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EXPLAINING DYNAMIC INTERACTIONS IN WIKI-BASED COLLABORATIVE WRITING

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This article reports a case study that examined dynamic patterns of interaction that two small groups of ESL students exemplified when they performed two writing tasks, i.e., Research Proposal (Task 1) and 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 Group A demonstrated a Collective pattern in Task 1, but switched to an Active/Withdrawn pattern in Task 2.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 one 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

INTRODUCTION

Wiki-based collaborative writing has been increasingly implemented in second/foreign language classes due to the potential of Wikis to promote and support collaboration (e.g., Kessler, 2009; Lee, 2010; Mak & Coniam, 2008). The wiki is a web site that allows users to jointly create and edit the contents of web pages. With its distinctive features of user editability, detailed page histories and time/space independence, the wiki technology encourages collaboration and continual revision (Purdy, 2009) and also affords extended collaborative writing practice (Storch, 2013). The 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/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 students' perceptions of wiki-based collaborative writing (e.g., Li & Zhu, 2013; Chao & Lo, 2011). Several studies (e.g., Li & Zhu, 2013; Bradley, Linstrom, & Rystedt, 2010; Kost, 2011) 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 & Zhu, 2013; Li, 2013), their revision behaviors in the wiki page (e.g., Kost, 2011), and the level/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)

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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 U.S. The study addressed two research questions: 1) What patterns of interaction occur when small groups of ESL students perform collaborative wiki writing tasks? and 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

Sociocultural Theory (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 to 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 adult/expert scaffolds the child/novice via helpful and structured interaction, consequently facilitating the child's/novice's development in the Zone of Proximal Development (Lidz, 1991; Vygotsky, 1978), which refers to the distance between the child's/ novice's current state of knowledge and the potential state of development (Vygotsky, 1978). The adult/expert not only fine tunes his or her assistance according to the child's/novice's level of performance but also encourages the child/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/small group activities. For instance, Donato 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” (Donato, 1994, p. 46).

The other sociocultural construct that guides our study is mediation, particularly the 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 (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 twelve scaffolding behaviors in adult-child interaction. For instance, one of the scaffolding behaviors, contingent responsiveness, which was also observed in our study, refers to the adult's ability to read the child's behavior and to make appropriate response accordingly. de Guerrero and Villamil (2000) drew on Lidz's (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 through the mediation of language facilitated the completion of joint learning tasks.

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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/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/pairs orally manipulated language to solve problems together and jointly constructed new knowledge and understanding (Swain & Lapkin, 2002). 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 (Lockhart & Ng, 1995; Zhu, 2001), learners negotiate meanings to achieve writing goals. Li & Zhu (2013) recently applied the concept of language functions to understanding and interpreting ESL student interaction and task negotiation during collaborative wiki writing process.

Goals, Emotion, and Agency

Other sociocultural concepts highly relevant to our study are goals, emotion, and agency, which have shed considerable light on student behaviors in L2 collaborative learning contexts (Imai, 2010; Lantolf & Pavlenko, 2001; Storch, 2004). Group/pair work is regarded as a goal-directed action in which one’s aims or objects of efforts, or desired results mediate group/pair 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 the face-to-face collaborative writing setting, further investigated from a SCT perspective how the convergent or divergent goal orientations mediated peer interaction. Through analyzing individual interviews, particularly students’ responses to questions on their perceived purposes/goals in pair work, Storch (2004) 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.

What are associated with goals in the sociocultural theoretical lens are agency and emotion. Agency is defined as “people’s ability to make choices, take control, 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, Ward & Horn, 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/her goals in a specific context, whereas collaborative agency energizes the activity with a larger number of learners’ joint capacity (van Lier, 2008). Collaborative agency events occur while learners volunteer to provide scaffolding and instruction to each other (van Lier, 2008). In brief, agency, constrained by such factors as social groupings, situational contingencies, and individual or group’s capacities, helps us understand why participants act in the way they do (Lantolf & Thorne, 2006).

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Emotion, being a sociocultural factor accounting for human behavior, is also an essential part of the 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, natural curiosity” (p.105). Also, 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 “may be co-constructed as an event progresses” (Swain, 2013, p.196). In sum, goals (convergent/divergent goal orientations), agency (including individual agency and collaborative agency), and emotion (i.e., 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 the 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: “equality” (i.e., learners taking directions from one another) and “mutuality” (i.e., 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/turn count and language functions. Equality refers to the equal distribution of turns, equal contribution, and equal degree of control over the task direction; mutuality refers to peer engagement with each other’s contribution, 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 operationalization of constructs for indexing patterns of interaction.

