explain why students form distinct online interaction patterns (Storch, 2013). Such investigations would contribute to writing pedagogy and inform instructors in better design and implementation of wiki projects to foster greater group collaboration.

In the study reported below, we aimed to examine the dynamic nature of group interactions and interpret the interaction dynamics in the wiki writing task environment. Our study was guided by sociocultural theory (SCT) and was conducted in an English for Academic Purposes (EAP) course at a public research university in the southeast US. The study addressed the following two research questions:

1. What patterns of interaction occur when small groups of ESL students perform collaborative wiki writing tasks?
2. What sociocultural factors can explain the interaction dynamics?

Following SCT as the theoretical framework, our study demonstrates how scaffolding and mediation help us understand students' interaction in collaborative wiki writing and how goal, agency, and emotion provide insightful explanations for the dynamic interactions within small groups across EAP writing tasks.

Literature Review

SCT highlights the role of social interaction in learning and emphasizes the importance of language as a mediating tool in the learning process (Vygotsky, 1978). SCT has guided research on L2 collaborative writing and has provided a powerful theoretical lens through which we can examine learner interaction and collaboration (de Guerrero & Villamil, 2000; Donato, 1994; Storch, 2004, 2013). Several constructs of SCT are particularly important to our study and are discussed below.

Scaffolding and Mediation

A key construct guiding research in L2 interaction is scaffolding, which is defined as an assisting process “that enables a child or novice to solve a problem, carry out a task, or achieve a goal which would be beyond his unassisted efforts” (Wood, Bruner, & Ross, 1976, p. 90). The expert scaffolds the novice via helpful and structured interaction, consequently facilitating the novice's development in the Zone of Proximal Development (Lidz, 1991; Vygotsky, 1978), which refers to the distance between the novice's current state of knowledge and potential state of development (Vygotsky, 1978). The expert not only fine-tunes his or her assistance according to the novice's level of performance, but also encourages the novice to have a greater participation to achieve learning goals. The construct of scaffolding is later extended from adult-child interaction to peer interaction (e.g., Donato, 1994; Ohta, 2000; Swain, 2000), in which learners act as both experts and novices and provide mutual scaffolding for one another in pair or small group activities. For instance, Donato (1994) illustrated “collective scaffolding” scenarios in his study, in which “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” (p. 46).

The other sociocultural construct that guides our study is mediation, particularly mediation through language (Lantolf, 2000; Vygotsky, 1978). Language, as a critical source of mediation, is a form of social communication that allows the novice and the expert to plan, coordinate, and review their actions (Wells, 1999). Previous studies (e.g., Bruner, 1978; de Guerrero & Villamil, 2000; Lidz, 1991) inform us that language embodies experts' scaffolding behaviors. Lidz (1991) developed the Mediating Learning Experience Rating Scale that consisted of 12 scaffolding behaviors in adult-child interaction. For instance, one of the scaffolding behaviors, *contingent responsivity*, which was also observed in our study, refers to

the adult's ability to read the child's behavior and to make an appropriate response accordingly. de Guerrero and Villamil (2000) drew on Lidz' (1991) taxonomy of adult-to-child mediating behaviors and identified a variety of scaffolding mechanisms (e.g., *instructing*, *joint regard*, *affective involvement*) employed by peers during peer response activity in which students critique each other's writing. Such scaffolding strategies facilitated the completion of joint learning tasks through the mediation of language.

These two concepts of SCT have informed research on collaborative writing such as the present study in which student interaction is essential for successful completion of the writing tasks and in which language constitutes a primary means for interaction. In pair and group work, language assists learners to co-construct knowledge and solve problems through interaction, thus affording collaboration (Anton & DiCamilla, 1998; Swain, 2000; Villamil & de Guerrero, 1996). Researchers (e.g., Swain, 2010; Swain & Lapkin, 2002) detected the occurrence of "collaborative dialogue," in which group members or pairs orally manipulated language to solve problems together and jointly constructed new knowledge and understanding. Research on ESL student interaction during writing tasks (e.g., peer response and collaborative writing) has also revealed that by employing various language functions (i.e., the mediating functions of language during communication, such as suggesting, stating, encouraging, and questioning; see Lockhart & Ng, 1995; Zhu, 2001), learners negotiate meanings to achieve writing goals. Li and Zhu (2013) recently applied the concept of language functions to understanding and interpreting ESL student interaction and task negotiation during collaborative wiki writing processes.

Goals, Emotion, and Agency

Other sociocultural concepts that have shed considerable light on student behaviors in L2 collaborative learning contexts and are highly relevant to our study are goals, emotion, and agency (Imai, 2010; Lantolf & Pavlenko, 2001; Storch, 2004). Group and pair work is regarded as a goal-directed activity in which one's aims, objects of efforts, or desired results mediate interaction. According to previous literature in L2 education (e.g., Ames, 1992; Cumming, 2012), goals have been traditionally classified into performance goals (i.e., simply performing and completing a task), mastery goals (i.e., mastering new knowledge and extending one's abilities), and intentional learning goals (i.e., gaining greater control over one's learning, mirrored in self-regulation). Cumming (2012) explained that goals are contingent on contexts and learners, and "people's motivations are realized through operations or behaviors that focus on particular goals, which can be articulated, analyzed, and altered or shaped" (p. 138). In collaborative practice, "members define the goals of joint enterprise and individual's roles in pursuing these goals," but the individual members may have varied levels of commitment to the shared goals and "position themselves differently in relation to those goals." (Nolen, Ward, & Horn, 2011, p. 114). Storch (2004), in an empirical study with university ESL students in a face-to-face collaborative writing setting, further investigated how convergent or divergent goal orientations mediated peer interaction from a SCT perspective. Through analyzing individual interviews, particularly students' responses to questions on their perceived purposes or goals in pair work, Storch identified the connections between peers' goal orientations and patterns of interaction. For instance, the dominant-dominant pair expressed the overriding and competing goal of displaying their knowledge, whereas the collaborative pair conveyed their shared goal of doing their best to complete the task together.

Two other sociocultural concepts associated with goals are agency and emotion. Agency is defined as "people's ability to make choices, take control, [and] self-regulate" while pursuing their goals (Duff, 2012, p. 414). It is "the socioculturally mediated capacity to act" (Ahearn 2001, p. 112) and "a contextually enacted way of being in the world" (van Lier, 2008, p. 163). Agency is also interpreted as students' "attunements to the affordances to make important decisions that contribute to the shared goals of the activity" (Nolen et al., 2011, p. 121). Since agency can be exercised by both individuals and communities (Lantolf & Thorne, 2006), van Lier (2008) proposed *individual agency* and *collaborative agency*. Individual agency drives the learner to take concrete actions in pursuit of his or her goals in a specific context, whereas collaborative agency energizes the activity with a larger number of learners' joint capacity. Collaborative agency events occur while learners volunteer to provide scaffolding and instruction to each other. In brief, agency, constrained by such factors as social groupings, situational contingencies, and individual or group

capacities, helps us understand why participants act in the way they do (Lantolf & Thorne, 2006).

Emotion, being a sociocultural factor accounting for human behavior, is also an essential part of goal-directed action (Swain, 2013). Vygotsky (1978) proposed the interrelatedness of cognition and emotion in language development: emotion and cognition co-mediate learning. Departing from the traditional view of emotion as private and inner reactions of an individual, van Lier (1996) described emotion as an emergent source of motivation, including “here-and-now interest in the tasks, the joy of exploration or working together, [and] natural curiosity” (p. 105). Imai (2010) defined emotion from a SCT perspective as “socially constructed acts of communication that can mediate one’s thinking, behavior, and goals” (p. 279). Emotions are thus considered “interpersonal,” “socially and culturally derived,” and able to “be co-constructed as an event progresses” (Swain, 2013, p. 196). In sum, goals (convergent and divergent goal orientations), agency (individual agency and collaborative agency), and emotion (i.e., an emergent source of motivation) help us explain the interaction dynamics in the current study.

