UNIVERSITY OF CALIFORNIA,
IRVINE

Digital Literacy in Academic Settings:
Synchronous Collaborative Writing among Linguistically Diverse Students

DISSERTATION

submitted in partial satisfaction of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

in Education

by

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Dissertation Committee:
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DEDICATION

To Gloria (은빈) and Elin (은설),
my two beautiful daughters

I feel so blessed to celebrate the closing of this journey with my two daughters: Gloria—whom I was pregnant with when I began my graduate journey in Boston, and who has been my biggest cheerleader ever since, and Elin—who was born during my dissertation writing and made my defense and commencement all the more special by being the youngest audience.

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ACKNOWLEDGMENTS

As I look back on my challenging graduate journey, I am filled up with gratitude for my amazing supporters, mentors, and friends without whom I couldn't have made it through. Their unwavering love and support have shaped who I have become, and driven what I have accomplished. Personally, it was an incredible journey of growth, during which I navigated and developed my multiple identities as a second language learner, researcher, teacher, mentee, mentor, wife, and mother. Academically, it was a humbling experience in which I constantly struggled with my own limitations, embraced them, and learned the beauty of rising from challenges and growing with others. The past five years was an incredibly cherished part of my life because of the following people that I want to honor and acknowledge.

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I also would not have been able to make it through this journey without the support of my dear mentors, friends, and colleagues both in and outside of academia. They have always been there for me to give me advice and encouragement. Special thanks go to Dr. Sang-Keun Shin, my advisor at Ewha Womans University, and my mentors that I was privileged to have around the world—Seoul, Boston, and Irvine: Dr. Kee Chun Park, Dr. Jung-shim Lee, Ms. Sumin Kim, Mrs. Amy Fish, and Mrs. Lisa Roderick. Moreover, my heartfelt gratitude goes to my church families whose prayers, support, and comfort have meant the world to me: the Hepsiba cell group at Bethel Korean Church in Irvine (Mr. Hyunsu Kim, Mrs. Bongju Koh, Mr. Ma Jun, Mrs.

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My deep appreciation and love also goes to my colleagues, cohort, lab mates, and student parents at UCI who struggled and celebrated alongside me. They have been my own communities of practice—"who share a concern or a passion for something they do and learn how to do it better as they interact regularly (Wenger)." I would like to particularly thank my peers—Youngmin Park, Nayoung Hwang, Jinkyung Hwang, and Kenneth Lee, for sharing all the moments of joy and struggles together. I also want to extend my thanks to my collaborators that I was fortunate to have at UCI, including Dr. Judith Olson and Dakuo Wang from the Informatics Department. I am also deeply grateful for the generous fellowships and grants that I received from UC Irvine, the Rotary Foundation (Wakefield Rotary Club, MA), the International Research Foundation for English Language Education, the Phi Beta Kappa Alumni Association, the Korean Ministry of Education, and the Harvard Graduate School of Education. Without their financial support, I would not have completed my Master's and PhD programs and conducted my research. Also, my deep appreciation extends to Ms. Elizabeth Ellison, who was an excellent teacher and collaborator, and her students at my study site for their participation and patience with my year-long study. This dissertation would not have been completed without the help of my undergraduate research assistants: Cassandra Hall, Pauline Dong, Ashley DeBoef, and Tony Quan. Mentoring and interacting with them was one of my fondest memories at UCI.

Lastly and most importantly, I would like to acknowledge and express my deepest gratitude to my family. The love and appreciation I have for each and every one of my extended family cannot be contained on this page. I thank them for putting up with a wife and mom who has been a busy full-time student and imperfect in so many ways. My husband, Daniel, has supported and cared for me and our two beautiful daughters, and showed such patience and resilience as we walked together through this difficult journey. Gloria (은빈), my first daughter, has been my biggest and untiring motivator whose endless cheers of, "You can do it, Mom!" kept me going whenever I felt guilty about not being able to give her undivided attention. I would also like to thank my baby, Elin (은설), for her patience during my difficult pregnancy with her, and for all her smiles and joy she brought home during my dissertation writing. This project would never have been completed if I had not had such a patient, understanding, and cheerful family all these years. Finally, I would like to express my deep gratitude and respect for my supportive parents and in-laws, who flew over all the way from Korea to support my two childbirths. Now that I am a parent, I am beginning to grasp the level of sacrifice and commitment you have made and the wells of faith and love you raised me with. Thank you for supporting me and my children unconditionally, praying continuously, and for encouraging me along the way.

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EDUCATION

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ABSTRACT OF THE DISSERTATION

Digital Literacy in Academic Settings:
Synchronous Collaborative Writing among Linguistically Diverse Students

By

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Doctor of Philosophy in Education

University of California, Irvine, 2017

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This longitudinal case study examined middle school students' (N=102) in-class digital literacy practices using Google Docs and their subsequent learning outcomes and perceptions in a technology-supportive K-8 school. Despite the widespread use of synchronous technology in writing, little research has been conducted on students' collaboration practices and their impacts on text outcomes and perceived learning, particularly among linguistically diverse students. Using a mixed-methods approach that combines qualitative, quantitative, and text mining methods, I examined multiple aspects of synchronous collaborative writing (e.g., patterns, strategies, phases, textual outcomes, perceptions of group writing) over the course of an academic year. I also discussed the implications of the new digital literacy practices for teaching and learning in K-12 academic settings. In my three-part dissertation, triangulation of multiple sources of data and analytic approaches revealed several major findings regarding the practices (Part 1), outcomes (Part 2), and perceptions (Part 3) of synchronous collaborative writing.

First, the groups' collaborative writing practices (i.e., balance of written participation, editing amount, the use of collaborative writing strategies) tended to differ across the two key contextual factors: ability-grouping status and task types. Compared to the same ability groups, mixed-ability groups demonstrated patterns of unbalanced participation (e.g., frequent use of main writer strategy) with higher numbers of self-edits. This implies that students in mixed-ability groups may encounter difficulty in dividing work equally due to the writing proficiency gaps among members (i.e., higher imbalance). Regarding task types, groups tended to employ more balanced and cooperative strategies of collaboration in argumentative and informative tasks, whereas a more sustained collaboration typically led by a main writer characterized group work in narrative tasks. The distinct patterns underscore the important role of key contextual factors—grouping arrangement and task type—in the design and implementation of collaborative writing.

Second, qualitative analysis of the focal groups' writing processes revealed distinct characteristics of collaborative and non-collaborative groups, and how such patterns shape group's subsequent choice of writing strategies. Of particular importance was the role of leadership in interaction patterns: unlike the non-collaborative groups (authoritarian/passive, dominant/withdrawn) characterized by dominant leadership, the groups with a collaborative stance (collectively contributing/ mutually supportive pattern, expert/novice pattern) involved distributed and fluid leadership that leveraged the opportunities for synchronous interaction.

Third, I examined how multiple indicators of collaborative writing practices (e.g., participation evenness, editing amount, collaborative writing strategy) may relate to the quality of group text outcomes. Results re-confirmed the critical role of task types in collaborative writing. For example, in the narrative task involving a creative open-ended prompt, balanced participation and more number of co-authors tended to weaken the organizational aspect.

However, no such effects were found in the argumentative and informative tasks characterized by more formal, closed genre structures. It was also noteworthy that the use of collaborative writing strategies that were found to be effective in each task type was also distinct. In the narrative writing, synchronous hands-on strategy that utilized the simultaneous writing and editing features of Google Docs was found to be effective in the areas of content and organization, whereas a strategy characterized by an explicit division of work (i.e., parallel writing) was effective in the argumentative writing, particularly in the area of content.

Fourth, I examined the phases of focal groups' community building (i.e., initial, conflict, intimacy and work, and termination phases) during their year-long engagement with collaborative group work. Qualitative analysis of multiple sources of data suggested that there were unique group tasks that needed to be accomplished in each phase, and the degree to which members effectively accomplished these sub-tasks ultimately determined the level of collaboration and perceived learning. The results also suggested that the intimacy and work phase — during which members build trust, negotiate differences, establish membership, and pool resources—was particularly important for novice members' transition from peripheral to full participation. It was also noteworthy that some struggling English language learners used their advanced technology skills to re-position themselves as meaningful contributors, despite their limited writing ability. This illustrated an expansion of CoP from a unidirectional process (i.e., novice learners being apprenticed into expert practices) to a multidirectional process in which members flexibly negotiate their membership and relationships.

Fifth, I examined the perceived affordances and challenges of integrating synchronous technology in teaching and learning writing, as well as the contextual factors that shaped students' year-long engagement with the digital literacy practices. Several themes have emerged

regarding the affordances (e.g., multiple entry points for participation, apprenticeship for 21st century literacy skills, support system for struggling writers), as well as the challenges (i.e., efficiency over quality, tension between collective vs. individual ownership) of engaging with the newly emerging digital literacy practices. The critical role of implementation contexts (e.g., technology-supportive instructional context, school's emphasis on collaboration and diversity, curricular integration and teacher's role) was also highlighted.

Lastly, I discussed the theoretical, pedagogical, and methodological implications of the multiple findings. Theoretically, this study helps us explore the value of synchronous collaborative writing as a new literacies practice and also as a community practice, both of which may effectively bridge the gap between traditional in-class literacy practices and increasingly multimodal, out-of-school literacy practices. Pedagogically, the results provided strong implications for task design and implementation by investigating the under-examined impact of multiple factors (e.g., task types, ability grouping, interaction patterns) on students' collaboration practices and learning outcomes. Methodologically, this study demonstrated how the integration of a text mining approach may enhance the research capacity for understanding the multiple aspects of the emerging digital literacy practices, particularly when combined with qualitative investigations. Overall, the findings help us better understand how to integrate collaborative digital literacy in K-12 settings and how to maximize the educational affordances of synchronous technology to equip students with the essential writing skills for the 21st century.

CHAPTER 1

Introduction

Developing digital literacy skills is an important entitlement for academic and career success in the knowledge economy. Digital literacy comprises of a set competencies required for effective participation and communication in the 21st century: the ability to make and share meaning in different modes and formats, and to interact and communicate effectively in digital environments (Warschauer, 1997; Dobson & Willinsky, 2009; Knobel, 2008). One important component of digital literacy is the collaborative processes and products of written communication (Yancey, 2009). In most career and academic settings, collaborative tasks are increasingly common due to the practical benefits of task efficiency and productivity (Jones, 2007). In K- 12 education, collaborative writing has been recognized as an effective instructional strategy for improving individual writing skills (Graham & Perin, 2007) as well as an important component of 21st century literacy demands suggested in the Common Core State Standards (e.g., Bunch, Kibler, & Pimentel, 2012).

Recently, technology-enhanced writing platforms, such as wikis, blogs, and Google Docs, have been gaining attention as mediums for collaborative writing due to features that allow users to simultaneously create, edit, and collaborate on a document. Collaborative communication in the networked environment can be conducive for writing development, as it "combine[s] the interactive aspect of written conversations with the reflective nature of composing" (Ware & Warschauer, 2006, p.111). Research suggests that collaborative online writing can be particularly beneficial for second language (L2) learners because it can provide them with communicative opportunities to practice English in a non-threatening and engaging environment, with little restriction on time and space (Warschauer, 1997; Sun & Chang, 2012). Drawing from

sociocultural theories of L2 learning, several studies have elucidated the positive impacts of L2 collaborative writing, such as enhanced writing quality (Storch, 2005), writing fluency (Bloch, 2007), a sense of audience (Sun & Chang, 2012), pooling of knowledge and ideas (Donato, 1994), and socialization opportunities with specific discourse communities (Yang, 2014).

However, most of these studies examine L2 learners' technology-based collaboration in post-secondary or English as a Second Language (ESL) contexts, with little investigation into whether these benefits may transfer to mainstream K-12 classes, where L2 students interact with their native speaking (NS) peers. Considering the steady growth of language minority students in the U.S. (Rjosk et al., 2015) and the popularity of collaborative group work in academic settings, more research is needed to explore students' collaborative writing experiences in linguistically and culturally diverse classrooms (Zhu, 2001; Yang, 2014). This is especially true given that immigrant bilingual students come from diverse cultural backgrounds and thus may have differing perceptions and expectations about effective group work in mainstream academic contexts (Zhu, 2001).

Furthermore, there is lack of knowledge on how new digital media may bring forth changes in the practices, perceptions, and outcomes of L2 students' collaborative engagement. Most recently, Google Docs—a cloud-based web-processing tool—has been rapidly increasing in popularity due to its enhanced sharing feature and accessibility that enable both synchronous and asynchronous collaborative work. However, despite the widespread use of Google Docs, little is known about students' synchronous interaction practices, outcomes, and perceptions using this platform in linguistically and culturally diverse classrooms, particularly over long stretches of time. This lack of research, in turn, makes it challenging for educators to implement and design appropriate instructional strategies and tasks that maximize the educational potential

of this cloud-based technology to promote L2 students' participation, collaboration, and ultimately, learning.

To address this gap, this longitudinal case study explores how adolescent bilingual students with differing levels of language proficiency and ability grouping status (i.e., same ability group vs. mixed ability group) engage with synchronous collaborative writing practices with Google Docs. A mixed methods approach is employed to understand 8th grade bilingual students' year-long engagement with cloud-based collaborative writing in three English language arts (ELA) classes (N=102 students) at a middle school with a high population of bilinguals. Using both qualitative and quantitative techniques, this study examines the students' synchronous collaborative writing practices, outcomes, and perceptions, in order to gain an in-depth understanding of their experience and its implication for learning. Specifically, I examine (a) the characteristics and patterns of students' collaborative writing behaviors, (b) how students' collaborative writing practices may influence the quality of their group documents as well as the development of their individual writing skills, (c) how students perceive their year-long engagement with synchronous collaborative writing practices (i.e., benefits, challenges, contextual factors of implementation).

Quantitative analysis of documents is supported by incorporating new text mining tools that extract information on writing and revision quantities in Google Docs. These analyses are also supported and guided by qualitative analysis of student interviews, observations, and verbal interaction, and document analysis from the four focal groups (N=16, groups of four) of different group compositions (two same ability groups, one mixed ability group with higher ability peers, one mixed ability group with lower ability peers). Through a close examination into the students' collaborative writing practices, outcomes, and perceptions, this study ultimately aims to

understand what learning affordances synchronous collaboration may offer to students of diverse linguistic backgrounds, including struggling English learners. The results provide valuable implications for integrating cloud-based technology into K-12 classrooms to accommodate students with diverse backgrounds and capacities.

CHAPTER 2

Conceptual Framework

Sociocultural Theories of Literacy Development

Support for the benefits of technology-based collaboration on learning comes both from sociocultural theories of literacy development and from the communities of practice model. Advocates of sociocultural theory emphasize the importance of learner interaction and the social and cultural situatedness of learner activity because they view learning as a social process (Vygotsky, 1978). In this context, L2 acquisition is considered the outcome of co-construction process of one's L2 knowledge with peers rather than a univocal process resulting from an individual's construction of knowledge (Swain & Lapkin, 1998; van Lier, 1996). Research from a sociocultural perspective of L2 acquisition suggests that collaborative writing involving two or more writers working together (Ede & Lunsford, 1990) pushes learners to reflect on their language use and to solve their language-related problems (Swain, 2000). In this sense, collaborative tasks are likely to provide scaffolding for each other's use of language (Storch, 2002). It is through this collaborative scaffolding that learners improve their linguistic and cognitive capacities.

From this perspective, collaborative interaction helps L2 learners to improve their writing by providing opportunities for them to focus on multiple aspects of writing, such as grammatical accuracy, vocabulary, organization, and discourse (Storch, 2002; Swain & Lapkin, 1998). By taking group responsibility to work on a single text, these learners generate ideas and pay attention to their language use and the organization of their ideas. During the process, they become engaged in collaborative scaffolding by giving and receiving feedback, which promotes

the elaboration of ideas and the consideration of alternative uses of language (Hernandez et al, 2008).

One of the fundamental assumptions in sociocultural theory of language acquisition is that collaboration may lead to higher performance than individual work, as learners with differing abilities can have a positive impact on each other's development (e.g., Storch, 2002; Swain & Lapkin, 1998). Because no two learners have the same strengths and weaknesses, peers can provide scaffolded assistance to each other and, by pooling their different resources, can achieve a level of performance that is beyond their individual level (Ohta, 2001). However, this assumption has not been documented with sufficient empirical evidence, as the particularities of contextual factors tend to complicate how one identifies the impacts of collaborative writing. As such, understanding the learner-internal (e.g., individual members' language proficiency, writing styles) and learner-external (e.g., task types, tool types) factors is the key to understanding the link between collaborative writing and language acquisition.