Researchers (e.g., Li & Zhu, 2013; Li, 2013) applied the concepts of equality and mutuality to the examination of peer interaction in wiki writing tasks. Li & Zhu (2013), for example, analyzed the wiki discourse on wiki “Discussion” from each small group 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/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/revising behaviors toward co-producing joint texts in wikis (Mak & Coniam, 2008), Li (2013) focused on the recursive wiki writing/revising processes, taking the collectively contributing/mutuality supportive group as the focal case. Various types of writing change functions were identified: adding, deleting, rephrasing, reordering, and correcting, and 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.

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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 Arnold et al.'s (2012) study, German as a Foreign Language students exhibited both cooperation and collaboration patterns in the 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, e.g., wiki "Discussion" and "History," to illustrate a comprehensive picture of student interaction during wiki writing processes. Although Li & Zhu (2013)'s study 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. Also, explanations on 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 which 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 English for Academic Purposes (EAP) course at a research university in the southeast U.S. The EAP course at this university aimed to develop students' academic skills necessary to successfully transition into a Master's degree program; 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 our cooperating instructor who had worked in the EAP program for four semesters. Twelve 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 of all enrolled students. For the wiki writing activity, small groups jointly performed two wiki writing tasks: Research Proposal and Annotated Bibliography, which were embedded in a team research project in which 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 beginning 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, using mixed L1/cultural backgrounds and mixed English skills as criteria. As previous studies (Iwashita, 2001; Polio & Gass, 1998; Storch, 2013) have indicated, students who come from different L1 backgrounds or 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 proposal and annotated bibliography, sequentially. The wiki writing activity was automatically recorded on wiki “Discussion,” “Comment,” “History,” and “Page” in 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 administrated 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 purposeful sample¹, namely twelve students from four small groups demonstrating varied L1/cultural background combination. These four groups served as focal cases in the large study. Specifically, the twelve students responded to seven guiding questions including the purpose of wiki-based collaborative writing and their group interactions in the wiki. In Weeks 6 and 7, we collected reflection papers from the four groups; in the reflection papers, each individual 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 group partners’ contributions to group writing. In Weeks 8 and 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*

Tasks	Research Proposal	Annotated Bibliography
Description	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.	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 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 group partners’ annotations, including selecting sources and revising annotations.

Throughout the wiki project, the instructor did not actively intervene in small groups’ wiki writing processes. However, in the early stage of the wiki project, she posted in the group wiki “Discussion” to encourage student participation; she also provided feedback using wiki “Comment” on group writing products after the deadline of each wiki task.

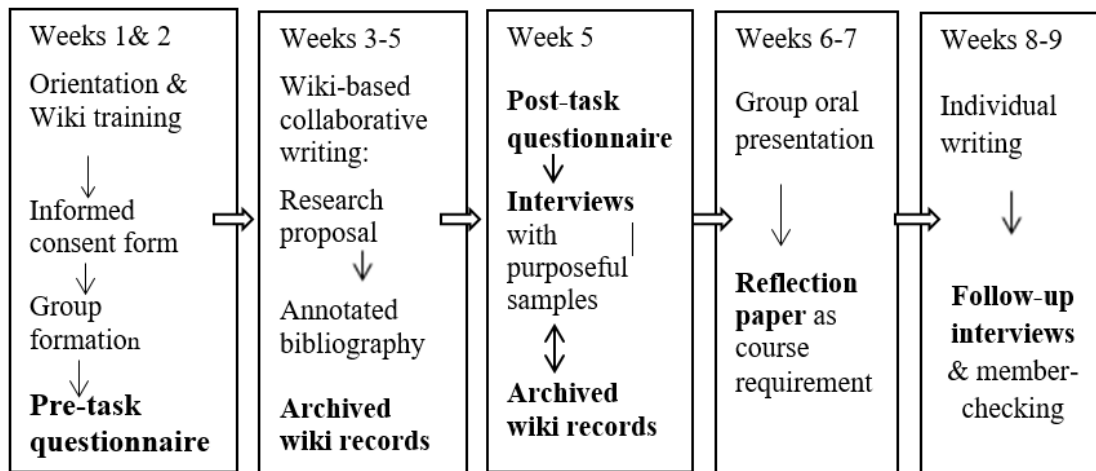


Figure 1. Data Collection Timeline.