Patterns of Peer Interaction

Several SCT-informed studies that examined peer interaction in a collaborative learning task environment, including patterns of interaction in wiki-based collaborative writing, provided methodological insights for our study. Damon and Phelps (1989) initially proposed two indexes of peer interaction (i.e., *equality*, or learners taking directions from one another, and *mutuality*, or engagement featured by reciprocal feedback) when describing three forms of peer-based instruction: peer tutoring (low equality, variable mutuality), cooperative learning (high equality, variable mutuality), and peer collaboration (high equality, high mutuality). Storch (2002, 2012) operationalized the concepts of equality and mutuality for pair interaction in collaborative writing tasks by analyzing peer talk transcripts in terms of word count, turn count, and language functions. Equality referred to equal distribution of turns, equal contribution, and equal degree of control over the task direction. Mutuality referred to peer engagement with each other’s contributions, reflected in such language functions as confirmation, repair, and explanation. Based on holistic assessment of equality and mutuality, Storch (2002) identified four distinctive patterns of dyadic interaction: collaborative (high equality and high mutuality), expert–novice (low equality and high mutuality), dominant–dominant (high equality and low mutuality), and dominant–passive (low equality and low mutuality). She also reported that the students in pairs showing a collaborative orientation (i.e., collaborative and expert–novice patterns of interaction), demonstrated more learning scenarios than the pairs displaying the dominant–dominant or dominant–passive pattern. Research by Damon and Phelps (1989) and Storch (2002) provided useful definitions and operationalizations of constructs for indexing patterns of interaction.

Researchers (e.g., Li, 2013; Li & Zhu, 2013) applied the concepts of equality and mutuality to the examination of peer interaction in wiki writing tasks. For example, Li and Zhu (2013) analyzed the wiki discourse on wiki discussions from small groups as the main source of data and examined equality and mutuality by reviewing and comparing group members’ language function instances (e.g., agreement, suggestion, and apology), supplemented with an exploratory analysis of text construction (i.e., each member’s contribution to group writing in terms of word counts). Three patterns of interaction were then derived: collectively contributing and mutually supportive (high equality and high mutuality), authoritative–responsive (low equality and high mutuality), and dominant–withdrawn (low equality and low mutuality). To extend the analysis of small groups’ text co-construction in light of writing change functions, (i.e., students’ writing and revising behaviors toward co-producing joint texts in wikis; see Mak & Coniam, 2008), Li (2013) focused on the recursive wiki writing and revising processes, taking the collectively contributing and mutuality supportive group as the focal case. Various types of writing change functions were identified: adding, deleting, rephrasing, reordering, and correcting. Equality and mutuality were further examined from the perspective of group members’ text contribution in terms of writing change function frequency counts and distinction between changes made to one’s own texts and those made to others’ texts. These studies provided specific analytical procedures for identifying patterns of interaction in wiki-mediated writing.

Other research examining wiki writing tasks focused on students' revision behaviors and distinguished between two distinct patterns (i.e., collaboration and cooperation) in student wiki interaction (Arnold, Ducate, & Kost, 2012; Bradley et al., 2010). Bradley et al. (2010) drew on wiki history records and identified three distinct patterns of interaction when EFL students constructed wiki assignments: lack of visible interaction (merely one individual contributed to writing), cooperation (individuals contributed to writing in parallel), and collaboration (individuals engaged with each other's ideas and co-produced writing). Similarly, in the study by Arnold et al. (2012), German as a Foreign Language students exhibited both cooperation and collaboration patterns in a wiki group writing project. Interestingly, more collaboration patterns were evident when students made formal revisions in relation to the use of language, whereas more cooperation patterns emerged when they made content changes.

To date, the research on patterns of interaction in wiki collaborative writing context is still at the infancy stage. Very few studies (e.g., Li & Zhu, 2013) have drawn on varied data sources such as wiki discussions and histories, to illustrate a comprehensive picture of student interaction during wiki writing processes. Although the study by Li and Zhu (2013) employed triangulated data sources, it did not fully explore the nature of wiki interaction by examining equality and mutuality through integrating language functions, writing change functions, and scaffolding strategies. Moreover, little research has explored possible changing patterns of interaction when small groups of students perform different writing tasks. Additionally, explanations of why learners form certain distinct patterns of interaction have rarely been provided. Guided by SCT and based on multiple data sources, the study reported below examined student interaction in a wiki project involving two collaborative writing tasks and explored sociocultural factors that offer explanations for student participation and interaction in these tasks.

Methodology

The present study comes from a larger project in which we adopted a multiple-case study approach (Stake, 2006; Yin, 2009) and examined and interpreted small groups' interactions in wiki collaborative writing as well as students' wiki products in an EAP course at a research university in the southeast US. The EAP course at this university aimed to develop students' academic skills necessary to successfully transition into Master's degree programs; students taking this course had, in general, an intermediate-advanced English proficiency level. The course emphasized researching and producing academic papers and presentations in different academic genres. Students enrolled in this course mostly came from Asia (particularly China) and the Middle East. In the semester during which the study was conducted, 29 ESL graduate students were enrolled in the EAP course taught by a cooperating instructor who had worked in the EAP program for four semesters. 12 of the students served as participants in four focal cases for the larger study. The wiki-writing project was an integral part of the course and was required for all enrolled students. For the wiki writing activity, small groups jointly performed two wiki writing tasks: creating a research proposal and an annotated bibliography. These tasks were embedded within a team research project where students worked together to produce research writing and an academic presentation. Details of the two wiki tasks are displayed in [Table 1](#).

The wiki project spanned nine weeks, as depicted in [Figure 1](#). In the first two weeks of the wiki project, we conducted wiki training and recruited the participants. Small groups were then formed. Students first chose their group-mates, and then the course instructor made adjustments to the initial group formation, based on grouping criteria of mixed L1 and cultural backgrounds and mixed English skills. As previous studies (Iwashita, 2001; Polio & Gass, 1998; Storch, 2013) have indicated, students who come from different L1 backgrounds or who have different L2 proficiency skills are more likely to engage in more task and language negotiations. In line with suggestions by Arnold and Ducate (2006), students were asked to select a group leader with the hope that group work could be well organized in the absence of teacher intervention. The leader was expected to monitor and facilitate online discussion and writing. We then collected participants' demographic information and prior experiences in English learning, technology use, and group work via a pre-task questionnaire. In the following three weeks (Weeks 3–5), students in small groups

worked on their research proposals and annotated bibliographies, sequentially. The wiki writing activity was automatically recorded in the discussion, comment, history, and page modules of the Wikispaces site. We collected these archived wiki records and began reviewing the data. In Week 5, when students completed the two wiki tasks, a post-task questionnaire survey was administered regarding participants' perceptions of the wiki collaborative writing tasks and their group interactions in this wiki project. The first author also conducted post-task interviews in English with a purposeful¹ sample, namely 12 students from four small groups demonstrating varied L1 and cultural background combinations. These four groups served as focal cases in the large study. Specifically, the 12 students responded to seven guiding questions including the purpose of wiki-based collaborative writing and their group interactions in the wiki. In Weeks 6–7, we collected reflection papers from the four groups. In the reflection papers, the students responded to six prompt questions and wrote in English about how they worked on the joint wiki writing tasks and how they perceived their own and their group partners' contributions to the group writing. In Weeks 8–9, primarily to conduct member checking on our interpretation of the interaction patterns observed of the four groups, the first author organized a follow-up interview with five participants from the four groups based on convenience sampling. In addition, the four groups' wiki papers in relation to the two tasks were graded according to the assignment rubrics in the larger study.