The recent advance of collaborative technology, such as computer-mediated communication (CMC) and social media tools, facilitates the collaborative writing process. With these technology tools, human interaction is increasingly characterized as easily archived, transmitted, archived, edited, and evaluated (Warschauer, 1997). These changes lead to generate new discourse practices, norms, and communicative processes (Dobson & Willinsky, 2009; Lankshear & Knobel, 2007). This transformation of literacy practices through the affordances of new media technology has led to an emergence of a related sociocultural framework: the New Literacies Studies (Lankshear & Knobel, 2007)—a framework that explores the novel types of literacy practices associated with use of digital media (Gee, 2009).

Scholars in the New Literacies Studies (NLS) argue that the meanings to which technologies give rise are shaped by the social and cultural practices of diverse communities and actors (New London Group, 1996; Lankshear & Knobel, 2007). This approach moves beyond the traditional view of literacy, which comprises discrete skill sets of reading and writing in print-based environments. It calls for the concept of *new literacies* that involve the knowledge, skills, and strategies needed for comprehension and communication via new technologies (Leu, Kinzer, Coiro, & Cammack, 2004). In this sense, new literacies are more participatory, collaborative, and distributed in nature than traditional literacies (Coiro, Knobel, Lankshear, & Leu, 2008). Through the collaborative process of co-constructing meaning and knowledge, students are expected to explore the fluid and multifaceted nature of literacy (Dobson & Willinsky, 2009). For second language (L2) learners who come from linguistically and culturally diverse backgrounds, engagement in in new literacies practices present opportunities as well as challenges. Although L2 students' digital literacy practices in out-of-school settings have been well documented in the literature (e.g., Black, 2005; Yi, 2008), little research has been conducted on their in-school digital literacy practices, learning outcomes, and perceptions. Therefore, my dissertation aims to fill this important gap, and inform K-12 teachers and educators on how to guide and scaffold L2 learners and their peers during their interactive digital literacy practices.

Communities of Practice

A broader theoretical explanation for the value of technology-based collaborative writing comes from the communities-of-practice theory (Wenger, 1998). Consistent with Vygotsky's sociocultural perspective of learning, Lave and Wenger (1991) asserts that "learning is a process that takes place in a participation framework, not in an individual mind" (p. 15). This theory posits that learning is experienced and meaning is co-constructed as an individual jointly share

and develop practices within a *community of practice* (Lave & Wenger, 1991). It is related to the sociocultural theories of literacy development in that it underscores the importance of sociocultural contexts of interactions. In a sense, the communities-of-practice theory extends the focus beyond the literacy development process, and into a broader knowledge building and participation process.

This theory posits that knowledge is situated in a particular activity setting, where learners working together to achieve a common goal towards (Lave & Wenger, 1991; Wenger, 1998). Knowledge building, thus, happens in the course of collaborative meaning-making through discourse. In this process, learners progress towards their "own understanding through the constructive and creative effort involved in saying and in responding to what was said" (Wells, 2000, p. 74). Members participate with and relate to each other in an ongoing social and interactional process, during which students develop into *full participants* in the community (Wenger, 1998).

For L2 learners, becoming a member of a community includes "learning how to collaborate in the community" (Lave & Wenger, 1991, p. 109) that can be culturally and linguistically different from their own. Lave and Wenger (1991) explains this process as *legitimate peripheral participation* –the process by which newcomers, with their limited responsibility and expertise, become part of a community of practice that has been already formed by expert members who are, in the case of L2 learning, native English speakers. This is similar to the concept of *language socialization* –the process of socializing speakers to a new language as well as the process of learning how to become a member of a discourse community (Riley, 2008).

The emergence of social technologies and virtual spaces has provided L2 learners with multiple channels of language socialization and affiliation opportunities (Thorne & Black, 2007). Collaborative online environments allow easy access to interacting with native English speakers and artifacts of the target language culture. They also provide opportunities to use multimodal means of self-expression that are not readily available in traditional offline contexts. In these environments, L2 learners' participation may take different forms and trajectories and lead to various states of belonging within a community of practice, from legitimate to full participation. Several studies explored L2 learners' online participation and identity development processes in virtual spaces, which were found to be welcoming venues whereby language learners express themselves more freely and develop from peripheral participation to full participation (e.g., Lam, 2004; Black, 2005). While these prominent studies have focused on L2 learners' digital literacy practices in natural contexts outside of school, little is known about the contextual variations of those practices in K-12 mainstream academic contexts where collaborative technology is used as a classroom tool. In particular, one area that has not been fully understood, and thus, needs further investigation is how learner internal (e.g., language proficiency) or external (e.g., task types) factors may affect the level and extent of students' participation and subsequent learning.

CHAPTER 3

Literature Review

In the subsequent sections, I review the current L2 literature on technology-based collaborative writing. I discuss three major research strands that have been examined in the extant studies, as well as the factors that may serve critical roles in effective collaboration. These include studies that focus on: (a) collaborative writing practices; (b) collaborative writing outcomes; (c) perceptions of collaborative writing; and (d) factors that may shape the effectiveness of collaboration (i.e., language proficiency, task types).

Collaborative Writing Practices

Research that analyzes collaborative writing practices usually focuses on the strategies, behaviors, roles, and responsibilities of collaborators, as well as the collaborative structure underlying writing tasks. In an attempt to capture the diverse types of collaboration in writing, researchers often carries out studies of collaborative writing in naturalistic settings by observing how writers collaborate, or by using self-report data (e.g., interview, survey) from writers engaged in collaborative writing. Previous studies on collaborative writing practices have examined the (a) patterns of collaboration, and (b) phases of collaboration.

Patterns of collaboration. The term 'patterns of collaboration' refers to the ways students negotiate writing tasks and use text construction to convey their negotiated meaning (Li & Zhu, 2013). Patterns of written collaboration have been conceptualized and researched in different ways according to how the researchers defined the central concept of *collaboration.* Some researchers embrace a broad definition of collaborative writing in which two or more individuals are writing together (Saunders, 1989). Other researchers follow a more specific definition, namely, mutual contribution from participants with a coordinated effort to solve a problem

together (Dillenbourg, 1999). In the latter case, scholars differentiate collaborative writing from peer feedback or review processes in which students do not share authorship or a common goal of composition. These scholars argue that collaboration should occur throughout the writing process, calling for instructional arrangements that allow writers to work together in order to plan, draft, revise, and edit their compositions (e.g., Graham & Perin, 2007).

In an L2 context, several studies examined collaborative interaction patterns in group writing tasks using transcribed pair talk and observations. For example, Storch (2002) identified four patterns of interactions in her longitudinal study of ESL pair writing work using: collaborative, dominant/dominant, dominant/passive, and expert/novice. By relating the interactional patterns to writing outcomes, she concluded that students in the collaborative pattern and expert/novice pattern performed better in writing tasks than pairs who were observed in the other patterns, exemplifying the scaffolding benefits as posited in the sociocultural learning theory. Using a small group case study, Li and Zhu (2013) found similar patterns of group dynamics in wiki collaboration. Their analysis of data from the wiki modules and interviews suggested that in each pattern (i.e., collectively contributing/mutually supportive, authoritative/ responsive, and dominant/ withdrawn), group members exhibited differences in their roles and responsibilities, which, in turn, influenced the participants' perceived learning experiences.

Other studies noted a distinct pattern of online collaboration, potentially due to the availability of web features that allow for both synchronous and asynchronous collaboration. For example, Lund (2008) examined high school EFL learners' wiki-based collaborative writing processes using a videotaped and written corpus of learner interactions, and analyzed two types of collaborative activity that differ in terms of the level and scope of the collaboration: local

collaborative (i.e., members working to develop topics in an autonomous mode) and distributed collective (i.e., branching out through responding to new information in an interdependent mode) language production. The findings suggest that students tend to transition from local collaboration to collective networked production, and also from the consecutive to mixed activity mode as the project progressed.

Phases of collaboration. Researchers have emphasized the importance of considering the developmental phases in collaborative writing research, arguing that the sub-processes of writing place different demands on the writers (Flower & Hayes, 1980) and may involve different interaction patterns for each sub-process (Onrubia & Engel, 2009). Research has revealed that technology-based writing tends to involve a less linear composition process and instead exhibits a high degree of recursion and between-draft revisions due to the convenience of online drafting and editing features (Van Waes & Schellens, 2003). Research on how the writing process may differ in collaborative contexts, particularly in online settings, has only recently emerged and is limited in number (Storch, 2011).

Several studies report the existence of distinct phases in collaborative problem solving tasks. For example, in one study on collaborative writing in a virtual class, Moodle, Onrubia and Engel (2009) analyzed students' messages and documents, interviews, and self-reflections, and found four distinct stages of collaborative writing (i.e., initiation, exploration, negotiation, and co-construction). The results suggest that the groups tend to stay at the second of the four established phases, exploration, with few reaching the highest phase of co-construction. Other studies on face-to-face collaboration have raised similar concerns, reporting the complexity and difficulty in transitioning from the initial phases to the more advanced phases of collaborative knowledge construction (Dillenbourg, 2002). The results also align with Storch's (2005) claim

that collaborative writing occurs only within a limited range of stages, rather than across all writing processes. It tends to be limited to the brainstorming stage, or more commonly, to the final stages of writing (i.e., the peer review stage). Typically, students work on their texts individually, and review each other's written texts and make suggestions on how they could be improved.

While Onrunbia and Engel (2009) identified the distinct phases of collaborative writing in a wiki, Strobl (2014) pointed out that the group writing stages in Google Docs are hardly distinguishable. The authors analyzed the Google Docs revision history and found that the group writing process was characterized by a constant intertwining of writing and revising (e.g., deleting, rewriting, reshuffling) activities. They suggest that this was potentially because its cloud-based system allows the group members to write and edit the same document synchronously. The results indicate that the technological characteristics (e.g., simultaneous writing and editing) of a collaborative platform can bring about new forms of collaboration, which illustrates the point that technology tools do not merely serve as a medium for collaboration, but as an integral part of collaboration itself (Thorne, 2003; Brodahl, 2011). Yet the new patterns and processes of collaborative writing evolving from increasingly widespread use of synchronous interaction can be arduous to interpret with qualitative document analysis and, therefore, need an alternative methodological approach such as text mining.

Collaborative Writing Outcomes

Previous research has long highlighted the benefits of collaboration in terms of both L2 learning and text quality (e.g., Elola & Oskoz, 2010; Kost, 2011; Storch, 2005). Researchers on collaborative writing in traditional non-technology settings have concluded that texts developed in pair- or group- writing contexts facilitate a higher level of accuracy than those written

individually (Storch, 2005). However, other scholars have questioned the credibility of the assumption that collaborative writing may be superior to individual writing as posited in the sociocultural theory of language acquisition. These scholars warn that some students working in groups or pairs often fail both to work collaboratively and to show any improvement in writing skills (Storch, 2002), potentially because students engage in collaborative writing without sufficient training (e.g., Arnold et al., 2012) or the necessary metacognitive knowledge (e.g., Myhil & Jones, 2007).

When it comes to online collaboration, evidence-based research on the effects of the collaboration process on writing products is scarce (Wang & Vásquez, 2012). Existing studies typically used descriptive textual analysis (e.g., Mac & Coniam, 2008; Elola & Oskoz, 2010) or quasi-experimental designs (e.g., Strobl, 2014; Wichadee, 2010) to report the link between technology-based collaboration and writing outcomes in small samples, with only few studies involving a control condition. Mak and Coniam (2008) examined the textual quality of technology-based collaborative products using small samples. They traced textual changes in the amount and the types of writing (e.g., word count, t-unit, purpose of revision) that were produced by one group of ESL secondary students across three phases of collaboration. Using both descriptive textual analysis and qualitative analysis, the authors suggested that the students produced increasingly more complex and more coherent texts in greater quantity, due to the collaborative nature of the task and the presence of authentic purpose. The approach to examine textual changes over the course of wiki-based collaboration is valuable; yet the small sample size, as well as the lack of assessment on the quality of final writing outcome, make it difficult to draw a reliable conclusion on how the textual changes may lead to writing improvement.

Other studies adopted quasi-experimental designs to understand the differences between individual and collaborative writing outcomes (e.g., Arslan, 2010; Strobl, 2014). These studies examined the impact of collaborative writing on specific L2 writing aspects (e.g., accuracy, complexity, content, organization) because the overall positive effect on writing outcomes is likely to vary from one writing skill area to another. The findings from these studies suggest that the strength of collaborative writing primarily lies in improving content and organization. For example, using a quasi-experiment design, Arslan (2010) provided empirical evidence on the effect of blog-based writing instruction on EFL students' writing performance. Compared to the control group, the blog intervention group showed greater improvement in their writing, particularly in content and organization. However, there were no notable differences between the two modes in other areas such as vocabulary and grammar. Qualitative findings from other studies (e.g., Wichadee, 2010) suggest that the use of a collaborative online platform may heighten students' awareness of readers, which helps them focus on the clarity of their message and organization.

A stronger reader-writer relationship in collaborative environments is also suggested in Kuteeva's (2011) discourse analysis study conducted in an English for Academic Purposes (EAP) setting. She employed meta-discourse textual analysis to compare the use of reader-oriented features and interactional meta-discourse markers in an individual and collaborative corpus. The results revealed a higher use of engagement markers (i.e., personal pronouns, questions, commands) in the wiki-based argumentative texts, combined with participants' questionnaire responses, suggesting that writing on the wiki can contribute to raising students' audience awareness, resulting in more reader-oriented texts.

Several studies investigated how writing processes or behaviors during collaboration might shape writing outcomes. Using a quasi-experimental design, Strobl (2014) examined the processes and outcomes of individual versus collaborative writing. Their quantitative findings suggested the superiority of collaborative texts in terms of content and fluency. The researchers hypothesized that the in-depth discussions members engage in during the planning phase of collaboration might have led to an improvement in group documents, particularly in the areas of content and organization. This echoes the studies that highlight the important role of the planning as a predictor of text quality (e.g., Saddler et al, 2004), and also as the most time-consuming yet valued activity during the group writing process (Storch, 2005).

A similar point was raised in Elola and Oskoz's (2010) wiki-based study. The authors compared writing outcomes produced individually and collaboratively. They did not find notable differences in writing outcomes (i.e., textual quality), admittedly due to a small sample size (8 participants). However, their in-depth qualitative analysis of wiki drafts and chats noted that participants in the two modes employ different writing strategies for producing a text. Participants who worked individually tended to wait until the final drafts for close editing of grammar and vocabulary, which indicate a linear process of writing. However, collaborative groups made such adjustments at multiple points in the collaborative writing process. The authors explained that the strong existence of a reader in the collaborative mode may have encouraged writers to attend to grammatical accuracy throughout the recursive process of group writing.

Overall, due to the diversity and complexity of collaboration contexts (e.g., task type, students' language proficiency), we have mixed results on the outcomes of collaborative writing. The use of small samples, as well as the lack of measurable data on collaborative behavior (e.g.,

the amount of writing, revision, feedback) makes it difficult to examine how students' collaborative writing practices may contribute to writing development and learning outcomes. For example, since we have little empirical data available about how much, and in what ways, group members write and revise their work, we do not have a clear understanding on how these collaborative behaviors may contribute to students' writing outcomes (Wnag et al., 2015). Several L2 studies have provided measurable data on the quantity of small group interaction and revision by analyzing data archives in wikis or blogs (e.g., Arnold et al., 2012). However, these studies have low statistical power due to their small sample sizes, which is understandable given how manual coding of group interactions can be intensive and time-consuming. To address this challenge, this proposed study will employ text mining techniques that automatically generate usage statistics related to collaborative writing and revision behaviors.

Text mining approach. Text mining techniques can provide more fine-grained analyses of collaborative writing processes that were once hidden to previous research that relies mainly on traditional methods of observation, survey, or qualitative document analysis. For example, cloud-based text mining tools can provide important usage statistics at the individual and group level, such as amount of writing and revision and number of edit sessions. This study will analyze students' collaborative documents using text mining tools specifically designed to extract information on the amount of writers' writing and revision. An open source tool called *SCAPES* (i.e., Studying Collaborative Authoring Practices in Educational Settings) has the capacity to download and analyze writing on Google Docs. This tool automatically produces revision history spreadsheets reporting the version, date/time, authors, word count, words added, and words deleted. Based on this data, researchers can extract collaboration-related variables such as the number of contributors, editing sessions (i.e., how many times authors made changes

to a document), edits (i.e., how many times a specific document was edited) as well as the number of words individuals added or deleted. These variables can be used to examine the characteristics of writers' collaborative behaviors and how their writing and revision may relate to their writing outcomes.