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 "thick description" (Lincoln & Guba, 1985) essential for qualitative case study research and, at the same time, 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 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 (Pseudonyms were used.). The students aged in the range of 23-26, and studied in the EAP program for the second semester.

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 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 wiki joint writing. Figure 2 depicts the specific ways of examining "equality" and "mutuality" in this study.

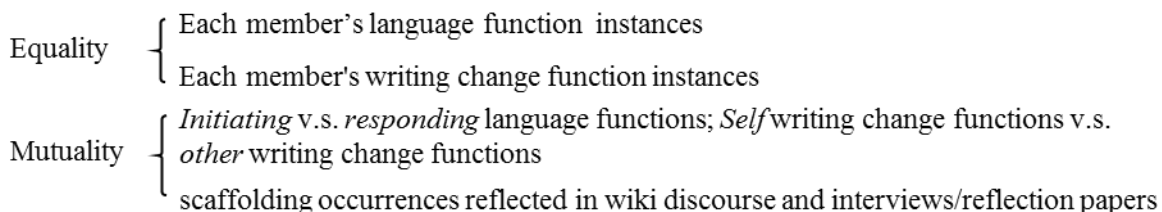


Figure 2. Analyzing two indexes of group interaction: Equality and Mutuality.

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. The balanced contributions in terms of language functions and writing change functions that the three group members performed indicated high equality, while sharply 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 the mutual engagement represented by *responding* language functions and *other* writing change functions, and employment of scaffolding strategies, and vice versa.

We examined the small groups’ wiki “Discussion”/ “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 & 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, i.e., the mediating functions of language used during wiki communication, as revealed in wiki “Discussion” and “Comment” (with a small occasion in “History” regarding Task 2). Rather than imposing existing categories on the available data, we read and reread 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), and meanwhile made 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 him- 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/mechanisms students employed to engage with and support group partners to jointly complete the wiki writing tasks. To examine peer scaffolding, we coded 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 (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/stances, embedded in the examination of equality and mutuality, when necessary².

To explain why the small groups were oriented to wiki collaborative writing in the ways they did, we conducted content analyses (Denzin & Lincoln, 1994; Duff, 2008) of the interviews and reflection papers supplemented with wiki discourse, in an inductive manner, in which we allowed themes to emerge from the data rather than impose 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 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 concerning students' understanding of the purpose of the wiki project and their approach to joint wiki writing were particularly relevant for our understanding of students' goals for participating in wiki-based collaborative writing. Students' answers to Interview Questions 3, 5, and Reflection Prompt Question 3 regarding their perceptions of group members' roles and their attitudes toward their group work provided the most relevant data for identifying the themes of agency and emotion.

For example, when responding to the question concerning the purpose/aim of wiki writing in the post-task interview, Group 1 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 goal* was derived when a goal was contradictory with other identified goals, as in the case of Group 1 in Task 2, to be reported below.

Table 2. Data sources used to derive themes to answer Research Question 2

Themes	Data Source	Questions
Goals	Post-task Interview Reflection paper	<i>Interview Question 2</i> : What do you think is the purpose of the wiki-based collaborative writing tasks? What is your aim in these tasks? <i>Reflection Prompt Question 2</i> : How did you/your group approach the two wiki writing tasks, i.e., research proposal and annotated bibliography?
Agency & Emotion	Post-task Interview Reflection paper & Wiki discourse	<i>Interview Question 3</i> : What do you think is your role in the wiki-based collaborative writing tasks?" <i>Interview Question 5</i> : What do you think of your group interactions in the wiki-based collaborative writing tasks? Do you enjoy it? Why or why not?" <i>Reflection Prompt Questions 3</i> : Did your group divide group tasks and labor? Did each group member play a distinct role? If yes, in which ways?

We derived the theme of agency in a similar fashion. We first conducted content analysis and coded relevant excerpts from interviews and reflection papers. For instance, we used the code of commitment/responsibility for "I want to post my ideas on the wiki [...] I want to do something very quickly." Codes which referred to one's commitment, one's taking concrete actions in pursuit of goals (Duff, 2012) or making decisions that contribute to the shared goals (Nolen, Ward & Horn, 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: Two case

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/whether 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 specific research topic, research background, and rhetorical structure although the groups demonstrated varying degrees of interaction while performing the task. The groups communicated much less in 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

Group A demonstrated a *Collective*³ pattern in Task 1 (Research Proposal), but switched to an *Active/withdrawn* pattern in Task 2 (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, but Abdul had a much lower degree of participation and even withdrew 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 (Research Proposal) 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 a 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

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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.