Table 1. *Wiki Writing Tasks*

Task	Description
Research Proposal	Group members discussed the focused aspects of a specific research topic that they planned to analyze in the Wikispaces site. Afterwards, they co-constructed a research proposal under their group tab through the wiki module of projects. The students were required to include research background, research questions, methods, and significance in their research proposal. They were also encouraged to make use of the wiki discussion, comment, and history functions to discuss and compose their writing jointly.
Annotated Bibliography	Within the same topic that each small group decided for the research proposal, group members selected nine sources and wrote annotated bibliographies of these sources under their group tab through “projects”. Each member was responsible for three sources. For each source, the students were required to include a complete citation, the purpose of the work, a summary of the content, its relevance to the research topic, and special features of the source. Each member was also required to engage with the group partners' annotations, including selecting sources and revising annotations.

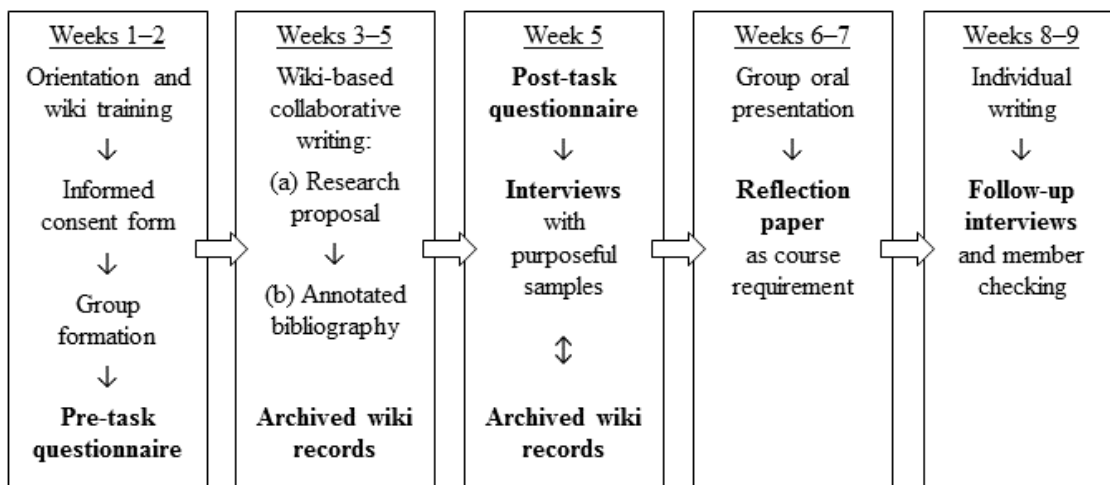
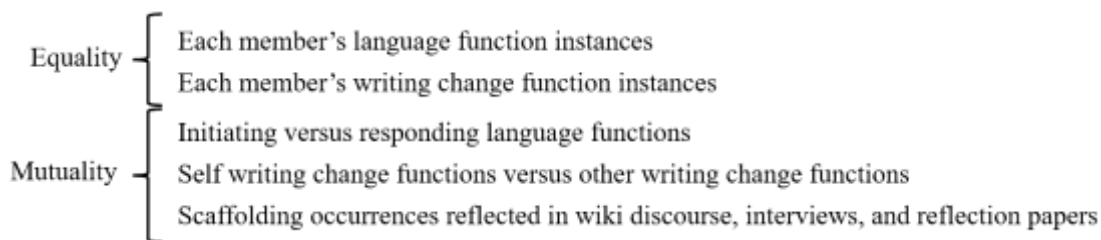


Figure 1. Data collection timeline.

In this article, we examine two focal groups from the larger study, with an in-depth look at the groups' interactions across two tasks as well as the sociocultural factors that accounted for the observed interactions. Focusing on two groups allows us to provide a thick description (Lincoln & Guba, 1985), essential for qualitative case study research. At the same time, it enables us to compare findings and themes across cases, thus enhancing the validity of our interpretations (Yin, 2009). Both groups demonstrated the dynamic nature of wiki interaction as reflected in changing interaction patterns when students performed the two wiki writing tasks. Both groups consisted of three male ESL graduate students. Members (pseudonyms are used) of Group A were two Chinese students (Dong and Feng) and a Saudi Arabian student (Abdul). Members of Group B were two Chinese students (Gao and Chuan) and a Russian student (Vitaly). The students aged in the range of 23–26 and were in the second semester of their EAP program.

Data Analysis

Multiple data sources including wiki records, student interviews, and reflection papers were analyzed to answer the two research questions. With regard to Question 1 addressing patterns of interaction, we took a holistic view of the triangulated data sources and examined how each small group approached the writing tasks in terms of equality and mutuality (Damon & Phelps, 1989; Storch, 2002). In our study, equality refers to the degree of control over the direction of wiki joint writing through negotiating writing tasks and the level of contribution to the group writing text, and mutuality refers to the degree of engaging with each other's ideas and each other's wiki texts and providing scaffolding in producing joint wiki writing. [Figure 2](#) depicts the specific ways of examining equality and mutuality in this study.



[Figure 2](#). Analyzing two indexes of group interaction: equality and mutuality.

As displayed in [Figure 2](#), equality is examined with respect to (a) the instances of language functions that each group member performed and (b) the instances of writing change functions that each group member performed. Balanced contributions in terms of language functions and writing change functions performed by the three group members indicated high equality, while drastically different numbers indicated low equality. Mutuality was examined by (a) distinguishing between instances of initiating language functions (i.e., proposing new ideas) and responding language functions (i.e., responding to other members' ideas), (b) comparing the instances of self writing change functions (i.e., making changes to one's own texts) and other writing change functions (i.e., making changes to other members' texts), and (c) analyzing scaffolding occurrences. High mutuality refers to mutual engagement represented by responding language functions, other writing change functions, and the employment of scaffolding strategies.

We examined the small groups' wiki discussion and comment discourse in terms of language functions; wiki history threads in terms of writing change functions; and wiki discourse, interviews, and reflection papers in terms of scaffolding strategies. Specifically, following the approach described in Li and Zhu (2013), we segmented wiki discussion posts into *idea units*, “a series of brief spurts which reflect the speaker's object of consciousness” (Gere & Abbott, 1985, p. 367). We then coded each idea unit in terms of language functions, that is, the mediating functions of language used during wiki communication as revealed in the wiki discussion and comment modules (and in a few posts in the history section module regarding Task 2). Rather than imposing existing categories on the available data, we read and reread the wiki discussion and comment records, and derived a taxonomy of language functions through inductive reasoning (see [Appendix A](#)). Afterwards, each language function unit was labelled (e.g., elaborating,

suggesting, agreeing) based on the taxonomy, and then each language function unit was further categorized into initiating (i.e., proposing new ideas) or responding (i.e., responding to other members' ideas).

We analyzed the wiki history records in terms of writing change functions, which refer to students' writing and revising behaviors during the joint production of texts in wikis (Mak & Coniam, 2008). We traced all the changes since the initial post and coded each writing change in light of the coding scheme developed in Li (2013), meanwhile making adaptations according to the data emerging from the present study. As [Appendix B](#) shows, writing changes were classified into adding, deleting, reordering, rephrasing, and correcting. Further, we labelled those changes made to the texts constructed by a group member himself or herself as self writing change functions, whereas the changes to the texts constructed by other group members were labelled as other writing change functions.

Scaffolding strategies in this study refer to the strategies and mechanisms that students employed to engage with and support group partners to jointly complete the wiki writing tasks. To examine peer scaffolding, we coded the wiki Discussion and Comment records under each group link in terms of episodes (i.e., units of discourse during which the participants discussed writing problems and task procedures; see de Guerrero & Villamil, 2000). We drew on scaffolding strategies established in previous literature (i.e., de Guerrero & Villamil, 2000; Lidz, 1991; Rommetveit, 1985) and constructed a coding scheme of scaffolding, which was applied to the discussion and comment data. [Appendix C](#) shows the scaffolding coding scheme. We also examined excerpts of interview transcripts and reflection papers to identify students' references to instances of scaffolding that occurred during the wiki project.