Zheng, Lawrence, Warschauer, and Lin (2015) made the first attempt to use the tool to relate students' collaborative writing and revision quantity to writing outcomes. By analyzing 257 sixth-grade students' Google Docs collected for an academic year, they examined how students' writing quantity and types of feedback related to their standardized writing achievement, but found no associations. The null finding may have been due to a number of confounding factors that were not controlled for, for example, the amount and quality of writing students had done on other platforms (e.g., non-technology platforms) or in other classes during the academic year. Instead of using the standardized writing scores as pre and post measures that span a year, this current study will attempt to analyze students' actual group documents to understand the impact of their collaborative writing behaviors on collaborative writing outcome.

Another text mining tool that can help address the methodological challenges in collaborative writing research is a document visualization tool called *DocuViz.* Using information from the revision histories and tracking changes on Google Docs, this tool produces a visual history chart across different time points, indicating the authors, their respective portions of writing, and the time (Wang et al., 2015). This tool also assists in in extracting variables that might be hard to identify without visualizing or quantifying the patterns, and thus, enables researchers to examine the link between the writing patterns and the writing quality. For example, Wang et al. used DocuViz data to develop a variable called *evenness of participation*, which measures the degree to which the group work was collaboratively distributed (i.e., the proportion

of the final document produced by each team member and the variance of the proportions). Using hierarchical linear regression, the researchers found that evenness of participation is strongly associated with writing quality. Other variables--such as document length and evidence of leadership--were also developed from coding with Docuviz, and were found to be strong predictors of the writing quality. The use of text mining tools will be critical to understanding the emerging document development processes in cloud-based platforms such as Google Docs, particularly those that evolve over extended periods. In L2 contexts where issues such as mutuality and equality affect group dynamics (see discussion in Storch 2002; 2005), balance in contribution and participation carries even greater weight and, thus, needs special attention

Computational text analysis. In measuring textual quality, this study will use Coh-Metrix, a computational text analysis tool that uses natural language processing techniques. This tool provides over 200 indices of textual features that reflect cohesion relation as well as language and discourse characteristics (Graesser et al., 2004) through modules such as syntactic parsers, and latent semantic analysis. This is a particularly useful tool to analyze deeper-level textual features in multiple discourse levels. Studies have validated the tool's predictive capacity for measuring textual difficulty and readability. For example, research has found that the indices of cohesion accurately predicted text readability (McNamara et al., 2006) and temporality in texts from different domains (Duran et al., 2006). Olinghouse and Wilson's (2013) study on secondary school students' writing also revealed that lexical diversity was a valid predictor of writing quality. Another critical textual feature that this study aims to investigate is academic vocabulary use. It is important to understand whether collaborative writing practices are related to the extent to which the adolescent students use academic vocabulary in their collaboratively written text, and also whether the pattern of academic vocabulary use differs between their

collaborative essays and individual essays. To answer these questions, I will use a computational tool called VocabProfile, which automatically calculates the proportion of academic words used in the given text, based on the Academic Word List (Coxhead, 2000). By utilizing these tools, this study attempts to provide new insights on how collaborative writing behaviors may impact specific textual characteristics in the writing outcomes.

Collaborative Writing Perceptions

Researchers have examined L2 students' perceptions of collaborative writing through survey, interview, and observations using either a qualitative or mixed-methods approach. The findings point to the pedagogical advantages and disadvantages of integrating collaborative technology in writing instruction. One of the strong affordances that L2 learners perceive as beneficial is the presence of a real audience. In interactive online environments, L2 learners tend to focus on the content of their intended message, rather than their limited language and grammar skills. For example, Turgut's (2009) analysis of EFL students' wiki writing, interviews, and reflective journals revealed an improvement in students' idea-sharing, confidence, and motivation to engage in writing activities as they collaboratively develop a text. Students reported that the interactive and iterative processes of wiki writing and editing helped them to experiment with their writing, and enhanced their idea generation and writing confidence.

Kessler, Bikowski, and Boggs' (2012) study on L2 students' use of Google Docs similarly noted students' positive perceptions toward collaborative academic writing. They conducted qualitative content analysis of participants' in-text communication and found that students used the collaborative space for a wide range of purposes, such as discussing the organization, planning logistics, and sharing strategies in handling writing concerns. Students reported that the use of cloud-based platform made the writing process more effective and

convenient. In the same vein, Sun and Chang (2012) underscored the potential of web-based collaboration for developing academic literacy skills. They qualitatively analyzed the blog pages produced by L2 graduate students, and suggested that blogs serve as a non-threatening environment for them to experiment with the academic genre while engaging in interactive commenting with peers, which typically occurs in academic writing processes. For L2 students, blogging entailed both formal and informal genre characteristics and, therefore, helped bridge the gap between students' local languages and academic English.

Despite the overall positive attitudes toward technology-based collaborative writing, there are several noteworthy cautions in using collaborative technology for writing. Based on the analysis of a videotaped corpus of student interactions, Lund (2008) has suggested that students are reluctant to have their unfinished work seen by others and to edit others' work due to concerns regarding their own editing inexperience, which could potentially offend the writer's feelings. In Kessler's (2009) study, analysis of student interviews and wiki archives revealed that students were more willing to edit their peers' work than to edit their own, but the peer edits were found to focus more on form than on content because students felt that they lacked the authority to change the content of the original writing.

A similar point was raised in Lee (2010)'s case study on wiki-based collaborative writing that used interviews, surveys, and document analysis of wiki pages. Despite the fact that students enjoyed the revision process, more than 40% of them were reluctant to edit their peers' entries because they lacked confidence in their own writing. Students also reported that they were much more willing to add text rather than to edit existing text. This stemmed from their concerns about rejecting or overriding peers' ideas. Arnold et al.'s (2012) study on wiki-based collaboration also suggested that the psychological ownership of a text might lead to hesitancy to change another

writer's contribution. Using the revision histories of wiki archives and questionnaires, they analyzed students' revision behaviors in two different modes (collaboration vs. cooperation) and found that students used a more cooperative approach when making changes to content.

Previous studies have identified the lack of student accountability and unequal contributions to the collective product as major issues in collaborative composition. In Strobl's (2014) study, survey and document analysis revealed that collaboration failed in one group due to members' free-riding attitudes. Although accountability is an important prerequisite for successful collaboration, how to hold students accountable and evaluate their contributions in technology-mediated environments has been a difficult and under-examined task (Hew & Brush, 2007). Given the challenges that writers experience during collaboration, the next step for research on collaborative writing perceptions is to understand specifically which conditions or behaviors may lead to negative perceptions of collaboration and what needs to be done to mitigate possible negative perceptions. To address this need, the proposed study aims to investigate the role of the contextual factors that significantly influence these perceptions, and how L2 learners' perceptions may develop or change across a longer period of time in mainstream academic contexts, rather than a short-term engagement in experimental or ESL settings.

Factors Shaping Technology-based Collaborative Writing

In order to reach a comprehensive understanding of the opportunities that technology-based collaboration may offer for L2 development, it is critical to understand the contextual factors that influence the dynamics of collaboration and subsequent L2 learning. Unfortunately, the human or situational factors that inevitably affect the findings are not sufficiently considered in computer-assisted language learning (CALL) research (Wang & Vasquez, 2012). Since the

field of technology-based collaborative writing is still in its emergent stage, most of the previous research has suggested or implied that these factors play a role, rather than making empirical investigations. This section discusses the critical, yet understudied role of two key factors that may shape technology-based collaborative writing: (a) language proficiency, and (b) task type.

Language proficiency. Compared to linguistically homogenous groups composed exclusively of native speakers or L2 learners, linguistically diverse groups are unique in that group members bring differing levels of linguistic, cultural, and pragmatic skills to group task (Zhu, 2001). Particularly given that there are considerable individual differences (e.g., some L2 learners have native-like or near-native communicative competence in L2), research into the role of language proficiency, both at the group (e.g., ability grouping status) and individual level is much needed (Leki, 2007; Li & Zhu, 2013).

The language proficiency of interlocutors is an important factor in pair or group writing, given that the foundational assumption of the sociocultural view of language acquisition is that students learn from peers of differing abilities who act as both novices and experts (Donato, 1994; Storch, 2002). Group members' level of proficiency can affect the degree to which they collaborate, accept others' input and feedback, resolve conflicts, and, ultimately, learn. Researchers who apply sociocultural theory to the study of L2 learning maintain that learners of differing abilities can provide scaffolded assistance to each other and pool their different resources, thus achieving a level of performance that is beyond their individual competence level (Ohta, 2001).

There has been a long debate regarding the superiority of mixed ability groups over homogeneous groups. Some researchers have claimed that heterogeneous groups exhibit greater degrees of elaborate thinking, exchanging help, which, in turn, leads to deeper understanding and

increased reasoning abilities (Johnson & Johnson, 1999). Studies on L2 collaborative writing also suggested that pairing a higher proficiency learner with a lower proficiency partner may result in greater collaboration and language learning opportunities than pairing learners from similar levels (e.g., Storch, 2002). However, others drew attention to the potential limitations of heterogeneous grouping. For example, the more proficient partner felt disappointed by or ignored the less able partner's input or feedback (Hedge, 2000) and preferred working on their own (Bahar, 2003) due to concerns about unequal distribution of work.

On the other extreme, lower proficiency learners tend to feel more comfortable interacting with peers of similar abilities and take a more isolated position when working with more advanced partners (Kowal & Swain, 1997), and take an isolated position (Leki, 2007). Researchers further suggested that average-ability students do not benefit from heterogeneous ability grouping, arguing that their learning is inhibited because they are excluded from the teacher–learner relationships that develop between high and low achievers of heterogeneous groups. As a result, average-ability students participate more and, therefore, learn more, in same-ability groups than in mixed- ability groups (Saleh et al., 2005; Webb, 1991). The mixed results in previous studies suggest the need for further investigation into how students from differing levels of abilities collaborate, what contextual factors facilitate or constrain the processes, and most importantly, what changes can be brought about with the integration of networked technology in collaborative group work.

This investigation is particularly important in supporting struggling learners. There has been a debate about whether the task demands in collaborative writing practices are suitable for low-proficient learners. Researchers have claimed that the overall positive effects of collaborative writing on second language learning have only come from studies where learners

are fairly advanced L2 learners (e.g., Wigglesworth & Storch, 2012). Concerns have been raised that some collaborative tasks (e.g., text reconstruction) may not be suitable for low proficiency L2 learners unless they work with higher-proficiency L2 learners (Leeser, 2004). Myhill and Jones (2007) warned that when students engage in the peer-review process "without the necessary cognitive, metacognitive, and social understanding to make appropriate changes," the potential benefits of collaborative writing and its accompanying feedback and revision might not help students with insufficient writing proficiencies (p. 325). These concerns rightly highlight the need to take students' diverse abilities and proficiencies into consideration during collaborative feedback and revision practices.

In order to facilitate low proficient learners' meaningful participation throughout the collaborative writing process, more research is necessary to understand the types of specific scaffolding strategies and collaborative arrangement they need. In studies of mixed-ability group settings, there is a clear division of roles, with low proficient learners assuming minimal or mechanical roles (e.g., Kost, 2011). Similarly, Zhu's (2001) study of mixed peer response groups in a freshman college composition class revealed that the non-native speakers as a group took fewer turns and produced fewer language functions during oral discussion of writing, particularly when they were performing the writer role, but they were comparable to the native speakers with respect to the number of global comments provided in writing.

Although the aforementioned studies suggest the critical need to consider group members' language proficiency as important factors that shape the degree and quality of collaborative writing practices, research in this area is still scant and demands further work, particularly in K-12 settings. To fill in the gap, this study attempts to examine the collaborative interactions

between adolescent bilingual learners and their NS peers in mainstream ELA classes and how their interactions in the cloud-based environment affect their writing outcomes and perceptions.

Task type. In language learning contexts, task can be defined as "a piece of classroom work which involves learners in comprehending, manipulating, producing, or interacting in the target language" (Nunan, 1992, p.10). Previous L2 studies have also suggested the critical role of tasks in facilitating collaborative dialogue. For example, Nassaji and Tian (2010) examined the effect of collaborative task type on vocabulary acquisition and found that editing tasks are more effective than cloze tasks in promoting negotiation and collaborative dialogue. Other researchers have shown that open-ended tasks in which learners co-construct a piece of discourse--such as essays or reports--tend to encourage an increased amount of lexical and morphosyntactic negotiations in peer interactions (Storch, 2005; Storch & Wigglesworth, 2007). In collaborative group work, Lee (2010) highlighted the importance of writing tasks, maintaining that task choice affected the degree to which students engaged in collaborative dialogue.

In technology-based environments, Lund and Rasmussen (2008) discussed the complex relationship between tasks, tools, and agents in computer-supported collaborative learning environments and stressed the need for an alignment of task design with "technological features that boost agents' awareness of the different levels of collectivity that are involved in joint knowledge construction" (p. 410). In one of the few empirical studies that explored the role of task types in technology-based environments, Aydin and Yildiz (2014) focused on the role of task types in L2 university students' revision behaviors on wikis. Their analyses of students' collaborative writing focused on three genres (argumentative, informative, and decision-making) and revealed that the argumentative task promoted more peer-corrections than the other tasks whereas the informative task involved a clearer division of labor and yielded more self-

corrections than the other two tasks. The participants reported that they felt less engaged in collaborative dialogue during the informative task compared to the argumentative task because they did not feel the need to defend or argue for their own stance and correct each other's contributions. This finding suggests the role of task types and activities in facilitating the level and amount of collaborative dialogue; thus, it should be an important consideration in designing instructions for collaborative academic writing. However, the specific mechanisms through which task types influence the pattern of collaboration needs further investigation. Building on the studies that have been discussed, the following research questions will be addressed in this proposed study.

Research Questions

PART 1: PRACTICES

1. What characterizes students' synchronous collaborative writing practices? Do they vary across (a) ability grouping status and (b) task types?
2. How do students approach collaborative writing in a cloud-based environment? What patterns of collaboration are they engaged in?

PART 2: OUTCOMES

3. How do students' collaborative writing practices relate to the quality and linguistic traits of the collaboratively written texts?
4. How do the focal groups engage in the community of practices (CoP) and how does it shape the members' level of participation and collaboration?

PART 3: PERCEPTIONS

5. What are the perceived challenges and benefits of students' and teacher' year-long engagement with synchronous collaborative writing practices, and what are the contextual factors that they recognize as shaping their experiences?

CHATER 4

Methods

Study Contexts

The research site is a technology-supportive K-8 school located in Southern California. The school supports the one-to-one laptop program in grades 3-8, and the one-to-one tablet program in grades 1-2. It serves an ethnically and linguistically diverse population. Asians make up the vast majority of the school demographics (77%, predominantly Koreans), followed by Whites (5.6%), Hispanics (5.6%) and other ethnicities. The school hosts a significant number of bilingual immigrants (51%) and English language learners (25%). The students were not socio-economically diverse: only 5.6% of students are free-or-reduced-price lunch recipients.

The school was purposefully chosen to address the research focus on second language (L2) learners' collaborative writing practices for the following reasons: (a) it hosts a large percentage of adolescent bilingual learners whose primary language is other than English (60%); (b) the school is known for a long and successful history of technology integration and support, and (c) cloud-based technology is used intensively in English Language Arts (ELA) instruction. The focal classes of this study are three 8th grade ELA classes taught by the same teacher. As such, the learning content and scheduled progress in the three classes are identical. The teacher holds a Master's degree in English and has 22 years of teaching experience, as well as extensive experience integrating technology into instruction.

Participants

The participants are 102 students from three 8th grade ELA classes. A majority of the students are language minority students (52%) who speak languages other than English at home, and most identify with Asian ethnicities (81%). Detailed information regarding student

characteristics is presented in Table 4.1 and Figure 4.1, which closely match the demographic composition of the school as a whole. A background survey reveals that most of the students have confidence in their technology skills: 53% of the students rated their technology skills as highly advanced and 41% as advanced (41%). A large percentage of students (87.8%) have used Google Docs for collaborative writing projects (6-7 times: 19/5%, 4-5 times: 18.3%, 2-3 times: 37.8%, once: 12.2 %, never: 12.2%), mostly in ELA class (72.8%; social studies 3.7%, math 1.2%, other 22.2%).