Table 3. *Characteristic features of interaction in Group A*

Group A	Task 1 Research Proposal	Task 2 Annotated Bibliography
Language Functions	<ul style="list-style-type: none"> • Dong: 9; Feng: 10; Abdul: 5 • 15 Initiating v.s. 9 Responding <p><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>)</p>	<ul style="list-style-type: none"> • Dong: 0; Feng: 1; Abdul: 0 • 1 Initiating v.s. 0 Responding <p><i>Example</i> Feng: “Can you find one more source to add?” (<i>Requesting</i>) Abdul: no response.</p>
Writing Change Functions	<ul style="list-style-type: none"> • Dong 5; Feng 2; Abdul 2; • 6 Self vs. 3 Other <p><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>)</p>	<ul style="list-style-type: none"> • Dong 7; Feng 9; Abdul 1; • 15 Self vs. 2 Other <p><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: <u>The purpose of this article is to describe</u> (<i>Rephrasing: self</i>) the nature and causes of the parallel trade in Coca - Cola between Shanghai and Hangzhou and [...]. <u>The audience is the individuals who has the strong intrest with the business strategies of Coca-Cola in China.</u> (<i>Adding, self</i>)</p>

Scaffolding Occurrences	<ul style="list-style-type: none">• Intersubjectivity <p><u>Example</u></p> <p>a. 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.</p> <p>b. 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.</p>	<ul style="list-style-type: none">• Lack of intersubjectivity <p><u>Example</u></p> <p>a. Feng: “Can you find one more source to add?”</p> <p>b. Abdul did not respond.</p>
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For instance, as displayed in Table 3, the three members used wiki “Discussion” and collectively discussed the specific topic to research and reached 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 that “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” (Reflection paper of Dong, 4/5/13).

Nevertheless, both “mutuality” and “equality” decreased when the group members composed the Annotated Bibliography (Task 2). 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, which was not responded to. Regarding text co-construction, unequal participation was obvious. Abdul did not complete his assigned task- he only contributed 1 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.

Group B

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 (i.e., Vitaly and Gao) took control over 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 (Interview with Chuan, 3/8/2013), 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 (Task 2). 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 the respective 24, 8, 8 instances of writing change functions. 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 “failities” 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 4. *Characteristic features of interaction in Group B*

Group B	Task 1 Research Proposal	Task 2 Annotated Bibliography
Language Functions	<ul style="list-style-type: none"> • Gao 13; Chuan 1; Vitaly 12 • 17 Initiating v.s. 9 Responding (including 2 positive response) <p><i>Example</i> Gao: We should focus on one company because we should narrow the topic. Focus on Apple (<i>Suggesting, justifying</i>).</p> <p>Vitaly: Apple could be just an example and I think it will be too narrow (<i>Disagreeing</i>).</p> <p>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>)</p> <p>Chuan: The professor wants us to narrow</p>	<ul style="list-style-type: none"> • Gao 0; Chuan 1; Vitaly 3 • 3 Initiating v.s. 1 Positive Responding <p><i>Example</i> Vitaly: Hey..., I found a useful link for you [...] (<i>Greeting, stating</i>)</p> <p>Chuan: Thanks. (<i>Acknowledging</i>)</p>

	out topic. She advises us use one company Apple in Russia and China. (<i>Stating, disagreeing</i>)	
Writing Change Functions	<ul style="list-style-type: none"> • Gao 7; Chuan 4; Vitaly 3 • 13 Self vs. 1 Other <p><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>)</p> <p>Gao: Moved the above texts to the latter part of the essay (<i>Reordering, self</i>)</p>	<ul style="list-style-type: none"> • Gao 24; Chuan 8; Vitaly 8 • 35 Self vs. 5 Other <p><i>Example</i> Chuan's other-correcting function: Vitaly: "demonstate" → Chuan: "demonstrate" Vitaly: "faicilities" → Chuan: "facilities"</p>
Scaffolding Occurrences	<ul style="list-style-type: none"> • Lack of intersubjectivity • Instructing unresponded to <p><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.)</p>	<ul style="list-style-type: none"> • Intersubjectivity • Contingent responsivity <p><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</p>

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

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 and reflection papers, supplemented with wiki discourse. Three main themes emerged that helped explain the interactional dynamics within small groups, i.e., 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 as well as the interaction of these goals mediated the group dynamics. Below we discuss the two groups' goals in-situ, illustrated with representative excerpts.