After analyzing equality and mutuality in terms of language functions, writing change functions, and scaffolding strategies, we identified corresponding interaction patterns for each group within each writing task in light of the grounded approach (Glaser & Strauss, 1967). For instance, Group A demonstrated a collective pattern featured with high equality and high mutuality in Task 1. We additionally considered the students' roles or stances embedded in the examination of equality and mutuality, when necessary.²

To explain why the small groups were oriented to wiki collaborative writing in the ways they were, we conducted content analyses (Denzin & Lincoln, 1994; Duff, 2008) of the interviews and reflection papers supplemented with wiki discourse, in an inductive manner. We allowed themes to emerge from the data rather than be imposed by pre-determined categories. When reading students' responses to the interview questions and reflection papers, we coded their comments with key words that could represent the gist of their response. We then derived themes by merging the codes and connected the emerging themes to the constructs regarding sociocultural factors that we had identified in the relevant literature. In particular, students' responses to key interview questions and reflection prompt questions, as displayed in [Table 2](#), helped us derive the salient themes. The codes assigned in the earlier rounds of analyses drew our attention increasingly to the three sociocultural factors: goals, agency, and emotion. Post-task Interview Question 2 and Reflection Prompt Question 2 were particularly relevant for our understanding of students' goals for participating in wiki-based collaborative writing. Students' answers to Interview Questions 3 and 5, as well as to Reflection Prompt Question 3 provided the most relevant data for identifying the themes of agency and emotion.

For example, when responding to the question concerning the purpose or aim of wiki writing in the post-task interview, Group A members used such words as *collaboration*, *good score*, and *teamwork*. We employed in vivo coding as these terms captured the gist of the students' comments. Since these codes reflected what these students hoped to accomplish, they reflected the theme of goals. We also compared the relationship among the coded terms, and derived convergent goals when the goals were reciprocal or complementary. Divergent goals occurred when a goal was contradictory to other identified goals, as in the case of Group A in Task 2, to be reported below.

Table 2. *Data Sources Used to Derive Themes to Answer Research Question 2*

Theme	Data Source	Questions
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Goals	Post-task interview and reflection paper	Interview Question 2: What did you think was the purpose of the wiki-based collaborative writing tasks? What was your aim in these tasks? Reflection Prompt Question 2: How did you and your group approach the two wiki writing tasks?
Agency and Emotion	Post-task interview, reflection paper, and wiki discourse	Interview Question 3: What did you think was your role in the wiki-based collaborative writing tasks? Interview Question 5: What did you think of your group interactions in the wiki-based collaborative writing tasks? Did you enjoy it? Why or why not? Reflection Prompt Question 3: Did your group divide group tasks and labor? Did each group member play a distinct role? If yes, in which ways?

We developed the theme of agency in a similar fashion. We first conducted a content analysis and coded relevant excerpts from interviews and reflection papers. Codes which referred to one's commitment, taking concrete actions in pursuit of goals (Duff, 2012), or making decisions that contributed to the shared goals (Nolen et al., 2011) reflected the theme of agency. Informed by van Lier (2008), we also distinguished between the learner's individual concrete action to achieve goals (i.e., individual agency) and learners' joint capacity in goal pursuit (i.e., collaborative agency). For instance, individual agency was reflected in "I want to post my ideas on the wiki [...] I want to do something very quickly," and collaborative agency was indicated in the quote "when we have good ideas, we post on the wikis and comment on one another's ideas." Also, as agency is not just an individual trait or activity, but a "contextually enacted way of being" (van Lier, 2008, p. 163) in relation to other social beings, we paid additional attention to the linguistic forms of addressing, including the use of nouns and pronouns occurring in the wiki discourse, interviews or reflection papers, which further helped us identify the evidence of collaborative agency. For instance, the use of the collective *our* in the wiki discourse "Our proposal will be divided into topic, resources, method and problems" was indicative of collaborative agency. The quote "We respect each other's work" in the interview also indicated collaborative agency, because it implied the group's joint capacity in goal pursuit. Moreover, we identified excerpts in the interviews and reflection papers that demonstrated "here-and-now interest in the tasks, the joy of exploration or working together" (van Lier, 1996, p. 105), and the theme of emotion as an emergent source of motivation was derived. For instance, we labelled positive emotion to "We are very friendly. We are sort of like old friends. We are familiar," which showed the joy of collaboration. In sum, we examined the triangulated data sources to derive emerging themes in relation to sociocultural factors mediating wiki collaborative writing.

To ensure the accuracy of our data analyses, inter-coder reliability checks were conducted on the coding of language functions and writing change functions. Two coders reached an inter-coder agreement of 87.4 % and 89.4% respectively, and disagreement was resolved through discussion. Regarding the analyses of scaffolding strategies, goals, agency and emotion, the co-author verified the themes derived by the first author.

Results

Patterns of Interaction

The patterns of interaction were featured in the degrees of equality and mutuality reflected in the three perspectives: how the group members negotiated writing tasks in terms of language functions, how they jointly composed writing in terms of writing change functions, and how they scaffolded each other during joint wiki writing processes. We found that small groups had more discussion on multiple aspects of writing during Task 1, such as research topic, research background, and rhetorical structure; although the groups demonstrated varying degrees of interaction while performing the task. The groups communicated much less on the wiki site during Task 2. Thus, the analysis of group interaction in Task 2 relied more on writing change functions and scaffolding strategies. Group A and Group B both exhibited distinctive interaction

patterns. Below we discuss the patterns of interaction of the two groups respectively, and focus on the group dynamics exhibited within each group over the course of two tasks.

Group A demonstrated a collective³ pattern in Task 1 (the research proposal), but switched to an active–withdrawn pattern in Task 2 (the annotated bibliography). When composing the research proposal, all members (i.e., Dong, Feng, and Abdul) made joint contributions to and exhibited a similar degree of control over group writing in terms of task negotiation and text co-construction. They were also willing to engage with one another’s contributions. However, when they constructed the annotated bibliography, the pattern switched to active–withdrawn in which two group members (i.e., Dong and Feng) actively participated in the writing task and one (Abdul) had a much lower degree of participation, even withdrawing from the task.

Table 3 summarizes the characteristic features of Group A’s triadic interaction that illustrate the dynamic patterns of interaction. Table 3 shows that the members of Group A in Task 1 demonstrated relatively high equality with a balanced contribution from the three members in task negotiation (showing 10, 9, and 5 language function units) and text construction (conducting 5, 2, and 2 instances of writing change functions). This group also demonstrated high mutuality of interaction reflected by a high ratio of responding to initiating language functions: The members of Group A performed 15 initiating language functions and positively responded to others’ ideas in 9 instances. Their mutual engagement can also be mirrored by the other writing change functions (3 instances) in the process of text construction, and multiple occurrences of intersubjectivity (Rommetveit, 1985), a scaffolding strategy defined as sharing understanding of the situation and being in tune with one another.

For instance, as displayed in Table 3, the three members used the wiki discussion and collectively discussed the specific topic to research and reached a consensus on the globalization of Coca-Cola as the research topic. The peer scaffolding observed in the interaction data was confirmed by participants’ comments in the interviews and reflection papers. Dong stated, “We arranged every team member specific tasks adequately and motivated positivity of each member. [...] Everyone have the inspiration to work as teamwork in order to make better performance.”

Nevertheless, both mutuality and equality decreased when the group members composed the annotated bibliography. The group members had little communication in the wiki, with merely 1 instance of language function in which Feng requested addition of two annotations from Abdul, but received no response. Regarding text co-construction, unequal participation was obvious. Abdul did not complete his assigned task. He only contributed one annotation for Task 2, which required each member to compose three annotations. In terms of writing change functions, Abdul merely contributed 1 instance in contrast to 7 instances by Dong and 9 instances by Feng, which further reflected a decreased equality. Moreover, lack of mutuality was evident. For instance, as displayed in Table 3, Feng reminded Abdul to add one more annotation, but Abdul did not act on his suggestion. Feng’s potential scaffolding was not activated.