In the three ELA classes, students were randomly assigned into groups of four, totaling 23 groups. Four students who wanted to work individually were not assigned to groups and one group had five members to provide support for a student with specific needs. All groups include at least one language minority student whose home language is a language other than English. The students stayed with the same group throughout the academic year, which enabled them to work with the same members for all collaborative assignments. In terms of ability groupings, there were 13 mixed-ability groups and 11 same-ability groups. Students' language proficiency categories were derived from the district's benchmark test results, with a performance band level in the order of increasing proficiency: below basic, basic, proficient, and advanced. Most of the students were at the proficient level (86%), while the rest were at the advanced (12%) and basic (12%) levels. As Table 4.2 shows, the mixed-ability groups were composed of proficient-level students working with either higher ability peers (advanced) or lower ability peers (basic). The same ability groups were composed of members of the same level (i.e., proficient). The average group proficiency was 3, with the mean for mixed groups (Mean=3.02, SD=0.42) was slightly higher than the mean for same ability groups (Mean=2.97, SD=0.12). The group proficiency

range was 0.82 (mix: 2, min: 0). Correlation between the two group proficiency indicators was low (0.002).

For qualitative examination into bilingual immigrant learners' collaborative writing practices and perceptions, I selected four focal groups (a total of 16 students, 2 mixed ability groups, and 2 same ability groups) for interviews and observations Participants from the focal groups were selected through purposeful sampling in order to meet the specific focus of the study (Merriam, 2009), which lies in adolescent bilinguals' collaborative writing experiences and particularly how students' ability grouping status may influence these experiences. The focal groups were chosen based on the following criteria: 1) a group that includes at least one immigrant bilingual learner, and 2) a group that represents the range of available group ability status in the class: (i.e., same ability group, mixed group with higher ability peers, mixed group with lower ability peers). Students' background surveys were examined for selection while the teacher's recommendations were also considered. Detailed information on the focal groups is presented in Table 4.3.

Table 4.1. *Student characteristics*

	Percentage
Male	43%
Asians	81%
White	5%
Hispanic	5%
Others	9%
Language minority learners	52%
Free/reduced lunch recipients	5%
English learners	1%
Total N	102

Table 4.2. *Ability grouping status*

	Proficiency	Group N (Student N)	
Same ability	Proficient		11 (44)
Mixed ability	Proficient +Advanced	7 (28)	13 (58)
	Proficient + basic	5 (21)	
Total			24 (102)

Table 4.3. *Focal group students' characteristics*

Ability grouping status	Writing proficiency	Home Language	Immigrant status	Collaborative Writing Experience	Year in the US
Same ability	Proficient	NS	No	2-3 times	Born in the U.S.
	Proficient	Korean	Immigrant	Once	11 to 13
	Proficient	NS	Immigrant	Once	11 to 13
	Proficient	Tagalog	Immigrant	2-3 times	11 to 13
Mixed (with higher ability peers)	Proficient	Tagalog	Immigrant	2-3 times	11 to 13
	Proficient	Korean	Immigrant	4-5 times	11 to 13
	Advanced	NS	No	2-3 times	Born in the U.S.
	Advanced	Korean	Immigrant	6-7 times	14
Mixed (with lower ability peers)	Proficient	Korean	No	6-7 times	Born in the U.S.
	Proficient	Korean	No	6-7 times	Born in the U.S.
	Basic	Korean	Immigrant	6-7 times	11 to 13
	Basic	Tagalog	Immigrant	2-3 times	11 to 13
Mixed (with high and low)	Advanced	NS	No	2-3 times	Born in the U.S.
	Proficient	Korean	Immigrant	2-3 times	3 to 5
	Basic	Korean	Immigrant	2-3 times	3 to 5
	Proficient	NS	No	2-3 times	Born in the U.S.

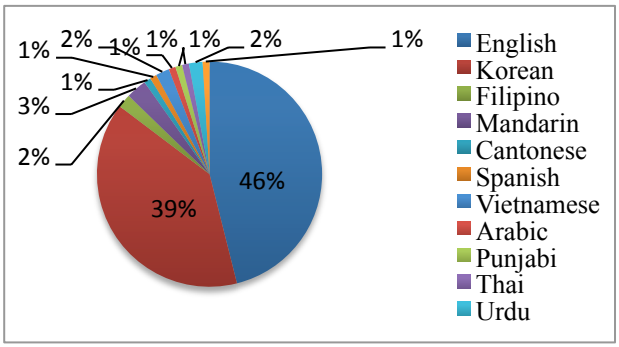

Figure 4.1. Distribution of students' home languages

Collaborative Writing Tasks

The ELA classes implemented a curriculum-based online program called the *Study Sync*, which provides multimedia support for reading texts and interactive features that promote peer discussion. A typical unit is composed of multimodal texts and exercises, including a preview video, main text, vocabulary and reading comprehension questions, and writing and discussion prompts (see Figure 4.2). The teacher implemented three collaborative writing projects during

the academic year, once per trimester. Using the extended writing prompts provided by the program, the teacher assigned three collaborative writing projects of different genres (i.e., narrative, informative, argumentative), each spanning approximately two weeks (see Table 4.4). Within a one-to-one laptop environment, all students synchronously collaborated on Google Docs for the three collaborative writing tasks. After composing each essay collaboratively, students wrote individual essays in response to the identical prompts. Over the academic year, students produced a total of 69 group documents and 270 individual documents across the three genres.

Table 4.4. Description of three collaborative tasks

	Genre	Task description	Implementation time
Task 1	Narrative	As a group, plan and write a suspenseful narrative by sequencing events of rising action, climax, and falling action.	October 2015
Task 2	Argumentative essay	As a group, plan and write an argumentative essay on the following prompt: How can people best respond to conflict?	February 2016
Task 3	Informative essay	As a group, write an informative essay analyzing how the Civil War changed Americans and their ideas about freedom.	May 2016

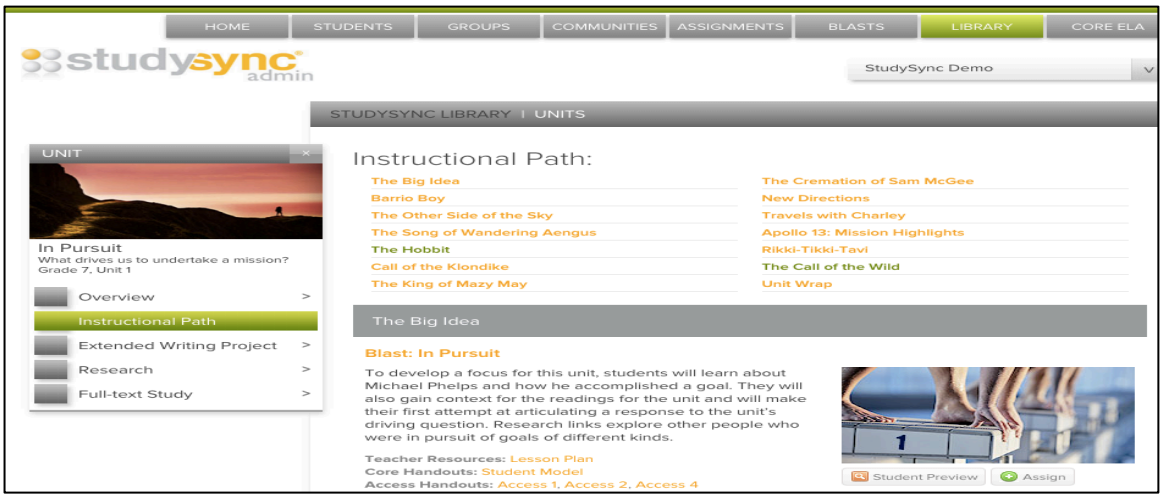

Figure 4.2. A screencapture of the StudySync program. Main components include unit overview, instructional path (pre-reading activities), reading text, extended writing project, and research prompts. The extended writing projects are used for collaborative writing.

Data Collection

Data Sources. This study used multiple sources of data collected from the three ELA classes during the 2015-2016 academic year: interviews, surveys, student essays, verbal discussion, and observations.

Interviews. Both individual and focus group interviews with students were conducted to gather additional information about their experiences learning, writing, and collaborating with Google Docs (see Appendix A and B for student interview protocols). Focal group interviews were conducted with four groups (student N=16), six times in total: twice during and the rest completed after each of the three collaborative writing projects. Both individual and focus group interviews were semi-structured interviews of about 25 minutes. Individual student interviews covered topics such as their collaborative writing processes, strategies, and perceived benefits and challenges of collaborative writing. In case of Korean ELL students who felt more comfortable speaking in their local language, interviews were conducted in Korean and later translated into English. Interviews with the teacher were also conducted during the collaborative writing periods and at the end of the academic year, face-to-face, over the phone, and via email (Appendix C for teacher interview protocols). Interviews were digitally recorded and later transcribed.

Student essays. Students' group essays (*N*= 72) written synchronously on Google Docs across three different genres (i.e., narrative, argumentative, informative) were collected. Groups spent about 2 weeks to complete the group essay. Before group composition, members read 4 to 6 reading texts related to the unit topic as a pre-writing task. Students were guided to plan their writing using questions provided by the StudySync Program and asked to use the readings as textual evidence for their group essay. Prompts were also provided by the StudySync program.

Table 4.4 describes the prompts and administration order for the three group writing tasks. (See Appendix D for samples of collaboratively-written essays: narrative, argumentative, informative).

Text-based interviews. Using the essays, I conducted text-based interviews to gain insights into students' collaborative composition processes in greater detail (Odell, Goswami, & Herrington, 1983). During these text-based interviews, I identified sections of the papers and queried the participants about the specific strategies they used during the writing process, any specific challenge they had, how they negotiated their ideas, and if they could identify their own voice from those of others in different parts of their essays. It was a stimulated recall supported by text visualization tools: DocuViz and AuthorViz (Wang et al., 2016, see Figure 4.3). AuthorViz color-codes the sections written by each author in the final document in Google Docs and, thus, helps identify each member's different textual contributions.

Surveys. The student background survey that queries basic demographic information, perceived technology proficiency, and collaborative writing experiences was administered at the beginning of the academic year. A post-study survey was administered at the end of the 2015-2016 school year (see Appendix E and F for pre and post-study survey, respectively). It queried students' overall perceptions of collaborative writing experiences and uses a five-point Likert scale (strongly disagree, disagree, neutral, agree, strongly agree). Both surveys were administered using Google Forms and took approximately 15-20 minutes to complete.

Observations of Classrooms. The three ELA classes were observed during the three collaborative writing projects. Three collaborative writing projects, each spanning two weeks, were observed in November 2015 (for narrative collaborative writing project), February 2016 (for informative collaborative writing project), and April 2016 (for argumentative collaborative

writing project). For each project period, there were 6-10 observation sessions. To better understand the instructional context of the collaboration projects, I occasionally and informally observed the teacher's instructional time prior to the collaborative project. The researcher used the observation protocol as a guide to capture the physical setting, participants, activities, conversations, as well as subtle factors such as the on-screen and physical behaviors and reactions of the participants (see Appendix G).

Group discussion data. The four focal groups' verbal discussions during the collaborative writing process was audio-recorded and transcribed to understand the process and strategy of students' group work. A total of eight 50-minute class sessions were recorded for each of the four focal groups during the argumentative task (24 class sessions audio-recorded in total). Students' collaborative discussion occurred for 25-35 minutes in each class session and influenced by the agenda for each session (e.g., planning, writing, revising and editing).

Students' written reflections and peer evaluations. At the end of the academic year, student groups completed written reflections on their collaboration experiences during the three writing tasks. Items included description of how they collaborated on each task and their growth as a writer over the course of year (Appendix H). In addition, students did self and peer evaluations on the aspects of participation and contribution during the group process. On the evaluation form, students were encouraged to discuss the strengths and weaknesses of each member and his or her contribution to the group tasks (Appendix I). These were used as supplementary data for qualitative analysis on collaborative writing characteristics (Ch. 5, i.e., identifying collaborative writing strategy), peer interactions (Ch. 6), phases of CoP (Ch. 8), and student perceptions (Ch. 9).

Course-related materials. Class materials, such as assignments, lesson plans, and instructional materials were also collected. These were used to understand students' classroom activities and experiences.

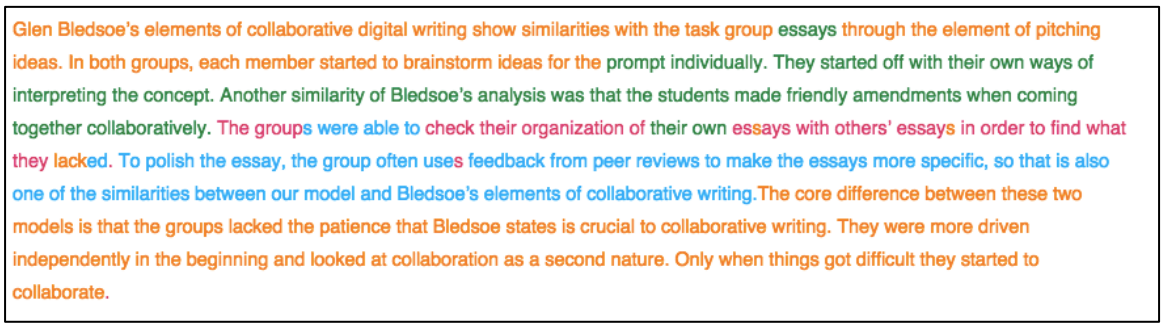

Figure 4.3. AuthorViz view of a collaboratively written paragraph in Google Docs. Different colors denote writing and revision made by each contributor.

Data Analysis

Data analysis involved both qualitative and quantitative analysis. Although several research questions were proposed, this mixed method study employed the exploratory design approach, in which the weight is given to the qualitative analysis so that it provides the foundation for the quantitative exploration of the topic (Heigham & Croker, 2009). As such, research questions were revised according to the themes that emerged from qualitative analysis. To address the three major areas of investigation (i.e., collaborative writing practices, writing outcomes, and perceptions) that I proposed, I used both qualitative and quantitative analysis to triangulate the results. In the sections below, I explain (a) the qualitative analysis methods (e.g., content analysis, constant comparison methods), (b) quantitative analysis methods (e.g., text-mining, computational textual analysis), and (c) analysis plan for each research question.

Qualitative analysis. Multiple sources of data were examined for qualitative analysis of the group's collaborative writing practices and perceptions. These include interviews, observations, open-ended surveys, reflection essays, and Google Docs essays.

Analysis of collaborative writing practices. Analysis of collaborative writing practices involved content analysis of students' collaborative dialogue and collaborative behavior. Qualitative content analysis (QCA) focuses on the contextual meaning of the text data, which is based on the "subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns" (Hsieh & Shannon, 2005, p. 1278).

Codling of collaborative dialogue. To understand how students' collaborative dialogues contribute to the group writing processes, content analysis (Hsieh & Shannon, 2005) of the focal group's verbal discussion data was conducted. Although this was a bottom-up analysis that derived emerging categories from data, several existing schemes introduced in previous computer-mediated communication (CMC) studies were referred to and modified accordingly (e.g., Curtis & Lawson, 2001; Arnold et al.; 2009, see Table 4.5). Most existing schemes incorporated a level corresponding to the intention (function) of a message and categorize the functional acts to identify patterns. The results were used to illustrate instances of how students collaboratively build knowledge and community through synchronous interactions, as well as to explain how the dialogues facilitate the collaborative writing process.

Table 4.5. Coding taxonomy of collaborative dialogue (Curtis & Lawson, 2001; Arnold et al., 2009)

Behavior categories	Sub-categories	Description
Planning	Group skills	Encouraging group activity and cohesiveness.
	Organizing Work	Planning group work; setting shared tasks and deadlines.
	Initiating Activities	Setting up activities, such as chat sessions to discuss the progress and organization of group work.
Contributing	Help Giving	Responding to questions and requests from others.
	Feedback Giving	Providing feedback on proposals from others.
	Exchanging Resources/Information	Exchanging Resources/Information to assist other group members.
	Sharing Knowledge	Sharing existing knowledge and information with others.
	Challenging Others	Challenging the contributions of other members and seeking to engage in debate.