Group A

Members of Group A conveyed convergent goals that drove their wiki writing for Task 1, including teamwork, good score, and collaboration, when they responded to the question on the purpose of collaborative wiki writing and their aims in these wiki writing tasks (Interview Question 2). 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 (from collaboration in wiki writing to individual personal goal) in Task 2. 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” (Post-task interview with Dong, 3/9/2013). The other member 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” (Reflection paper of Feng, 4/ 5/13). Abdul also expressed his goal of collaboration and team success: “We write in the same way. [...] Do my best to achieve high” (Post-task interview with Abdul, 3/8/13). 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” (Interview with Feng, 3/8/13). 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.

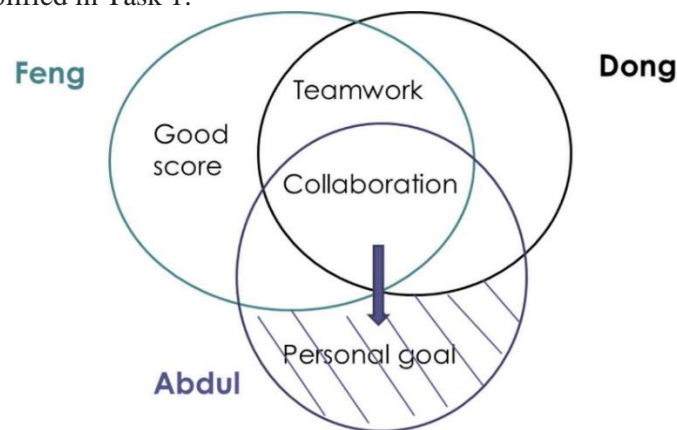


Figure 3. Dynamic Goals in Group A

Note. The shadowed area shows the switching goal of Abdul in Task 2.

Group B

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” (Vitaly, 3/8/2013), “achieve the goals with small groups” (Chuan, 3/8/2013), and “teamwork” (Gao, 3/8/2013). 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). Gao 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.” (Post-task interviews with Gao, 3/8/2013). 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” (post-task interview with Chuan, 3/8/13). However, his leadership was not acknowledged by his group partner

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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. He reasoned:

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. (Post-task interview with Vitaly, 3/8/13)

A holistic examination of the triangulated data sources indicated dynamic goals that mediated joint wiki writing process for this group. The two goals, i.e., collaboration and leading, seemed to have had different weight across the two tasks. In Task 1, the goal of leading group work was predominantly obvious. When the selected leader Chuan's individual accountability and leadership 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" (post-task interview with Vitaly, 3/8/2013). 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." (Vitaly, wiki "Page," 3/8/2013)



Figure 4. Dynamic Goals in Group B.

Note. 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/ nouns employed to address group members in the interviews, reflection papers and wiki discourse, which revealed socially mediated agency (Donato, 1994; van Lier, 1996).

Group A

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 (van Lier, 2008) in Task 1. Individual agency was mirrored by each member's commitment and responsibility, revealed in both wiki discourse and interview transcripts. Regarding the role he played (Interview Question 3), 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" (Post-task interview with Dong, 3/9/2013). 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” (Wiki discussion, Dong, 2/24/2013). Abdul told in the interview that “itw as great experiences to work with *my friends* from other culture” (Post-task interview with Abdul, 3/9/2013). 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” (Post-task interview with Feng, 3/8/2013, italics used by the authors forempphasis). 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?” (Feng, 2/28/2013) 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 (Reflection paper of Feng, 4/5/2013). 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 & Collaborative agency: “we,” “our,” “my friends”	Individual agency: reduction from Abdul
Emotion	Positive emotions: respect, familiarity, and friendship	Negative emotion: dissatisfaction

Group B

Group B also manifested dynamic agency and emotions, as displayed in Table 6.

Table 6. *Agency and Emotion in Group B*

	Task 1	Task 2
Agency	Individual agency & Zero collaborative agency: “he,” “group,” “Russian guy,” “Chinese people,” and “minority”	Individual agency: responsibility & Collaborative agency
Emotion	Negative emotions: distrust, unhappiness, and frustration	Positive emotions: more trust, less contention, and joy

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/ideas, sometimes I will follow, sometimes I will have my own opinion about this” (Post-task interview with Gao, 3/8/2013). 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” (Post-task interview with Vitaly, 3/8/2013). 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" (Vitaly, Wiki "Page," 2/14/13, italics used by the authors for emphasis). Both the rhetorical question and the non-collective pronouns "I," "you," and "your" indicated negative emotions and lack of collaborative agency during Task 1.