The members of Group B exhibited dynamic interaction as well, switching from dominant–defensive in Task 1 to collaborative in Task 2. Table 4 displays the characteristic features of Group B’s triadic interaction. As Table 4 depicts, in Task 1, Group B demonstrated relatively low equality and low mutuality. Two members (Vitaly and Gao) took control of the writing direction, mirrored in the language functions (12 and 13 instances, respectively). The third member (Chuan), the selected leader, ironically contributed the least to group writing discussion (with merely 1 language function instance), but defended his writing contribution and leadership in the post-task interview, stating his responsibility for “What we should do first, what we should do next and separate the tasks, what you should do, what they should do, make every steps clear for everyone. [...] I gave my recommendation face-to-face.” Also, group members were unwilling or unable to engage with one another’s writing, reflected in merely 1 instance of other writing change function against 13 instances of self writing change functions. No reciprocal interaction in terms of responding to initiating language functions occurred, and few scaffolding strategies were implemented when they performed Task 1. For instance, as shown in the first representative excerpt in Table 4, group members did not exhibit intersubjectivity when discussing the specific topic that they were to explore. When Gao suggested narrowing down the topic to Apple’s outsourcing strategy, Vitaly expressed his

disagreement by justifying that discussion of multiple companies in diverse countries better supported the broad topic of globalization. Gao later conveyed his agreement with Vitaly's idea, but Chuan disagreed implicitly by addressing their instructor's advice of researching "Apple in Russia and China." In this way, the group members did not reach consensus and were not in tune with one another. Also, Vitaly attempted to instruct Chuan on constructing specific research questions after he noticed Chuan's unsatisfactory wiki post, but his instruction encountered his group partner's non-action.

In contrast, Group B exhibited a collaborative pattern reflected in higher equality and mutuality when constructing the annotated bibliography. For this collaborative pattern, peer interaction occurred just between two group members, and no scenarios of the three members' collective scaffolding (in which three members together discussed and determined the writing direction) were identified. Equality was revealed by the balanced contribution from three members in text construction: the completion of three annotations, with 24, 8, and 8 instances of writing change functions contributed by Gao, Chuan, and Vitaly, respectively. Mutuality in text construction was obvious between two members of the group, which was revealed by the five instances of other writing change functions. For instance, as depicted in [Table 4](#), Chuan performed correcting acts to Vitaly's texts, fixing such spelling mistakes as *faicilities* and *demonstate*. Mutuality was also reflected in the employment of scaffolding strategies between members during task negotiation. For example, Vitaly suggested to Chuan a useful link of source to annotate when Chuan struggled with a source regarding the "counter-argument," which vividly demonstrated the strategy of contingent responsivity, in which the group member reads his or her partner's behavior and responds appropriately. To positively respond to Vitaly's suggestion, Chuan acknowledged Vitaly's assistance and incorporated this source in his annotated bibliography.

Table 3. Characteristic features of interaction in Group A

Features of Interaction	Task 1	Task 2
Language Functions	Dong: 9; Feng: 10; Abdul: 5 15 Initiating and 9 Responding <i>Example</i> Dong: Hi, guys, our proposal will be divided into topic, resources, method and problems. How you think about that? (<i>greeting, suggesting, eliciting</i>) Feng: Sure, and rhetorical stance should be presented, and explain the significance of the research. we need a timeline for investigating the topic, possible sources for investigation. (<i>agreeing, elaborating</i>)	Dong: 0; Feng: 1; Abdul: 0 1 Initiating and 0 Responding <i>Example</i> Feng: "Can you find one more source to add?" (<i>requesting</i>) Abdul: no response.
Writing Change Functions	Dong: 5; Feng: 2; Abdul: 2; 6 Self and 3 Other <i>Example</i> Dong: The detailed topic is the business of Coca-Cola in China and Saudi Arabia. (<i>adding, self</i>) Abdul: The detailed topic is the business of Coca-Cola in China and Saudi Arabia Middle East countries. (<i>rephrasing, other</i>) Dong: The detailed topic is the business of Coca-Cola in China and Middle East countries Saudi Arabia. (<i>rephrasing, other</i>) Dong: The detailed topic is the business of Coca-Cola in China and Saudi Arabia the Middle East (<i>rephrasing, self</i>)	Dong: 7; Feng: 9; Abdul: 1; 15 Self and 2 Other <i>Example</i> Dong: This article describes the nature and causes of the parallel trade in Coca - Cola between Shanghai and Hangzhou and [...]. (<i>adding, global, self</i>) Dong: The purpose of this article is to describe (<i>rephrasing, self</i>) the nature and causes of the parallel trade in Coca - Cola between Shanghai and Hangzhou and [...]. The audience is the individuals who has the strong intrest with the business strategies of Coca-Cola in China. (<i>adding, self</i>)
Scaffolding Occurrences	Intersubjectivity <i>Example</i> Dong: I recommend we choose the topic of immigration in the United States and its influence on American Culture, because its the topic that we have already familiar with and can find the subtopic and resourses quickly. Feng: The idea is good, but we need some more challenges. ... Globalization is a hot topic nowadays... So how about we make our research on Globalization, and we can choose Coca-Cola as our target. Cause it owns wide- range consumers and its successful development experience has made it standing over 100 years.	Lack of intersubjectivity <i>Example</i> Feng: "Can you find one more source to add?" Abdul did not respond.

Note. Excerpts were from the original data. Language errors were not corrected.

Table 4. Characteristic Features of Interaction in Group B

Features of Interaction	Task 1	Task 2
Language Functions	Gao: 13; Chuan: 1; Vitaly: 12 17 Initiating and 9 Responding <i>Example</i> Gao: We should focus on one company because we should narrow the topic. Focus on Apple (<i>suggesting, justifying</i>) Vitaly: Apple could be just an example and I think it will be too narrow (<i>disagreeing</i>) Vitaly: [...] Our big topic is globalization so we need to develop it to show that it is spread all over the world. Do you know that we have Korean “Hyundai”, German “BMW” and “Volkswagen” factories in Russia? We do and it’s also one of the examples of globalization. (<i>stating, justifying</i>) Chuan: The professor wants us to narrow out topic. She advises us use one company Apple in Russia and China. (<i>stating, disagreeing</i>)	Gao: 0; Chuan: 1; Vitaly: 3 3 Initiating and 1 Responding <i>Example</i> Vitaly: Hey..., I found a useful link for you [...] (<i>greeting, stating</i>) Chuan: Thanks. (<i>acknowledging</i>)
Writing Change Functions	Gao: 7; Chuan: 4; Vitaly: 3 13 Self and 1 Other <i>Example</i> Gao: Our purpose is finding the outsourcing use in different countries. To find why it is best way to make both host countries and home countries get benefits. (<i>adding, self</i>) Gao: Moved the above texts to the latter part of the essay (<i>reordering, self</i>)	Gao: 24; Chuan: 8; Vitaly: 8 35 Self and 5 Other <i>Example</i> Vitaly: “demonstate” → Chuan: “demonstrate” Vitaly: “faicilities” → Chuan: “facilities”
Scaffolding Occurrences	Lack of intersubjectivity Instructing unresponded to <i>Example</i> Chuan posted irrelevant texts under “Series of questions.” Vitaly: Don't you remember that last time we already defined the series of questions. (What is the contra argument, what is the argument and etc). [...] It should be a kind of overview of our research but not a paragraph with concepts of writing a research paper (Chuan unresponded.)	Intersubjectivity Contingent responsivity <i>Example</i> Vitaly: Hey ...I found a useful link for you. (While Chuan sought sources, Vitaly shared with Chuan a useful source link about the “counter-argument.”) Chuan positively responded

Note. Excerpts were from the original data. Language errors were not corrected.

Explaining Dynamic Interactions

Both Group A and Group B demonstrated dynamic interaction patterns when they performed two academic writing tasks in the wiki site. We explored why the group members participated in wiki-based collaborative writing in the way they did through analyzing the participants’ own perceptions as revealed in post-task

interviews, reflection papers, and wiki discourse. Three main themes emerged that helped explain the interactional dynamics within small groups: goals, agency, and emotion.