	Explaining/Elaborating	Supporting one's own position (possibly following a challenge)
Seeking Input	Help Seeking	Seeking assistance from others.
	Feedback Seeking	Seeking feedback to a position advanced.
	Advocating Effort	Urging others to contribute to the group effort.
Reflection / Monitoring	Monitoring Group Effort	Comments about the group's processes and achievements.
	Reflecting on Medium	Comments about the effectiveness of the medium in supporting group activities.
Social Interaction	Social Interaction	Conversation about social matters that is unrelated to the group task. This activity helps to break the ice.

Coding of scaffolding strategies. In addition to analyzing students' verbal discussion using the taxonomy of collaborative dialogue, which gives an overview of different language acts occurred during group discussion, I used Li and Kim's (2016) taxanomy of scaffolding strategies to understand the group's interaction in more depth. In the content analysis, the unit of analysis was episodes, which refers to the units of discourse where the participants discussed writing problems and task procedures (de Guerrero & Villamil, 2000). According to Li and Kim, examination of scaffolding interaction enriches the understanding collaborative group work, as successful scaffolded interaction embodies good collaboration. Following Li and Kim, scaffolding was operationally defined as assistance from group members that facilitated the completion of joint writing tasks. In this additional coding process, I re-examined both verbal discussion and interview data, and coded only the data relevant to scaffolding, rather than calculation frequencies for each code. As detailed in Table 4.6, the taxonomy of scaffolding strategies comprised of six different categories that have been established in previous literature on group work (Lidz, 1991; Rommetveit, 1985; Villamil & de Guerrero, 1996; Wood et al., 1976).

Table 4.6. Coding taxonomy of scaffolding strategies (adopted from Li & Kim, 2016)

Categories	Descriptions
Affective involvement (Lidz, 1991)	Expressing warmth to group members and giving them sense of caring in the task
Contingent responsivity (Lidz, 1991)	Interpreting group member's behavior and responding appropriately
Direction maintenance	Maintaining pursuit of the goal for the group work

(Wood et al., 1976)	
Instructing (de Guerrero & Villamil, 2000)	Giving directions or instructions in an authoritative tone
Intersubjectivity (Rommetveit, 1985)	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

Coding of collaborative writing strategy. Several sources of data have been used to qualitatively analyze collaborative writing strategies. First, I qualitative analyzed the DocuViz visualizations to identify commonly used writing styles and noted the characteristics that identify these styles. In the first cycle of coding, the visualization charts of the 72 group documents have been generalized and qualitatively analyzed. As the initial coder, I developed a coding category (Table 4.7) that followed and modified several existing coding schemes (Lowry et al., 2004; Yim et al., 2017). In the second cycle of coding, students' written reflections (Appendix H) on their collaboration process and strategy have also been examined to modify and confirm the coding categorizations. The qualitative analysis was partly informed by Wang et al. (2015) and included information such as the presence of a leader, member roles (e.g., writer, editor, reviewer, equal work, consultant), and peer editing behaviors (e.g., during or after writing). After setting up the coding category, a second coder was invited to categorize the writing strategies and discrepancies have been resolved during a series of meetings. The inter-coder reliability (Cohen's Kappa) for categorizing the strategies was .92.

Table 4.7. Description of collaborative writing strategies and comparisons to existing categorizations

Category	Descriptions	Interchangeable terms
Main writer	One or two main writers dominate or are delegated to scribe or write the group text.	Adopted from Yim et al., (2017); Single-author writing (Lowry et al., 2004); Scriber (Posner & Baecker; 1999)
Parallel writing	Members divide work into discrete units and work in parallel, but rarely edit each other's text.	Adopted from Lowry et al. (2004); Divide and conquer (Yim et al., 2017); Separate writing (Posner & Baecker, 1992); Partitioned writing

		(Ellis et al.,1991)
Cooperative revision	Members divide sections but edit each other's freely, mostly at the later stage of writing.	Adopted from Yim et al. (2017)
Sequential writing	One person writes at a given time; each writer completes his or her section and then passes it on to the next person, who becomes the next single writer	Adopted from Lowry et al. (2004); Sharples (1992)
Synchronous hands-on	Members create sentences together by simultaneously building off of each other's text. Members react and adjust to each other's changes and additions without significant pre-planning and explicit coordinations.	Reactive writing (Lowry et al., 2004); Reflective writing (Ellis et al., 1991); Consensus writing (Ellis et al., 1991)

Analysis of students' perceptions and experiences. A multi-case qualitative study approach was employed to provide a contextually rich account of the shared learning environment under investigation. Such an approach was particularly fitting for assessing the complex technological learning environments where multiple factors interact within a dynamic learning ecology (van Lier, 2000). Specifically, I used the constant comparative approach (Glaser & Strauss, 1967; Denzin & Lincoln, 2005) in order to understand focal groups' diverging experiences. This helped break down "the uniqueness and complexities of the process in-depth" (p. 457). This approach helped analyze the data on comparable dimensions of learning, and the relationship with student and contextual factors across different cases (Denzin & Lincoln, 2005).

Multiple sources of data, including student interviews, open-ended survey responses, group documents, verbal discussion data, and students' reflection essays were first read and reread during iterative stages of coding, ranging from initial coding to the last stage of theoretical coding (Saldana, 2009). Based on the initial coding results, I set up comparisons of cases to understand the focal group students' converging or diverging experiences in different contexts (e.g., ability grouping setting, task type setting). The codes were then examined group-by-group and then systematically categorized to derive the emerging themes. Each theme was checked

internally for consistency and externally for differences across the themes (Sornumen et al., 2014).

In addition, to understand the changes in students' participation trends or perceptions throughout the quarter, students' actions or reflections were identified as potential key events (Fetterman, 1998). These key events were sorted and compared with each student and within student groups to locate students' recurrent actions and signs of struggle (Fetterman, 1998). The recurrent key events of the data analysis included frustration with limited participation or language barrier, or excitement about using Google Docs.

Quantitative Analysis. For quantitative analysis on collaborative writing practices and outcomes, (a) collaboration-related variables have been extracted using text mining tools, and (b) group documents have been analyzed using both human-graded rubrics of writing quality and computational text analysis.

Text mining analysis of collaborative writing behavior. To understand student's participation and collaborative writing patterns, I extracted the following variables from group documents using the DocuViz, a text-mining tool specifically designed to analyze Google Docs documents. Using information from the revision histories and tracking changes on Google Docs, DocuViz produces a visual history chart across different time points, indicating the authors, the amount of written contribution by each author, and the time (see Figure 4.4, Olson et al., 2017). Based on the data available from the data mining tool, I extracted the following variables that indicate the quantity of collaborative writing and revision. The unit of the editing variables (self edit, peer edit, total edit) is character being written, inserted, and deleted. They are estimation of editing activeness during the group writing and revising process, not the count of written

contribution to the final text. In the DocuViz tool, the characters are counted at the millisecond level. Descriptive statistics of each variable are presented in Table 4.8.

Document length. This variable describes the number of words in a given document after it was edited for the last time.

Number of self edits. This variable records the number of edits (i.e., total count of characters written, inserted, deleted) made to one's own text in the group document. For example, if one writer typed 500 characters and then deleted 80 characters of these characters, his or her self edit is 580 characters.

Number of peer edits. This variable records the number of edits (i.e., edited characters) made to one participant's contribution by another member of the group that he/she worked with. In the algorithm, the editing amount of Writer A (writing, deleting, inserting of characters) within the boundary of Writer B is calculated as peer edit that belongs to Writer A. For example, if Writer A deleted 20 characters and inserted 5 characters within the boundary of Writer B, there are 25 peer edits attributed to Writer A. Since the DocuViz counts characters at the millisecond level, the algorithm differentiates peer edits from self edits in both asynchronous and synchronous modes.

Number of total edits. This variable is the sum of self edits and peer edits made to the group document. It indicates the activeness of group editing behaviors: writing, inserting, and deleting of characters that occurred throughout the collaborative writing process.

Imbalance of participation. This variable was calculated using a formula suggested by Olson et al (2017). Based on the proportion of the final document produced by each team member (non-participation as 0), the variance of the proportions was calculated to create a measure of imbalance; the higher the number the greater the imbalance. The maximum value is

0.25 (most uneven participation) and the minimum value is 0.00 (most even). Figures 4.5 illustrates the extremes, from one with uneven participation in a, and even participation in b.

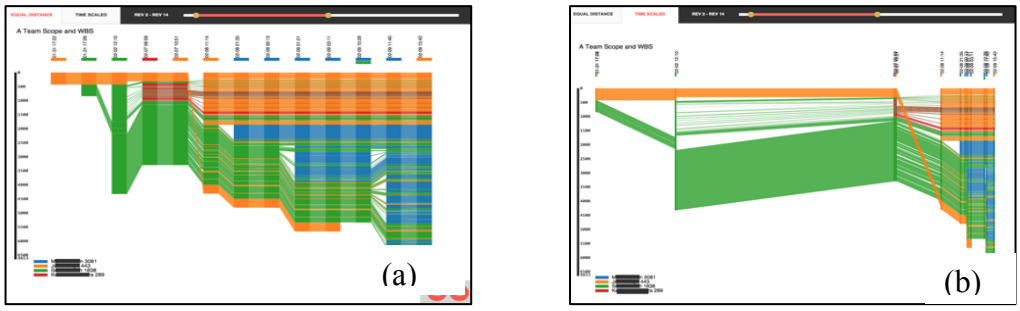

Figure 4.4. DocuViz views of participation in co-authoring a document (Olson et al., 2017). They illustrate the amount of contribution each person made and when they made it. Vertical bars are the slices with authors noted in colors; the size of their contribution is the size of the bar. (a) shows the slices in order of appearance; (b) shows the slices on a timeline, where one can see bursts of activity and then delays. The key at the bottom shows which person corresponds to which color and how many characters in the final document they contributed.

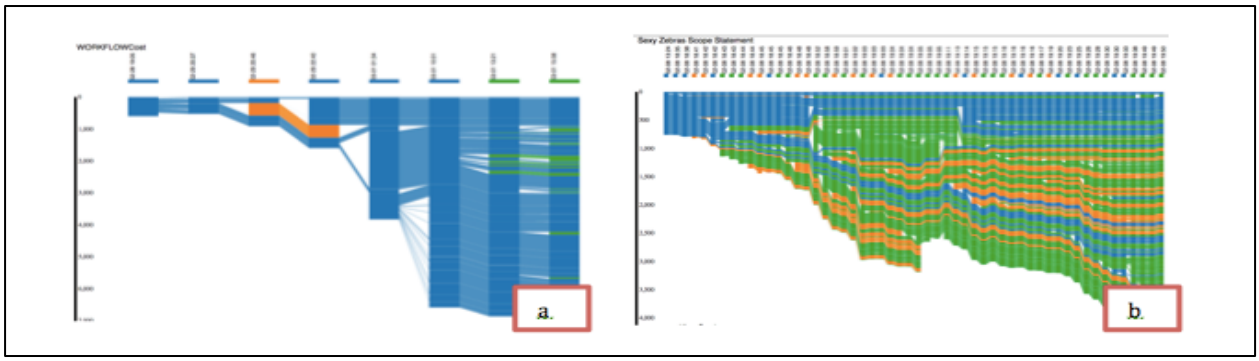

Figure 4.5. DocuViz views illustrating the degree of even participation (Olson et al., 2017). The two figures show the extremes with figure (a) featuring uneven participation and (b) featuring even participation.

Computational text analysis. Students' collaborative writing outcomes were analyzed using a computational text analysis tool called Coh-Metrix. Using natural language processing approach, Coh-Metrix analyzes texts on multiple levels of language and discourse that can be used to determine the quality, readability, or other specific properties of text (Grasser et al., 2004, available at http://cohmetrix.memphis.edu). Among the available measures, this study used the following measures to focus on the principal aspects of L2 writing: lexical diversity, grammatical

complexity, and textual cohesion. Traditionally, these measures have been widely used in studies on L2 textual quality (Wolf-Quintero et al., 1998), particularly in several collaborative writing research (Kost, 2011; Strobl, 2014). In addition, research suggests that they have strong predictability to distinguish between L1 and L2 texts (Crossely & McNamara, 2012). Among the Coh-metrix indices, I selected the following measures of lexical diversity, grammatical complexity, and textual cohesion:

Lexical complexity. This measure indicated either lexical sophistication or lexical diversity in text. MTLD (the Measure of Textual Lexical Diversity) was chosen among other lexical diversity measures like type-token ratio and D, considering McCarthy's (2005) finding that it was the only measure among 14 lexical diversity measures that was not affected by text length.

Syntactic complexity. To measure syntactic complexity, I used SYNNP (number of modifiers per noun phrase, mean.'(McCarthy et al., 2009). Crossley et al. (2008) revealed that SYNNP was one of the three measures that contributed to readability judged by EFL learners.

Textual cohesion. Based on Crossley and McNamara (2012), which identified connective devices and causal cohesion as reliable measures of cohesion in Coh-metrix, I selected SMCAUSvp (Causal verbs and causal particles incidence). Causal verbs and particles serve as an extremely important indication of cohesion in a text (Haliday & Hasan 1976; Graesser et al. 2004). Causal verbs such as *kill*, *throw*, and *drop* are identified through WordNet (Fellbaum 1998; Miller et al. 1990). Causal particles are identified in a pre-defined set and include items such as *because*, *as a consequence*, and the semantically depleted verbs *make* and *cause*.

Academic vocabulary. To measure the level of academic vocabulary use in both collaborative and individual essays, I used a computational tool called VocabProfile (Cobb, n.d.).

This tool calculates the percentage of academic words per text. This tool includes the Academic Word List (Coxhead, 2000), which include 570 word families and approximately 3,000 total words that frequently occur in many types of academic text. These words are not included on the list of 2,000 most frequently used words (i.e., the GSL).

Assessment of writing quality. In addition to the computational measures of textual characteristics, rubric-based quality of the group essays (*N*=72, 24 documents per each task type) was also assessed. As the essays differ in terms of genre, this study used an analytic rubric specifically tailored to each genre. Research suggests that genre-specific rubrics, as compared to general rubrics, can improve generalizability and dependability, and thus enable the comparison of textual quality across different genres (DeRemer, 1998; Marzano, 2002, as cited in Olinghouse & Wilson, 2013). In consultation with the teacher, the final rubric was developed by modifying both the genre-specific rubric provided by the StudySync Program and the grade-specific rubric provided by the Common Core State Standards. Each rubric evaluates four aspects of writing: (1) Content/Ideas (Elaboration), (2) Organization, (3) Language, and (4) Mechanics, and (5) Overall quality, which is the sum score of the four components (see Appendix J). While the aspects are consistent, the specific criteria varied slightly by genre. The modified rubric used a scale from 1 (low) to 10 (high). A second coder was a graduate student pursuing a teaching credential in secondary education, and had prior experiences of teaching and tutoring writing to both monolingual and bilingual K-8 students. Multiple training sessions were provided, where I and the second coder discussed and practiced scoring on each criteria, selected anchor papers together, and resolved conflicts. Then the two coders graded the essays independently. The inter-rater reliability using Cohen's Kappa was acceptable and ranged from

0.75-0.93: Content/idea (.82), Organization (.75), Language (.76), and Mechanics (.93). The average of the two scores were used in the analysis.

In addition, the quality of group planning was assessed using a 6-point likert scale adopted and modified from Limpo, Alves, and Fidalgo (2014). This scoring scale was originally based on Whitaker et al. (1994), and Olinghouse and Graham (2009). Scores 1 and 2 were assigned to plans that represent no or minimal pre-planning, respectively. Plans that include a brief outline without elaboration received a score of 3, and plans with a brief outline with elaboration received a score of 4. A score of 5 was attributed to plans with detailed outline, including simple answers to the pre-writing questions, and a score of 6 was given to plans with detailed outline with elaboration (e.g., detailed answers to the pre-writing questions), emergent subordination (i.e., rudimentary macrostructure) or structural relationships (e.g., graphic organizers), which suggest that the group made an extra effort to plan the group text. Inter-rater reliability using Cohen's Kappa was .81 and was acceptable.