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" (Chuan, reflection paper, 4/5/2013, italics used by the authors for emphasis). 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 (e.g., Li & Zhu, 2013; Storch, 2002) reporting relatively stable or static patterns of interaction. 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 on 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, in which Abdul did not complete the required workload of three annotations due to a change in his goal, and the other group members showed a 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 the *Collaborative* pattern on 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 pattern in this writing project.

A few factors may help explain the different results (regarding changing patterns of interaction v.s. 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, and the one/ones with a relatively high 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) study 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 discussed 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.

In addition, group members' communication style may 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, which 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.

To explore sociocultural constructs that help explain the interaction dynamics, we identified three main sociocultural factors: Goals, agency, and emotion in relation to the second research question. Our analyses echoed Storch's (2004) findings that the students' perceived goals and the relationship of the goals (reflected in convergence v.s. divergence) influenced patterns of interaction that each group exemplified. Moreover, our study revealed that students' goals were dynamic and that the convergence/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. Take Group A as an example: the convergent goals of "collaboration"/"teamwork"/"good score" that members of Group A held in Task 1 accounted for their collective pattern, and one member's switching to the goal of "passing an important test" as a divergent personal goal explained behaviors characterizing the Active/withdrawn pattern that this group demonstrated in Task 2. Also, our study indicated that ongoing agency and socially constructed emotion helped account for the variation of interaction patterns across 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, but the positive affect was gradually reduced, complemented with the decline of collaborative agency, with one member's withdrawal from the wiki project on Task 2. Furthermore, our study illustrated the concept of relational agency, i.e., "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 in the interview 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, however, 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, 2012), and students can behave quite differently depending on their goals and agency. In this study, students jointly worked on two wiki writing tasks: Task 1 (Research Proposal)

required group members' co-construction of the research proposal using wikis throughout the writing process, while Task 2 (Annotated Bibliography), despite a common writing product, required each member's contribution of three annotations. 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 Research Proposal (which entailed group members' joint text construction and decision making throughout the writing processes) and the cooperative nature of Annotated Bibliography (which entailed combination of each member's individual writing efforts), 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, and 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 of the study. 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. Third, 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/cultural backgrounds, with a purpose to promote inter-cultural understanding and provide 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 L1/cultural 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. Also, our study revealed that small groups' interaction dynamics changed across two 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 collaborative 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 second and foreign language 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 the online context.

APPENDICES

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 self or others' ideas about writing.
Eliciting	Inviting or eliciting opinions, comments etc. from group partners.
Greeting	Greeting group members.
Justifying	Defending one's own ideas/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/recommendations about writing contents, structure, format etc.
Two Main Categories	Definition
Initiating	Proposing new ideas

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Responding	Reacting to others' ideas
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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/meaning in a different way
Reordering	Moving around /reorganizing texts
Correcting	Correcting or attempting to fix grammatical, spelling, or formatting
Engagement of Writing Change Functions	Definition
Self	Writing changes made to the texts composed by the member
Other	Writing changes made to the texts composed by other group

Appendix C: Coding Scheme of Scaffolding

Scaffolding Mechanism	Definition
Affective involvement (Lidz, 1991)	Expressing warmth to group members, and give group members sense of caring in the project.
Contingent responsivity (Lidz, 1991)	Reading group partners' behavior and respond appropriately. Group members are in tune to one another.
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)	Group members participate in a common task and have a shared understanding of the situation and are in tune with one another.
Recruiting interest (Wood et al., 1976)	Arousing group members' interest in the task.

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

NOTES

1. According to the criterion of maximum variations (Miles & Huberman, 1994), we selected four small groups with variations in the L1/cultural composite of grouping in the context of the course in which the majority of the student participants were Chinese. Three of the groups had a diversity of cultural background, i.e., Chinese and a different origin. The fourth group chosen was

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composed of three female Chinese students, considering additionally the variation in gender.

2. We primarily examined the two indexes of interaction: equality and mutuality to identify the interaction patterns. We additionally considered the students' roles/stances, embedded in the examination of equality and mutuality, when necessary. For instance, we noticed few instances of language functions that Chuan in Group 2 performed, but 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 three 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 among all three members.

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