Goals

Students' comments in the interviews and reflection papers helped us derive diverse goals in collaborative wiki writing. Connecting students' perceived goals to their group interaction, we were able to explain how the individual goals and the interaction of these goals mediated the group dynamics. Below we discuss the two groups' goals in situ, illustrated with representative excerpts.

When responding to the question on the purpose of collaborative wiki writing and their aims in these wiki writing tasks (Interview Question 2), members of Group A conveyed convergent goals that drove their wiki writing for Task 1, including teamwork, good score, and collaboration. Figure 3 illustrates three convergent goals that group members perceived in joint wiki writing, as well as the switch of goal on the part of one member in Task 2 (from collaboration in wiki writing to individual personal goal). Specifically, Dong related the goal of wiki writing to their identity-to-be when asked about his perception of the purpose of wiki collaborative writing: "To have a good collaboration in the teamwork. In the society, we need teamwork as a business man." Feng echoed his identity of business man, and noted the importance of teamwork in enterprises: "As we look around different businesses, companies, and agencies around the world, it's hard to deny that teams have become integral and essential components in organizations." Abdul also expressed his goal of collaboration and team success: "We write in the same way. [...] Do my best to achieve high." Moreover, Feng claimed the goal of getting a good course score. He stated that "We have the same goal: we need to pass the class, need a good score." Thus, the intrinsic and extrinsic motivational factors acted in a concerted environment (van Lier, 1996).

However, a certain degree of goal switch for Abdul in Task 2 was indicated during the post-task interview (conducted right after the groups composed the Task 2 writing). Abdul explained that he was occupied for "passing a very important test" in the post-task interview. This indicated that an important personal goal emerging for Abdul in Task 2 might have overridden the goal of joint wiki writing. Abdul's divergent goal helped explain his reduced participation, which changed this group's collective approach to wiki group writing as exemplified in Task 1.

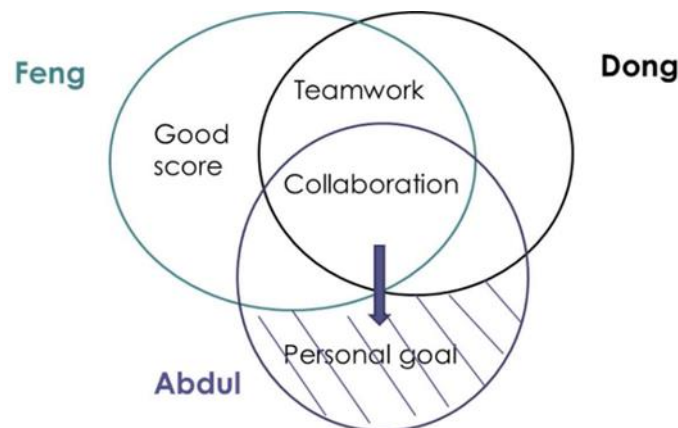


Figure 3. Dynamic goals in Group A. The shadowed area shows the switching goal of Abdul in Task 2.

Similar to Group A, Group B demonstrated dynamic goals in wiki writing. As displayed in Figure 4, the goals that the group members perceived included leading group work, collaboration, and task completion. Specifically, the three members explicitly or implicitly conveyed an overlapping goal of collaboration, reflected in post-task interviews, such as "to learn how to collaborate with each other," "to achieve the goals with small groups," and "teamwork." Gao also indicated the completion of wiki tasks as one of his goals, the case of performance goal reported in previous studies (e.g., Cumming, 2012). He explained: "I want to post my ideas, and sometimes good for others to relate to the topics" and "I want to do something very

quickly.” However, Vitaly and Chuan held a competing goal of leading the group work.

In the post-task interview, Chuan indicated that he aimed “to play the role of leader as assigned: separate the tasks, what you should do, what they should do, make every steps clear for everyone.” However, his leadership was not acknowledged by his group partner Vitaly. When asked about his role in this collaborative wiki writing project, Vitaly claimed that he had to assume the leadership when it was missing:

A group leader has to manage the entire project, because he is the manager of it. I expected the same thing from our leader, but it was worthless. I know that this project wasn’t taken seriously but still it had to be done. This is why I had to take responsibility and to plan the whole project.

A holistic examination of the triangulated data sources indicated dynamic goals that mediated joint wiki writing process for this group. The two goals (collaboration and leading) seemed to have had different weights across the two tasks. In Task 1, the goal of leading group work was predominantly obvious. When the individual accountability and leadership of the selected leader (Chuan) were not recognized by his partner Vitaly, the in situ goal of leading group work emerged for Vitaly. The emergent leader Vitaly appeared to “push everybody to do something.” As shown in Figure 4, Vitaly intended to lead the writing direction by instructing his partner, Chuan, on the section of series of questions: “It should be a kind of overview of our research but not a paragraph with concepts of writing a research paper.” However, Chuan did not respond to Vitaly’s instruction. Conversely in Task 2, the goal of collaboration seemed to outweigh the goal of leading as there was no indication of competing leadership goals. Also, the mild tone of students’ interaction suggested a more collaborative stance, as reflected, for example, in the wiki post “Hey ... I found a useful link for you.”



Figure 4. Dynamic goals in Group B. The shadowed area indicates the changing weights of leading versus collaboration in Task 1 and Task 2.

Agency and Emotion

In this study, participants’ interview transcripts and reflection papers, supplemented with wiki discourse, allow us to identify themes related to agency and emotion in the two groups. We also analyzed the specific pronouns and nouns employed to address group members in the interviews, reflection papers and wiki discourse, which revealed socially mediated agency (Donato, 1994; van Lier, 1996).

Table 5 below depicts agency and emotion manifested in Group A across two tasks. The members of Group A showed both individual agency and collaborative agency in Task 1 (van Lier, 2008). Individual agency was mirrored by each member’s commitment and responsibility, revealed in both wiki discourse and interview transcripts. Regarding the role he played, Dong recalled, “When we have good ideas, we post on the wikis and comment on one another’s ideas [...] I also invited others to respond.” Collaborative agency was reflected in scaffolding and instruction that group members provided in pursuit of team goals as well as in the use of *we*, *our*, and *my friends* in the wiki discourse and interview data. For instance, when Dong

proposed a structure of their research proposal, he wrote “Our proposal will be divided into topic, resources, method and problems.” Abdul told in the interview that “it was great experiences to work with my friends from other culture.” The collaborative agency was also associated with positive emotions emerging from the group work. For instance, in response to Interview Question 5 addressing students’ attitude toward group interaction, Feng resonated with joy, “We respect each other’s work. We are very friendly. We are sort of like old friends. We are familiar.” However, in Task 2, collaborative agency diminished, and no collective pronouns *we* or *our*, but *you* were used in the wiki discourse. An example was “Can you find one more source to add?” when Feng noticed Abdul’s failure to complete his three annotations. Reflection papers also indicated group members’ switch to not-so-positive emotion. As Feng indicated, “My team mate didn’t write three for their own parts,” “I could have come up with a better performance,” which showed his dissatisfaction. The lack of collaborative agency and less positive emotion mediated Group B’s interaction during Task 2.

Table 5. Agency and Emotion in Group A

	Task 1	Task 2
Agency	Individual agency and collaborative agency: <i>we, our, my friends</i>	Individual agency: Reduction from Abdul
Emotion	Positive emotions: Respect, familiarity, and friendship	Negative emotion: Dissatisfaction

Group B also manifested dynamic agency and emotions, as displayed in Table 6. In Task 1, group members demonstrated individual agency, but did not exhibit collaborative agency, as indicated in the interview data. For instance, Gao stated “[When it comes to] different opinions or ideas, sometimes I will follow, sometimes I will have my own opinion about this.” The lack of collaborative agency can also be glimpsed from the way in which the group members addressed their partners, such as *he, group, Russian guy, Chinese people, and minority*. Interestingly, Vitaly commented that he was a mere member who represented a different culture than Chinese in this group; thus, he considered himself a “minority.” Meanwhile, negative affect such as distrust and frustration was noticeable when the members encountered discrepancy in writing direction, as was revealed in the wiki communication discourse. For example, when Vitaly read Chuan’s irrelevant posts regarding “Series of questions” for their research proposal, he conveyed his unhappiness and voiced in a chiding tone: “Don’t you remember that last time we already defined the series of questions [...] Even in the assignment it’s written: I identify a series of questions that will inform your research.” Both the rhetorical question and the non-collective pronouns *I, you, and your* indicated negative emotions and lack of collaborative agency during Task 1.