Table 4.8. *Descriptive statistics of variables in quantitative analysis*

		Mean	SD	Min	Max
Collaboration variables	Imbalance	0.0686111	0.0706968	0.00	0.25
	Self Edit	121306.5	132464.7	11783	525925
	Peer Edit	84099.76	147256.4	6301	617211
	Total Edit	207001.7	229645	19670	725842
	Document length	14021.43	7139.885	6116	34037
Text quality variables	Planning	3.541667	1.500587	1	6
	Content	7.666667	1.95729	3	10
	Organization	7.652778	1.951235	2	10
	Language	7.708333	1.909483	2	10
	Mechanics	7.763889	2.086125	2	10
	Overall	38.16667	6.702953	19	48
Computational text measures	Academic Vocabulary	3.799722	1.996025	0.51	7.77
	Lexical diversity	82.55026	16.83048	40.917	103.169
	Syntactic complexity	0.7603472	0.0936648	0.478	0.955
	Textual cohesion	41.57435	7.538012	25.373	59.779

Data analysis plan. This section explains the data analysis plan for each research question. Table 4.9 summarizes the data sources used to address each research question. More details on data analysis plan are discussed at the beginning of each chapter.

RQ 1: Characteristics of collaborative writing practices. The potential differences in students' collaborative practices across ability grouping status (i.e., mixed vs. same ability grouping) and task types (i.e., narrative, argumentative, informative) were examined using two sample t-test and repeated measures ANOVA. The alternative non-parametric procedures were additionally performed as the normal distribution was not evident in the variables (Mann-Whitney U test, Kruksal-Wallis test). In each analysis, group status or task type were the independent variable and the collaboration-related variables were the dependent variables. The collaboration-related variables included the amount of self edit, peer edit, total edit, imbalance of participation, and extracted from DocuViz. I then examined the potential differences in students' writing and revision behaviors across ability group settings (i.e., mixed vs. same groups) using the Mann-Whitney U test, and also variations across task types (i.e., narrative, argumentative, informative) using the Kruksal-Wallis test. A post-hoc Tukey (HSD) test followed to determine where the actual differences lie.

RQ 2: Patterns of interaction and collaborative writing strategy. To understand the students' collaborative writing processes, I qualitatively examined how the four focal group students' collaborative dialogues may facilitate their composition processes, primarily using analysis of focal group interviews, observations, verbal interaction data, reflection essays, as well as the document visualization charts available from the DocuViz. As discussed earlier, the constant comparison method was used to examine the (dis)similarities of collaborative writing patterns among the focal groups with different ability grouping status. For analysis of

collaborative writing strategies, multiple data sources were triangulated (i.e., reflection essays, document visualizations, observations) and qualitatively analyzed.

RQ 3: Collaborative writing practices and textual outcomes. I used multivariate regression analysis to examine how the collaboration variables may relate to the quality of group texts. Multiple sets of regression analysis were conducted for examining the predictability of the collaboration variables (i.e., imbalance of participation, peer edit, self edit, quality of group planning, collaborative writing strategy) for the text outcome variables (i.e., writing quality: content, organization, language, mechanics, overall, textual features: academic vocabulary, lexical diversity, textual cohesion, syntactic complexity) for each genre. Three separate sets of multiple regressions were conducted to examine the relative predictability of the collaboration behaviors for writing outcomes in each task type (i.e., narrative, argumentative, and informative). This approach was chosen over a single regression with task types as dummy variables, as I am more interested in understanding the distinct patterns across task type, rather than overall patterns when task type is controlled as a covariate. In addition, I examined the interaction effects between the collaboration variables (Imbalance, Peer edit, Self edit) and ability grouping status to understand whether the effects of collaboration on writing quality differed by ability grouping status. A sample regression equation for text outcome is as follows.

$$\text{Outcome} = b_0 + b_1\text{Evenness} + b_2\,\text{Peer} + b_3\,\text{Self} + b_4\,Document\ \text{Length} + b_5\,Strategy +$$
$$b_6\text{AbilityGrouping} + b_7\,\text{Group mean} + b_8\,\text{Group range} + b_9\,\text{Imbalance X AbilityGrouping} + b_{10}$$
$$\text{Peer X AbilityGrouping} + b_{11}\,\text{Self X AbilityGrouping} + \varepsilon$$

In this equation, the independent variables are document-level variables, including the imbalance of participation (Imbalance), and frequency of peer edits/self revision (Peer, Self). In addition, I included the collaborative writing strategy types as dummies to examine whether a certain strategy is more effective than the baseline strategy (i.e., main writer strategy) in the

given genre. In all regressions, document length, number of authors, and groups' ability gap (i.e., Ability means: group means of writing proficiency, Ability range: gap among member writing proficiencies) were controlled as covariates. Among the multiple variables, the main predictors in this analysis are imbalance and editing amount, as I am primarily interested in whether the evenness and activeness of written participation in the given genre promote better writing quality, and if so, specifically in what aspect of text (e.g., content, organization, lexical diversity).

RQ 4: Phases of building CoP and levels of collaboration. To identify the different phases of building CoPs over the course of the academic year, I conducted several stages of qualitative coding. During the first cycle of coding, I qualitatively analyzed students' interviews, open-ended survey responses, verbal discussions, and observations using initial coding method (Saldana, 2009), and then used axial coding method to categorize the initial codes during the second cycle of coding. Lastly, I used the theoretical coding method, also known as the selective coding, in order to apply the existing theories that have the explanatory relevance for my research question. These include Palloff and Pratt's (1999) model of CoP phases and Shah's (2010) model of collaboration.

RQ 5: Perceptions of synchronous collaborative writing. To understand students' perceived experiences of collaborative writing, I qualitatively analyzed students' interviews, open-ended survey responses, documents, and verbal discussions. Particularly, I considered using the constant comparison method and the key-event analysis (see detailed discussion on qualitative methods). Themes emerged from these analyses, as well as the key contextual factors that influence students' participation and collaboration. In addition, students' survey responses were also analyzed and discussed to support the qualitative findings. In addition, I qualitatively analyzed students' interviews, open-ended survey responses, documents, and verbal discussions

in order to identify the contextual factors that the students and teacher perceive as facilitating or constraining the synchronous collaborative writing practices. Particularly, I used the constant comparison method and key-event analysis (see detailed discussion on qualitative methods). Themes emerged from these analyses, as well as the key contextual factors that influenced students' participation and collaboration.

Table 4.9. *Data sources for each research question*

	Qualitative Data Sources						Quantitative Data Sources		
RQs	Interviews	Open-ended survey responses	Observations	Reflection essays	Verbal discussion data	DocuViz visualization charts	Text-mining analysis data	Computational text analysis data	Surveys
RQ 1	X			X		X	X		
RQ 2	X		X	X	X	X	X		
RQ 3	X						X	X	
RQ 4	X	X	X	X	X	X	X		X
RQ 5	X	X	X	X	X				X

Researcher role. During the qualitative investigation of the study, I took a participant observer position, with peripheral membership (Miles & Huberman, 1994). I established membership in the classroom by observing the students and attending classes, but I was a peripheral member in that I did not participate in class activities. As an observer, I closely examined students' collaborative interactions by attending the classes during the three collaborative writing project periods across the academic year. I also occasionally attended their regular lecture classes (e.g., reading) to understand the context of the ELA curriculum, without being involved in any of the activities. I limited my participation due to the ethical concern that when the researcher is in an evaluative position, participants may be influenced and become a captive population (Morita, 2004). Meanwhile, my own language and ethnic background as a Korean non-native speaker of English helped me build connections and trust with the participants. Additionally, my teaching

and research experiences in the field of English as a Second Language (ESL) education eventually helped me draw and interpret L2 students' linguistic and cultural challenges from an insider language learner/ teacher's perspective, rather than as an outsider in the role of a researcher.

CHAPTER 5

Results for RQ 1: Collaborative Writing Practices

To understand variability in collaboration characteristics across ability grouping status and genre type, I performed a series of two-sample independent measures t-test and repeated measures ANOVA (3 genre X 4 collaboration variables: imbalance, peer edit, self edit, total edit) respectively. Variability in document length across genre was tested and confirmed as non-significant. Therefore, there was no need for controlling the potential covariate using ANCOVA. Prior to examining the variation in collaboration practices across the two proficiency groups and task types, I performed a normality test to confirm the normality assumption. Using the Shapiro-Wilk test, the normal distribution of all variables was tested. Among the variables, the normal distribution was not evident in the following variables with a W value ranging from 0.56 to 0.86: imbalance (0.74), peer edit (0.56), self Edit (0.74), and document length (0.86). Therefore, a series of alternative non-parametric tests (i.e., Mann-Whitney U test and Kruksal-Wallis test) were performed in addition to the independent samples t-test and ANOVA (Cohen et al., 2003). The non-parametric tests compare median scores, not mean scores; therefore they are more robust against outliers and heavy tail distributions. These tests are appropriate for comparing groups when the dependent variables are not normally distributed and, therefore, used as post-hoc analysis following the two-sample independent measures t-test and repeated measures ANOVA. A series of Mann-Whitney U test were used conducted to examine the variations of collaborative practices across two ability groups (i.e., same vs. mixed ability groups). For variations across task types (i.e., narrative, argumentative, informative), the Kruskal-Wallis test was performed. A post-hoc Tukey (HSD) test was also followed to determine where the actual differences lie. The alpha for achieving statistical significance was set at .05.

Variations across Ability Grouping Status

Quantitative findings. Descriptive statistics and the results of two-sample texts and Mann-Whitney U test are presented in Table 5.1. The results reveal that the documents produced by same ability groups tend to involve a more balanced level of written participation (Mean=0.03) compared to those produced by the mixed-ability groups (M=0.10, the lower, the even) at a statistically significant level (p=.00). The texts produced by the two groups also differed in terms of the amount of self-edits: the same ability groups conducted fewer self-edits (M=73208) than the mixed-ability groups (M=162005) per documents at a statistically significant level (p<.01). The results also revealed a significant difference in total edits (p<.05), but no such variation in peer edits between the two groups. The results indicate that groups working with differing levels of writing abilities may not have equal distribution of work among individual members, yet are generally more active in editing behaviors than the groups with similar writing abilities—particularly in self-edits.

Regarding the evenness of participation, it can be assumed that same-ability groups may involve a more balanced pattern of collaboration (e.g., cooperative pattern with equal division of labor) compared to the mixed-ability groups who may find it more difficult to distribute work equally among members due to the writing proficiency gaps that exist within the group. The results regarding the editing behaviors are in line with previous small-case qualitative studies, which suggest that groups with higher proficiency gaps tend exhibit greater interactions among members than the homogeneous groups (e.g., Storch, 2001).

However, my quantitative analysis shows that this claim must be interpreted with caution. The mixed-ability groups had a significantly higher number of self-edits than the same-ability groups, but there were no significant differences in the amount of peer edits between the two

groups. This may be attributable to unbalanced writing patterns potentially dominated by higher-ability peers, in which members focus on their own or take over others' portion of writing (i.e., writing on behalf of the peer) without providing peer edits to each other's texts for revisions. Although mixed ability grouping may provide more opportunities for editing, they could be largely self edits that do not involve peer interactions.

Table 5.1. *Characteristics of collaboration behaviors by ability grouping status*

		Same Ability Groups (Text N=33)		Mixed Ability Groups (Text N =39)		*t*-test	Mann-Whitney U-test
Factors	Variables	Mean	SD	Mean	SD	P	P
Balance	IMBALANCE	0.03	0.0201556	0.1012821	0.0812786	0.00***	0.00***
Quantity of editing	SELF EDIT	73207.88	74992.37	162005.3	156013.1	0.004***	0.007***
	PEER EDIT	81430.42	176881	86358.44	118984.9	0.88	0.075
	TOTAL EDIT	158119.2	211531.6	248363.7	238795.3	0.096	0.034***

In addition to the differences in editing behaviors, I examined how the use of collaborative writing strategies may differ across grouping statuses. As seen in Figure 5.1, documents produced by same-ability groups tend to involve strategies with evenly distributed labor, such as cooperative revision (43%) and parallel writing (30%) with relatively few involving main writer (12%), synchronous hands-on (9%) and sequential writing (6%). In contrast, the most frequent collaboration strategies employed in the mixed-ability groups include main writer strategy (41%), followed by parallel writing (31%), cooperative revision (15%), synchronous hands-on (10%), and sequential writing strategy (3%). This contrasting use of strategies in the two groups aligns with the previous quantitative results, suggesting a pattern of more balanced distribution of work in the same-ability groups, which can be exhibited in the frequent use of cooperative revision and parallel writing strategies, and a higher amount of self-edits in the mixed-ability groups, which can be relatable to the frequent use of dominant writing strategies.

Overall, these results reveal how editing behaviors and collaborative writing strategies might be associated with ability group status, which has not been informed by previous qualitative studies (e.g., Storch, 2002; Li & Zhu, 2013). Specifically, it suggests that the mixed ability groups may provide more opportunities for editing since students of heterogeneous ability levels can work together to negotiate their differences. Yet, mixed ability groups also tend to employ dominant, unbalanced collaboration strategies that may push a few members in a group to take over most of the writing.

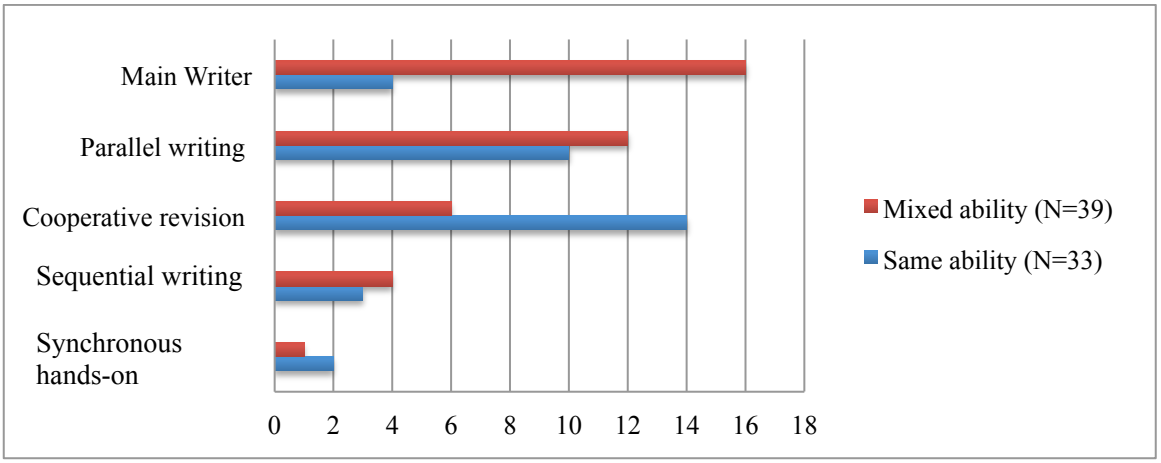

Figure 5.1. Distribution of collaborative writing strategies across ability grouping status

Qualitative findings. Interviews and observations have revealed that students have different perceptions toward ability gaps within a group, which may influence the differential patterns in participation evenness and editing behaviors. Some students expressed the benefits of working with same-ability peers, as discussed in the following comments: "I like an average group because if I have average-level people like me, then we understand each other better. People with higher knowledge are a bit too smart for me." The perceived benefits of understanding each other easily and, therefore, needing fewer editing adjustments in the same-ability groups may explain why group members tend to edit less compared to the mixed-ability groups.

Others also expressed concerns about unequal contribution that typically occurs in mixed ability groups: concerns about high-level peers dominating the group work and about lower level peers' lack of participation and contribution. For example, one student commented that "I think I would do average group because if they're higher they would just start becoming more cocky and they start taking the leadership role and they'll write everything." Regarding the disadvantage of working with lower-level peers, one student commented that, "Working with lower-level people is hard because it can be frustrating at times and they don't really help me with my writing." Another student elaborated on the importance of mutual learning benefits as he discussed his preference for working with higher level peers: "I prefer working with higher level because it helps me become a better writer and I learn from them. If I see them working it will help me set up how much I want to work, like it encourages me."

Other students showed more open attitudes towards working with different levels of students, as discussed in the following comments: "I think it's better if it's both [levels] so you can learn from someone who has a better understanding, and also help others whose writing is not as strong as yours." The qualitative findings in the subsequent chapters (Ch.6: Patterns of interaction and collaborative writing strategies, Ch.8: Phases of CoP and levels of collaboration) will discuss in-depth how these attitudes toward ability grouping status are gradually developed and shaped by multiple factors.

Variations across Task Types

Quantitative findings. Table 5.2 presents the descriptive statistics, ANOVA, Kruskal-Wallis H Test, and Tukey post-hoc test results that reveal the variations of collaboration behaviors across task types. The Kruskal-Wallis analysis demonstrates that there is a significant difference only in the evenness of participation ($F=11.64$, $p<0.01$) across the three task types. As

a follow up, a series of post-hoc Tukey tests were performed to identify the pairs of means that differ. The Tukey results show that students contributed to the group task less equally in the narrative genre (evenness of participation mean=0.11), compared to the argumentative (mean=0.04, *Tukey p*< 0.01) and informative (mean=0.047, *Tukey p*<0.01) genres. There was no significant difference between the argumentative and informative tasks in terms of the equality of participation. As for the editing amount, results indicated students conducted fewer self-edits in the narrative genre (mean=60929) than in the argumentative task (mean= 155099.3, *Tukey p*<0.05) and informative task (147890.1, *Tukey p<.05)*; however, the differences were only marginally significant in Kruskal-Wallis test (*p*<.10)

Unlike Aydin and Yildiz's (2014) finding that revealed a contrasting pattern of collaborative editing in argumentative and informative tasks—with argumentative tasks involving more peer edits than informative tasks—my analysis demonstrated how the two writing tasks exhibited similar characteristics, both in terms of evenness of participation and editing amount. In Aydin and Yildiz's study on adult English learners' wiki-based writing, they found that peer edits occurred more often in argumentative tasks than in informative tasks, in which students mostly conducted self-edits. In the follow-up interviews, participants of their study explained that they did not feel the need to defend or argue for their opinions in the informative task; therefore, editing was limited to the individual's text during the task (i.e., self-edits). In my analysis that compared synchronous collaboration across three task types, collaboration behaviors (participation equality, editing amount) in the narrative task sharply contrasted with those in the argumentative and informative tasks; however, there was no statistical difference between the latter two tasks.

Table 5.2. Characteristics of collaboration behaviors by task type

		Narrative (N=24)		Argumentative (N=24)		Informative (N=24)		ANOVA		Kruskal-Wallis	Location of significance: Tukey *p*		
Factors	Variables	Mean	SD	Mean	SD	Mean	SD	F	*p*	*p*	N-A	N-I	A-I
Balance	IMBALANCE	0.118	0.099	0.040	0.024	0.047	0.033	11.64	0	0.01***	0	0	0.92
Quantity of editing	SELF	60929.96	39131.47	155099.3	140010.6	147890.1	165225.4	4.08	0.21	0.06	0.03	0.05	0.97
	PEER	45143.54	123011.9	96275.42	136392.9	110880.3	175263.6	1.33	0.27	0.11	0.45	0.27	0.93
	TOTAL	110859.8	140138.6	251374.8	230796.1	258770.4	274580.4	3.37	0.04	0.19	0.08	0.06	0.99

This contrasting pattern among the task types (i.e., narrative vs. argumentative, informative) was also evident in the use of collaborative writing strategies. As seen in Figure 5.2, the main writing strategy was most frequently used in the narrative task, followed by the synchronous hands-on (21%), sequential writing (13%), parallel writing (8%), and cooperative revision (8%). Compared to the strategies employed in the narrative task, diverse types of strategies were employed less frequently in the argumentative and informative tasks (5 types in narrative vs. 4 and 3 in argumentative and informative, respectively). In addition, in the latter genres, collaboration strategies that involve balanced contribution of work were used most frequently. For example, the two genres included a high percentage of parallel writing (argumentative: 42%, informative: 42%), cooperative revision (38% and 37%, respectively), followed by main writer (12% and 21%, respectively), and synchronous hands-on (8% in argumentative).

A similar pattern was observed in one previous study on the use of undergraduates' synchronous collaborative writing strategies in argumentative academic essays (Yim et al., 2017). During the timed, argumentative task, 83 undergraduates used cooperative revision (40%) and parallel writing (20%) strategy frequently, with only a few groups employing synchronous hands-on strategy (9%). In addition to the findings on the use of collaborative writing strategies in argumentative tasks, this study examines the influence of task type on collaboration with more depth, as it reveals how the strategy use may differ in tasks with an open-ended structure (i.e.,

narrative) compared to tasks with a more fixed, closed structure (i.e., argumentative, informative task).

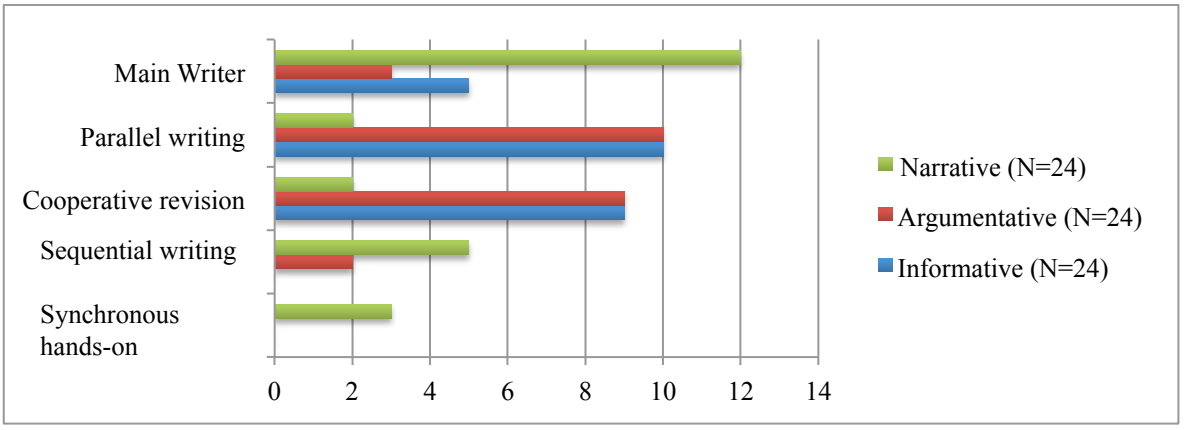

Figure 5.2. Distribution of collaborative writing strategies across task types

Qualitative findings. Student interviews and open-ended surveys have provided potential reasons for these distinct collaboration patterns that differ across task types. In narrative task, the numbers of both self-edits and peer edits were low compared to the argumentative and informative writings. One student explained that given the genre characteristics of narrative tasks that require mutual consensus on how the story develops, the role of verbal discussion was more important than writing and editing. This led to less need for peer editing, as one student discussed in the following excerpt:

> Excerpt 5.1
> The most discussion was most likely the narrative writing because we had to express and convey our own ideas to every member. It was essential to come to a conclusion so that we had a clear path for our writing. For the Narrative, peer editing was the least because the writing was all jumbled together. There was no need to edit another team member's writing.

Regarding collaborative writing strategy, another group explained that they usually had a main scriber as the group discussed (i.e., dominant writing strategy), commenting that, "I feel like narrative is just easier to talk to your group like having a conversation." During the narrative task, most students discussed the plot as a group, yet did not divide sections in writing and

developed the storyline as they progressed in the assignment. This appears to have led the groups to use the dominant writing strategy. One student commented as follows: “Some people found narrative writing really hard because you didn’t get to divide sections or roles so it was very hard to have everyone participate. Usually one or two people type for the group.” Another student described her group’s use of the synchronous hands-on strategy, commenting that:

> Excerpt 5.2
> In narrative, we didn’t really divide it. We all just worked together. We just wrote out our plot and used that to create our story. We then came up with more ideas as we wrote and added to the story. We got our ending as we went.

There were positive responses about the creative aspect of the narrative task, such as, “In some ways for me, narrative was more fun because we would get all kinds of ideas that wouldn’t be possible in reality, and with argumentative, we had to follow a certain idea for it to work,” or “I actually really like it because I’m more of a creative person. I thought it would help more with social skills because in informative, you would just be like I’ll talk about this part; you talk about this part. Then we will come up with conclusion and finish it.” However, other students expressed concerns about unequal distribution of work in the narrative task, commenting that “Some people found narrative writing really hard because you didn’t get to divide sections or roles, so it was very hard to have everyone participate. Usually one or two people type for the group.”

Student interviews also revealed a sharp contrast in perceived benefits between the narrative and the other two task types. In contrast to the narrative task, students perceived that they had more room for independent work in the argumentative and informative tasks. In one such case, the student stated the following:

> Excerpt 5.3

> Personally, I prefer the argumentative because we are able to work individually and with a group. With the narrative, there is too much room for where the story can go. At some points we fed off of each other's ideas, but then at other times it was confusing. Argumentative has more independence and the social aspect together.

Students further discussed that the division of labor was easier in the argumentative and informative tasks, which explains why a cooperative pattern of writing is common in the two task types (e.g., parallel writing, cooperative revision strategy). For example, one student commented that:

> Excerpt 5.4
> I think it definitely makes you have to participate more because you have to write your own body paragraph and you have to research this article or story. In the argumentative essay, it is completely different from the narrative because in narrative you have to work with your group for your entire essay together and it's like your ideas, but when you try to write argumentative, you have to research on your own and then you have to be responsible from your paragraph.

One student commented that the use of parallel writing strategy (i.e., divide and conquer) in the informative task facilitates more of a 'fixed' form of writing, and how the results are collectively a variation of the end product rather than a creative, joint product. The student noted that, "I think the narrative and informative were really two different things. So the narrative involves more creative thinking, [whereas] the informative is more of fixed platform. Everyone will have some kind of variation of the end product." Some students pointed out that this more independent, cooperative work pattern is a limited form of collaboration, stating that:

> Excerpt 5.5
> I guess collaborating is discussing, and discussing only happened at the beginning, so collaboration effect has been dropped [in the argumentative or informative essays]. We only collaborate a lot during planning part but during revision part we never really collaborate.

This point that collaboration tends to occur only within a limited range of writing, rather than throughout the process, has been raised by previous qualitative studies on collaborative

writing (Storch, 2002). Students perceived that the open structure of the narrative genre may force members to collaborate more closely and consistently, commenting that, "But then for the narrative, we did collaborate a lot where we didn't have clear idea of what we were going to write."

Several students observed that the independent component of group work was stronger in the informative task than in the argumentative task. One student discussed how, "For argumentative, we are trying to persuade a point, but for informative, it was already a known fact, so it's more of just informing the audience about the situation and to just give them more information." A similar point was raised in Aydin and Yildiz's (2014) wiki-based study, which suggested that students do not typically negotiate their different perspectives in the informative essay. The following interview excerpt illustrates this point:

> Excerpt 5.6
> I think it was easier for informative because we all had the same point of view. It was easier for everyone to agree on the same thing. So we didn't spend a lot of time discussing your differences. Informative essay was based on facts and easier to write about. There's more to explain.

In the informative essay, members tended to focus on explaining fact and did not feel the need for negotiating and arguing for different perspectives. Therefore, they conducted fewer peer edits in the informative task than in the argumentative task.

CHAPTER 6

Results for RQ 2: Collaborative Writing Patterns and Strategies

In this section, I examined the collaboration patterns of four focal groups with different ability grouping status (i.e., same ability, mixed with lower ability peers, mixed with higher ability peers, mixed with both levels) across different tasks. Based on the constant comparative method and grounded approach (Glaser & Strauss, 1967; Saldana, 2009), I read and reread the multiple sources of data from the four groups (interviews, group discussion, observations, group essays on Google Docs, text mining visualization charts) and noted several salient features and subsequent patterns of interactions. Following the initial open coding of data, I used the axial coding method to identify recurrent themes and made connections among categories that are relevant to students' collaborative interactions. In this process, I set up comparisons of cases and analyzed the data from comparable dimensions. The dimensions included the level of equal contribution, the level of mutual engagement, group dynamics (e.g., member roles, existence of leaders), group cohesion, types of scaffolding, and perceived learning benefits. In the third cycle of coding, I used the theoretical coding method, also known as selective coding, to set the salient themes that have the "greatest explanatory relevance" for the final categorizations (Corbin & Straus, 2008 as cited in Saldana, 2009).

During the theoretical coding stage, I applied the concept of equality and mutuality (Damon & Phelps, 1989) as core indexes for categorizing patterns of interactions. These two indexes were adopted in representative studies on collaborative writing (e.g., Storch, 2002, Watanabe, 2008, Li & Zhu, 2013) and were deemed applicable to my dataset. Equality refers to "the degree of control or authority over the tasks" (Storch, 2002, p. 127), including the extent of contribution to group writing and the degree of control over the direction of writing. Mutuality

refers to "the level of engagement with each other's contribution" (Storch, 2002, p. 127), including the degree of reciprocal response and sharing of ideas.

While these two indexes provided the fundamental basis for pattern categorization (Storch, 2002; Li & Zhu, 2013), I extended the model by 1) triangulating additional sets of data, 2) discussing how additional factors (e.g., group cohesion, scaffolding strategies) may relate to the level of mutuality and equality, and 3) by examining how the patterns of collaboration may lead to each group's use of collaborative writing strategies. In terms of data triangulation, I examined equality through the following sources of data: each group's use of language functions, DocuViz information on evenness of participation, interviews, observation, and students' peer evaluations and written reflections. Mutuality was examined through each group's use of language functions, interviews, observations, peer evaluations, and written reflections.

Next, I examined two concepts capturing the distinctive features of interaction: group cohesion and scaffolding strategies. Group cohesion refers to the degree of positive relationships among group members (Zaccaro & Lowe, 1988) and often the force to bind group members together to commit to the group goals (Gonzalez et al., 2003). It can be manifested through positive group rapport, mutual respect, and openness toward each other's perspectives. Research suggests that group cohesion leads to more frequent interactions and is positively related to group performance (Zaccaro & Lowe, 1998). The second concept, scaffolding, is defined as mutual assistance that facilitates the completion of writing tasks. It includes strategies established in previous literature, such as affective involvement and contingent responsivity (Li & Kim, 2016).

Lastly, I expanded Storch's model by illuminating how the distinct patterns of collaboration lead to the use of collaborative writing strategies, which have been under-examined

in the literature (Li & Zhu, 2017). Five strategies (main writer; parallel writing; cooperative revision; sequential writing; synchronous hands-on) were identified by using multiple sources of data: students' written reflections on their collaborative writing processes, text mining visualization charts, group discussion, and interview data. I illustrated what may have led each group to choose a certain strategy and how the group's strategy use may differ across task types.

My year-long observation and data analysis demonstrated a consistent, overall pattern of interaction within the groups, yet the flexibility and fluidity of interaction patterns across different tasks is also worthy of note. The nature of the task may affect the role relationships enacted among the participants (Saunders, 1989; Storch, 2002). However, most studies on collaborative writing have merely examined group interaction either over a short period of time or on a single task (e.g., Donato, 1988; Lockhart & Ng, 1995). Regarding this limitation, Storch underscored that patterns of group collaboration take time to develop, and should in effect, be examined longitudinally and across multiple tasks as this current study attempts to do.

In Table 6.1, I summarized the definition of each factor and how the four patterns can be distinguished by these factors, resulting in: (1) collectively contributing/mutually supportive; (2) expert/novice; (3) authoritarian/passive; and (4) dominant/withdrawn patterns. In Figure 6.1, I graphically represented the four patterns by the quadrants formed by the two axes. Each of the two axes is on a continuum, with the intersection point representing a moderate level (Storch, 2002). The level of mutuality and equality are affected by relevant factors, such as member roles, the use of scaffolding strategies, and group rapport. The initial categorization of qualitative data was re-examined and confirmed using several triangulation sources: coding results of group discussion (Table 6.2), editing information of Google Docs (Table 6.3), group's written

reflection on their writing strategies (Appendix H), and DocuViz visualization charts (Figures 6.3- 6.6).

Quadrant 1 (collectively contributing/mutually supportive) represents a pattern of collaboration where there is a moderate to high level of both equality and mutuality (Li & Zhu, 2013). In this pattern, members work together throughout the writing processes, rather than on specific parts of the composition. It also demonstrates mutual responsiveness characterized by reciprocal responses and collective inquiry. Therefore, this pattern is termed 'collectively contributing/ mutually supportive' (Li & Zhu, 2013).

Quadrant 2 (expert/novice) represents a pattern of collaboration with moderate to low equality, yet moderate to high mutuality. In this pattern, certain member(s) assume the role of expert(s), taking more control over the task than others who are not as confident in their writing skills. However, the expert member(s) is not authoritarian or dominant since he/she actively incorporates the other members' responses and encourages their engagement, thus displaying a high level of mutual responsiveness.