Table 6. Agency and Emotion in Group B

	Task 1	Task 2
Agency	Individual agency and no collaborative agency: <i>he, group, Russian guy, Chinese people, and minority</i>	Individual agency and collaborative agency: Responsibility
Emotion	Negative emotions: Distrust, unhappiness, and frustration	Positive emotions: More trust, less contention, and joy

In contrast, when this group worked on Task 2, individual agency was manifested in self-responsibility: every member took an initiative to complete their part of writing three annotations. Meanwhile, collaborative agency co-existed, as reflected in peer scaffolding reported in reflection papers and the use of collective pronouns *our* and *we* in the post-task interview. To take an example, Chuan exclaimed at the nice collaboration with his group partners in Task 2: “Vitaly even helped me find a more proper resource for

our discussion [...] we researched the articles from the library, easily created annotated bibliography on Refworks.” This scenario mirrored the co-existence of collaborative agency and individual agency, as well as the evolvment of positive emotion (i.e., less contention and more trust). The collaborative agency (van Lier, 2008) and the joy of working together (van Lier, 1996) demonstrated in Task 2 collectively account for a collaborative interaction pattern.

Discussion

The present study examined two research questions. In relation to our first research question regarding patterns of interaction, we found that the two small groups of ESL students demonstrated different patterns of interaction when they performed wiki writing tasks, which confirmed the results of previous studies on collaborative writing (e.g., Li & Zhu, 2013; Storch, 2002, 2004). On each writing task in our study, Group A demonstrated a different pattern of interaction when compared to Group B, which was represented by different degrees of equality and mutuality via an integrated examination of language functions, writing change functions, and scaffolding strategies. Moreover, our study also found that patterns of interaction varied within each group when the students worked on two writing tasks, which differed from the findings of previous research reporting relatively stable or static patterns of interaction (e.g., Li & Zhu, 2013; Storch, 2002). For example, in Storch’s (2002) study, students in pairs worked on three language tasks sequentially: a short composition, an editing task, and a text reconstruction—all three tasks sharing the theme of migration. Distinctive and stable patterns of dyadic interaction were observed throughout the project.

In our study, Group A demonstrated a collective pattern in Task 1, featured by three members’ equal contribution to task negotiation and text construction (high equality) and ample instances of responding language functions, other writing change functions, and the scaffolding strategy of intersubjectivity (high mutuality). However, the pattern switched to the active–withdrawn pattern exemplified by lower equality and mutuality on Task 2. Abdul did not complete the required workload of three annotations due to a change in his goals, and the other group members showed decreased mutual engagement (reflected in fewer other writing change functions), despite their active participation in the writing of their individual parts (three annotations). In contrast, Group B exhibited a dominant–defensive pattern on Task 1, in which two members took the control over writing directions (one in task negotiation and the other in text construction) and the third member, as the selected leader, defended his writing contribution despite the small amount of his contribution (low equality). At the same time, few instances of positive responding language functions, other writing change functions, and scaffolding strategies were observed (low mutuality). This pattern switched to a collaborative pattern in Task 2, with three members equally contributing three required annotations (high equality), and interactions occurring between two dyads (i.e., Vitaly and Chuan, and Vitaly and Gao) as they offered other writing change functions and scaffolding strategies such as intersubjectivity and contingent responsivity (high mutuality).

As a new contribution, our study discovered a dynamic nature of interaction patterns. A few factors may help explain the different results (regarding changing patterns of interaction vs. relatively static patterns) between our study and those of previous studies. One factor may concern the way in which group leadership was established. In this study, a leader was selected by the group members based on the individual willingness before they worked on collaborative writing tasks. While jointly performing the tasks, group members seemed to evaluate the performance of the leadership role and change the leadership, as shown in Group B. In previous studies (e.g., Li & Zhu, 2013; Storch, 2002, 2004), however, no leader was assigned during group formation. The students with a higher language proficiency level tended to guide the group work in some way, which remained relatively stable during collaborative writing tasks. Also, Storch’s (2002, 2004) studies addressed dyadic interaction. It is possible that the pair tended to follow a particular pattern of interaction once it was set. Dynamics in small groups, however, may become more fluid, as shown in this study. Changes in task contribution (equality) and engagement (mutuality) on the part of any group member could have an obvious influence on the group’s interaction pattern.

Group members’ communication style may also have partially influenced the peer interaction in this study.

As [Table 4](#) illustrates in Group B's dominant–defensive pattern on Task 1, when Vitaly identified a discrepancy in his group partner's texts, he left a comment in a demanding manner. His comment was not responded to by his partner (lack of mutuality). However, on Task 2 (collaborative pattern), Vitaly posted a message attempting to offer help in an approachable manner, to which the same group member responded positively, thus demonstrating mutuality. Therefore, one's communication style or the ability to use language effectively to engage and scaffold peers seems to be a factor contributing to mutuality between peers and influencing patterns of interaction.

In relation to the second research question, and to explore sociocultural constructs that help explain interaction dynamics, we identified three main sociocultural factors: goals, agency, and emotion. Our analyses echoed Storch's (2004) findings that the students' perceived goals and the relationship of the goals (reflected in convergence vs. divergence) influenced patterns of interaction that each group exemplified. Moreover, our study revealed that students' goals were dynamic and that the convergence or divergence of these goals helped explain not only the variations of interactions among the groups, but also the dynamic interactions that each group demonstrated across the two tasks. For example, the convergent goals of collaboration, teamwork, and good score that members of Group A held in Task 1 accounted for their collective pattern. One member's switching to the divergent personal goal of passing an important test explained behaviors characterizing the active–withdrawn pattern that this group demonstrated in Task 2. Our study also indicated that ongoing agency and socially constructed emotion helped account for the variation of interaction patterns across the two tasks within the small groups. In particular, agency and emotion were constantly co-constructed and renegotiated via interaction with others (Lantolf & Thorne, 2006; Swain, 2013). For instance, the members of Group A exhibited positive emotions while demonstrating collaborative agency in wiki writing on Task 1. However, the positive affect was gradually reduced and complemented with the decline of collaborative agency by one member's withdrawal from the wiki project on Task 2. Furthermore, our study illustrated the concept of relational agency, or the “awareness of the responsibility for one's own action vis-à-vis the environment” (van Lier, 2008, p. 172). For example, in Group B, Vitaly reported that his intention to take more responsibility and emergent leadership occurred after he realized that the selected leader, Chuan, did not manage the group work successfully. This relational agency was tightly connected to his increasing individual agency.

Results of our study indicate a link between interaction patterns and goals, agency, and emotion. For instance, the collective pattern is connected with convergent goals, collaborative agency, and positive emotion. The dominant–defensive pattern is related to divergent goals, individual agency, and negative emotion. Our study also reinforces that learning tasks are merely blueprints (Coughlan & Duff, 1994; Storch, 2004; Zhu & Mitchell, 2012), and that students can behave quite differently depending on their goals and agency. In this study, students jointly worked on two wiki writing tasks: Creating a research proposal required group members' co-construction of the proposal using wikis throughout the writing process, while creating an annotated bibliography required each member's contribution of three annotations, despite having a common writing product. While it might be reasonable to expect that students would demonstrate more collaboration in Task 1 than in Task 2, due to the collaborative nature of Task 1 and the cooperative nature of Task 2, Group B actually demonstrated a more collaborative stance in Task 2. This indicates that writing tasks interact with sociocultural factors such as learners' agency and emotion in situ to co-mediate student interaction during wiki writing.

Conclusion

In this article, we illustrate two ESL small groups' dynamic interactions in wiki-based collaborative writing and explain the group dynamics from the SCT perspective focusing on goals, agency, and emotion. SCT informs us to view interactions as developmental “processes in flight” (Ohta, 2000, p. 54), and the present study reiterates the role of SCT in exploring and explaining interactions in online collaborative writing. Small group interactions in the wiki environment are dynamic processes driven by sociocultural factors such as goals, agency, and emotion. Collaborative writing tasks in the wiki environment constitute

sociocultural sites in which goals, agency, and emotion of group members may be in harmony or in conflict. Joint writing tasks themselves do not bring about collaboration automatically, and collaboration in the sense of high equality and mutuality may depend on group members' effort and ability to align, negotiate, and co-construct goals, agency, and emotion.

Our study represents an initial exploration of changing group dynamics and interpretation of dynamic patterns in relation to goals, agency, and emotion in the online collaborative writing task environment. Limitations of the study need to be considered when interpreting the results. First, we illustrate two small groups' interaction patterns across two tasks in this study. It is possible that only a limited number of dynamic patterns in collaborative wiki writing were identified given the sample size. An extended study of more cases may help provide a more comprehensive picture of peer interactions in wikis. Second, students only performed two wiki writing tasks in this study, and it is possible that other patterns of interaction may be observed with more types of writing tasks. While we did not set out to examine the connection between task types and interaction patterns, we believe this merits examination in future research. Additionally, we focused on language mediation in the study but did not examine the mediating role of the wiki tool in peer interactions during wiki writing tasks. However, language mediation and tool mediation may be related in wiki collaborative writing, and technological affordances and constraints need to be examined in future research to enable a deepened understanding of peer interaction in the computer-mediated learning environment.

The study has yielded some pedagogical implications. First, group formation is an important factor to consider when implementing wiki group writing. It is beneficial to form groups of students from different L1 and cultural backgrounds with the purpose of promoting intercultural understanding and providing the opportunity for students to communicate in the target language. We emphasize, however, the importance of instructors' help in developing students' positive attitudes towards working with people from different backgrounds so as to maximize interaction opportunities. Instructors cannot simply assume learners' positive attitudes towards collaboration when group work is assigned (Storch, 2004). In our study, for example, one participant had a negative perception of group work initially as he did not share the same cultural background with the other two members. Therefore, instructors should be aware of and respond to the potential problem of students' feeling of isolation in group work, as suggested in the *minority* status reported by a group member in this study.

Moreover, appropriate assessment can be utilized to encourage students' active participation and collaboration. As our study indicated, participants' behaviors changed over the course of joint wiki writing, and performance goals comprised an important part of students' goals. In order to foster students' continuous participation and interaction, it may be necessary for instructors to assign a certain portion of points to both each individual member's wiki posts and group members' mutual engagements throughout the joint wiki writing process. Our study also revealed that small groups' interaction dynamics changed across writing tasks, influenced by such sociocultural factors as goal, agency, and emotion. We propose that students' joint self-assessments of equality and mutuality of their group interaction at different stages of a wiki project may enable them to continually monitor and evaluate their group writing processes. Joint self-assessment may help facilitate interactions by maintaining shared goals, negotiating individual and collaborative agency, and achieving positive emotion.

The wiki is a prominent collaborative tool for group writing, but collaborative functions of the technology cannot automatically result in participants' collaborative approach to writing tasks, as shown by the results of our study. Multiple factors may affect participants' interaction in small group wiki writing projects. For instance, writing tasks, as part of the sociocultural context, may play a mediating role in wiki group writing. Future studies explicating the role of tasks in wiki interaction and the interplay of tasks and group dynamics would contribute to our understanding of group interaction. Also, as noted in this study, the sociocultural factors that mediated student interaction (i.e., goals, agency, and emotion) co-occurred in a specific context. An examination of the interactions between the three factors would help us further understand and explain the dynamic group patterns. Composition of groups, in addition, constitutes an important element in

computer-mediated collaborative writing. In this study, the majority of the participants were Chinese students; how students of different demographic backgrounds interact in small group writing in the wiki environment deserves exploration. Last but not least, the affordances of the technological tools for wiki-mediated writing deserve examination. We believe that computer-mediated collaborative writing can be more effectively implemented in L2 classes when teachers and researchers understand more clearly how students approach online writing tasks, what sociocultural factors mediate peer interaction and how they co-function, and how writing tasks and technological tools jointly mediate collaborative writing in an online context.

Notes

1. The majority of the students in the course were Chinese. Based on the criterion of maximum variation (Miles & Huberman, 1994), we selected three groups demonstrating L1 and cultural background variation—each of these groups had two Chinese students and a student of a different nationality. The fourth group was composed of three female Chinese students; thus, this group was different from the other three groups in terms of gender composition.
2. We primarily used the two indexes of interaction (see Figure 2) to explore the interaction patterns. We additionally considered the students' roles or stances, when necessary. For instance, to examine the interaction pattern for Group B on Task 1, we identified a few instances of language functions that Chuan performed and meanwhile detected his defending stance from the interview transcripts.
3. We distinguished between the collective pattern and collaborative pattern in this study. The collective pattern, drawn from collective scaffolding (Donato, 1994), emphasized the group members' joint negotiation of writing tasks while assuming simultaneous roles of individual novices and collective experts. The collaborative pattern, however, emphasized the bilateral interaction between two group members, with little consideration of the three members as a collective. In this sense, the degree of mutuality in the collaborative pattern was not as high as in the collective, because there was no collective decision making about the writing direction. Also, the mutuality in the collaborative pattern mostly occurred between two members rather than between all three members.

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Appendix A. Taxonomy of Language Functions

Language Functions	Definition
Acknowledging	Recognizing or praising others' ideas, comments, helpfulness, and capabilities
Agreeing	Expressing agreement with others' viewpoints
Disagreeing	Expressing disagreement with others' viewpoints
Elaborating	Extending and elaborating on own or others' ideas about writing
Eliciting	Inviting or eliciting opinions, comments, and so forth from group partners
Greeting	Greeting group members
Justifying	Defending one's own ideas or comments by giving reasons
Questioning	Asking questions that one is not clear about
Requesting	Making direct requirements or requests
Stating	Stating one's ideas and the ideas groups have discussed earlier; posting writing contents or sharing information
Suggesting	Offering suggestions or recommendations about writing contents, structure, format, and so forth
Two Main Categories	Definition
Initiating	Proposing new ideas
Responding	Reacting to others' ideas

Note. Each of the above language functions can fall into the category of either initiating or responding.

Appendix B. Taxonomy of Writing Change Functions

Types of Writing Change Functions	Definition
Adding	Contributing new content and adding language forms
Deleting	Removing existing content and language forms
Rephrasing	Stating the same ideas or meanings in a different way
Reordering	Moving around or reorganizing texts
Correcting	Correcting or attempting to fix grammatical, spelling, or formatting mistakes
Engagement of Writing Change Functions	Definition
Self	Writing changes made to the texts composed by the member himself or herself
Other	Writing changes made to the texts composed by other group members

Appendix C. Coding Scheme of Scaffolding

Scaffolding Mechanism	Definition
Affective Involvement (Lidz, 1991)	Expressing warmth to group members and giving group members a sense of caring in the project
Contingent Responsivity (Lidz, 1991)	Reading group partners' behaviors and responding appropriately
Direction Maintenance (Wood et al., 1976)	Maintaining pursuit of the goal for the group work
Instructing (de Guerrero & Villamil, 2000)	Giving mini-lessons in an authoritative tone
Intersubjectivity (Rommetveit, 1985)	Participating in a common task, having a shared understanding of the situation and being in tune with one another
Recruiting Interest (Wood et al., 1976)	Arousing interest in the task

Note. The scaffolding mechanism listed in this table was combined based on previous literature. This list was applied to the entire data of the larger wiki study. Thus, some scaffolding strategies were not discussed in the present study.

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