In contrast, Quadrant 3 (authoritarian/passive) involves contrasting characteristics: high levels of equal contribution, yet low mutuality. This pattern typically indicates the presence of an explicit leader who takes an authoritarian stance as he or she manages the direction of the task and monitors whether all participants make equal contributions. Unlike the expert-novice relationship, however, this pattern shows little sign of negotiation or mutual responsiveness. The other participants simply adopt passive, subservient roles within the one-sided interaction pattern.

Lastly, Quadrant 4 (dominant/withdrawn) represents a pattern where the level of equality and mutuality are both moderate to low. In this pattern, work is not evenly distributed among members and there is little sign of mutual engagement. With no specific roles or expectations

assumed by each member, certain members reluctantly contribute more than others and often complain about unequal work, resulting in a negative group rapport. This pattern is characterized by a lack of agreed-upon rules and norms.

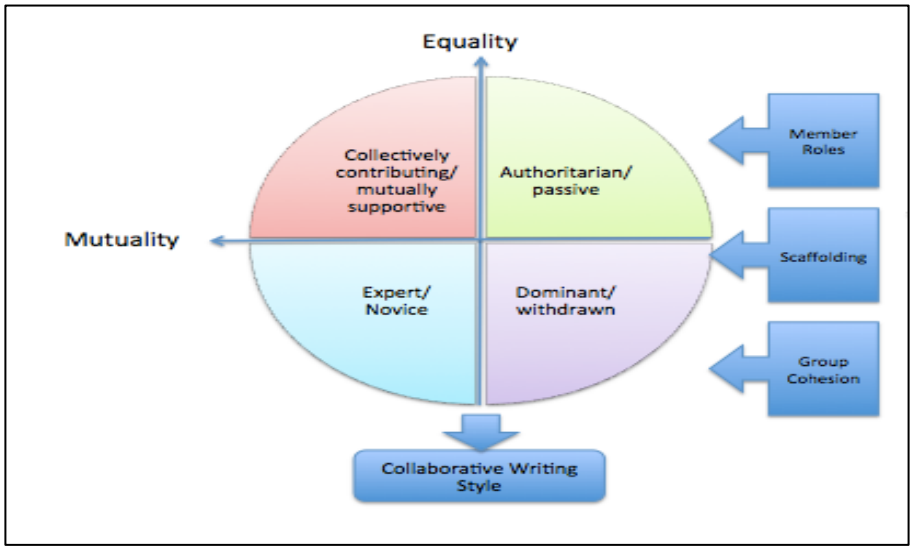

Figure 6.1. Patterns of interaction and the relevant factors

Table 6.1. *Definition of factors and characteristics of each pattern*

Factors	Definitions	Group 1 Collectively contributing/ mutually supportive	Group 2 Expert/novice	Group 3 Authoritarian/ passive	Group 4 Dominant/ withdrawn
Ability grouping	Members' ability grouping status	Mixed (Intermediate-High)	Same (Intermediate)	Mixed (Intermediate-Low)	Mixed (High-Intermediate-Low)
Equality	The degree of control or authority over the tasks; the degree of equal contribution	High	Intermediate to Low	High	Intermediate to Low
Mutuality	The level of mutual engagement	High	High	Intermediate to Low	Intermediate to Low
Member roles (Role configuration)	The existence of assigned member roles, including leader roles	Fluidity in membership roles; sub-teams	Two main leaders/ main writers guide the other incompetent members	One explicit leader assigns roles/ tasks to other members, who respond passively	No leader; two reluctant main writers; others are non-participating
Scaffolding strategies	Salient types of scaffolding	Affective involvement; contingent responsivity; intersubjectivity	Affective involvement; Contingent responsivity; Direction	Direction maintenance; Instructing	None in particular

			maintenance; Instructing; Intersubjectivity		
Group cohesion	The degree of positive relationships among group members. Include group rapport, mutual respect	High level of trust, respect, openness	High level of trust, respect, openness	Low level of trust, respect, openness	Low level of trust, respect, openness
Collaborative writing strategy	Collaborative writing strategies across different tasks	• Synchronous hands-on (narrative) • Cooperative revision (argumentative, informative)	• Main writer (narrative) • Co-operative revision (argumentative, informative)	• Parallel writing (consistent across tasks)	• Sequential writing (narrative) • Parallel writing (argumentative, informative)

Table 6.2. *Coding results of collaborative dialogue across groups*

Behavior categories	Sub-categories	Group 1	Group 2	Group 3	Group 4
Planning	Group Skills	74	33	31	21
	Organizing Work	24	48	38	15
	Initiating Activities	29	81	35	22
Contributing	Help Giving	164	91	24	13
	Feedback Giving	41	74	20	8
	Exchanging Resources/Information	8	30	5	12
	Sharing Knowledge	135	33	4	6
	Challenging Others	14	4	9	8
	Explaining/Elaborating	55	82	16	8
Seeking input	Help Seeking	81	97	6	17
	Feedback Seeking	36	78	6	14
	Advocating Effort	16	39	3	5
Reflection / monitoring	Monitoring Group Effort	31	53	56	6
	Reflecting on Medium	2	9	3	1
Social interaction	Non-task related talk	131	40	97	77
Total		841	792	353	233

Table 6.3. *Editing information of group texts (narrative, argumentative, informative)*

		Group 1			Group 2			Group 3			Group 4		
	Coding category	NAR	ARG	INF	NAR	ARG	INF	NAR	ARG	INF	NAR	ARG	INF
Balance in participation	Evenness	0.05	0.09	0.01	0.1	0	0.06	0.13	0.09	0.07	0.25	0.07	0.09
Amount of editing	Peer edit	5093	28134	7555	29713	5137	10267	12993	188972	112839	20937	4556	1034
	Self edit	21135	52692	34875	80957	45133	88482	70523	406379	525934	52722	24388	58609
	Total edit	26228	80826	42430	110670	50270	98749	83516	595351	638773	73659	28944	59643
	Doc length	6116	19413	15063	12434	12319	23369	17212	32253	19042	5312	8659	7133

Pattern 1: Collectively Contributing/Mutually Supportive Pattern (Group 1)

Group 1 demonstrated a collectively contributing/ mutually supportive pattern of interaction. This group consisted of two female peers with high levels of writing proficiency (Tory and Joy, pseudonyms) and two male peers with intermediate levels of proficiency (Sam and Layne). They share similar linguistic and ethnic backgrounds (language minority students with Asian ethnicities) and were not familiar with each other at the beginning of the collaborative work. Analysis revealed that the four members made joint contributions to the group tasks (i.e., high equality) and were fully engaged with each other's contributions (i.e., high mutuality). In discussing these two qualities, I illustrated how multiple factors (member roles, group rapport, scaffolding strategies) influenced the collaboration patterns, as well as the resulting style of collaborative writing. I also provided the quantitative description of the group discussion and revision histories to support and triangulate my qualitative interpretations. As Table 6.2 reveals, Group 1 engaged in the group discussion most actively among the four groups (total 841 episodes). Particularly, interactive language acts such as help giving (164 episodes), help seeking (81 episodes), sharing knowledge (135 episodes), as well as off-tangent discussions (131 episodes) were used most frequently during their group discussion. Individual variations within the group are discussed in relevant sections.

Equality. The four members in Group 1 shared an equal degree of control over the tasks with no one taking an explicit leadership role. Rather, their roles were flexible and frequently shifted as the members collaborated on different tasks. As seen in Table 6.3, Group 1 demonstrated a generally balanced participation pattern across the task types (0.05 for narrative, 0.09 for argumentative, and 0.01 for informative) compared to other groups. In Excerpt 6.1, one member explains that her group had two sub-teams with distinct responsibilities: transcribing the text (i.e., writers) and facilitating oral discussion (i.e., discussion leaders.

> Excerpt 6.1
> I wasn't necessarily a main writer in a sense, because for this part, this is actually our storyline and then we all brought it and then we all created ideas then one person wrote the storyline out… I think usually the guys are the ones that think of the ideas, and me and Joy are the ones that write it down.

Even though Group 1 had main scribers, particularly in the narrative task, the group members perceived their contributions to the task as equal. As discussed in the above

excerpt, members acknowledged that participation could come in different forms, not just writing. One student commented, "Even if not all of us typed as much, we all shared an equal amount of ideas and input into the story." As further illustrated in Excerpt 6.2, there was no clearly identifiable leader or expert, but all members jointly contributed to the task according to their unique strengths.

> Excerpt 6.2
> I think we were mainly playing more towards our main skills. So because Tory and I are more skilled in our writing, it kind of goes well with the guys who are opened to giving us ideas and we're the ones that write it out.

One member further explained that the division of work happened naturally as they sought to pool each other's resources and unique strengths. While there was a gap between the four members' writing ability levels (high vs. intermediate), the role of expert was not assumed solely by the higher-level peers. Rather, it was distributed among members (cf. Storch, 2002; Li & Zhu, 2013). This represents a pattern of *collective scaffolding,* in which all group members collectively pool their resources and scaffold each other as "individual novices and collective experts" (Donator, 1994, p.46). During the process of collective scaffolding, each member, regardless of his or her writing proficiency level, offered different expertise to the group task, which is manifested in frequent episodes of knowledge-sharing (135 episodes, Table 6.2).

The members also shared an equal degree of control over writing. In the following excerpt (Excerpt 6.3), one member who assumed the role of facilitator discussed how he and his partner constantly checked with the other two members to reach consensus rather than providing directions as leaders.

> Excerpt 6.3
> Generally, I think that we are the ones that are encouraging everyone to get to work, but it's not necessarily that we assign everyone to something. We would ask questions more as facilitating. So we would ask, "Are you okay with doing this?" or "Would you prefer to do this?" So we're not being like a dictator.

The following segment of group discussion (Excerpt 6.4) is yet another example of how Group 1 made efforts to develop a collective dialogue. As they worked on the introduction of their argumentative group essay, they verbally composed the sentence in a collaborative manner. They engaged with a wide range of language acts, such as challenging

(line 3), suggesting (line 4), explaining (line 5), seeking help (line 6), and providing help (line 8). No one dominated one or more of these language functions; they all equally contributed to the sentence building process. Here, the task of searching for the necessary textual evidence was not given to Male 2 in a directional manner, but was discussed among all members. The following excerpt also illustrates that responsibility for the exploration of resources or finding solutions was distributed equally among the members.

Excerpt 6.4
Female 1: Wait, since the beginning of time…
Female 2: Humans have relied on…relationships?
Female 1: Broader than that. And talk about relationships later.
Male 2: How about since the beginning of time early humans have always trusted on relationships to survive?
Male 1: Just say since the beginning of time, humans have relied on relationships to survive. No, but were saying since the beginning of time humans… so since the beginning of time already implies early.
Female 1: Okay, wait, but we need examples.
Male 1: Yeah, and we need evidence because we can't just say stuff.
Female 2: Okay, I'll find some good evidence.

Mutuality. This group also exhibited a high level of mutual engagement. All members were willing to offer and engage with each other's ideas; they were also open to criticism and corrections. As seen in Table 6.2, this group had highest frequencies of language acts in help giving (164 episodes), help seeking (81 episodes), and social interaction (131 episodes), which represents a high degree of reciprocal response and sharing of ideas. Both Excerpts 6.4 and 6.5 display how members mutually scaffolded each other using strategies such as intersubjectivity (i.e., seeking a shared understanding of the situation and are in tune with one another, Rommetveit, 1985) and contingent responsivity (i.e., interpreting group partner's behavior and responding appropriately, Lidz, 1991).

In Excerpt 6.5, Male 1 invited the members to provide feedback on her sentence (lines 1-3). Initiated by Male 1's request, the group evaluated the appropriateness of the newly added sentence and debated whether they had to explicitly state a call-to-action or infer it. Their conversation is characterized by intersubjectivity and contingent responsivity: They engaged in a dialogue that displayed a smooth flow of collective thoughts and discussion

cohesiveness (Storch, 2002, lines 5-6). In both Excerpts 6.4 and 6.5, members verbalized their thought processes as they sought and provided explanations of how to evaluate information, analyze problems, and search for resources to arrive at a mutually agreed-upon solution. This process is referred to as cognitive elaboration, which promotes the reorganization and integration of thought process strategies. (Meyers, 2010).

Excerpt 6.5
Male1: You can change the order to whatever sounds best.
Alright, can you guys see the sentence I added to the intro paragraph?
Do you agree that this is a call to action? To value relationships.
Male 2: Hmm….
Female 1: Yes. Do you agree? Tell me if there is a call to action and if there isn't…then we will change it to take babies on a walk.
Male 2: You can infer a call to action, but there isn't a call to action.
Male 1: Do we have to explicitly say it?
Female 2: You can infer the call to action as to value the relationships.

Also noteworthy in this pattern is how peer corrections occurred mutually, regardless of the variations in writing proficiency levels. In the next excerpt (Excerpt 6.6), student1 (high writing proficiency) actively sought feedback from other members to find appropriate vocabulary (lines 1-4). In response to her request, Male 2 provided support by adding more explanation about the overall flow of the text (lines 5-7). Then Males 1 and 2 (both intermediate level peers) provided alternative vocabulary to help student1 complete her sentence (lines 8-9). In this segment, all members engaged with collective inquiry about the given problem (i.e., searching for vocabulary) and exhibited positive interdependence among members. This demonstrates one of the salient features of effective collaboration (Johnson, Johnson, & Holubec, 1998; Wang, 2009).

Excerpt 6.6
Okay guys, can you help me real quick, just on the last sentence? "Relying on relationships proves to be the key to survival through the relationships portrayed in these stories and were proved to something, something, something.
Male 2: Because the final sentence in the example essay is positive attitudes contributed to the mental and emotional strength that is necessary to survive physical abuse or hardships at the hands of others.
Male 1: Or prove to benefit your life… or help your life.
Female 2: Well, benefit your life sounds better because…

Group cohesion. Closely related to mutuality is group cohesion. Positive interdependence is often the result of building trust and mutual respect among group members, which is indicative of strong group cohesion. Group 1 demonstrated a high level of mutual respect, trust, and open attitudes towards collaboration. In the following excerpt (Excerpt 6.7), one member emphasized the role of communication in effective collaboration.

> Excerpt 6.7
> I think verbal communication is very important in the collaboration process because, well, in our group the members are generally loud and it's easy to build off each other's ideas more. If someone was shyer, it's not as easy because they are not as open about their ideas.

Such an open attitude enabled opportunities for constructive criticism. Analysis of collaborative dialogue in Group 1 revealed that they frequently engaged in language acts such as challenging ideas and explanation/elaboration. As illustrated in Excerpt 6.8, members were open to constructive criticism while they added supporting evidence (i.e., statistics) and evaluated the appropriateness of each source. In this dialogue, Female 1 disagreed with Male 1's idea to use statistics concerning war casualties (lines 1-2), Male 1 and Male 2 attempted to defend it (lines 6-8), and Female 1 justified her criticism (lines 9-11). Female 2 (line 12) and Male 1 (line 13) were then persuaded. This type of conversation exemplifies the notion of "exploratory talk" (Wegerif & Mercer, 1996, as cited in Storch 2002), which refers to the critical and constructive conversation that successfully resolves disagreements.

> Excerpt 6.8
> Male 1: It would only be relevant if that statistics had anything to do with relying on relationships.
> Female 1: Yeah, which is exactly what they are doing.
> Male 1: No, they're not. Just because you have a statistic of people dying doesn't mean—
> Female 1: No I meant—
> Male 2: To survive this hard of the time…
> Female 1: Yes, I mean like in the wild there is like—
> Female 2: No, but in the beginning you know how it is broad and then it goes abyss? We don't talk about animals we are talking about war. So it would be hard to tie that in unless we change our whole intro.
> Male 1: Exactly. So I guess it should have something to do with World War II.
> Female 1: Okay. Let's do World War II statistics.

In providing constructive criticism, they typically used a polite tone, as seen in Excerpt 6.9 (lines 3-4), which helps avoid offending the writer's feelings. They also used scaffolding strategies supporting affective involvement (i.e., expressing warmth to group members, sense of caring). They frequently encouraged each other and praised team efforts, for example, with responses such as "Good job, guys," and "I like your idea."

> Excerpt 6.9
> Male 2: Having connections and relationships with other countries helps give the upper hand to other countries. Remember, we were writing about that?
> Female 1: I like your idea here, but it has to be reworded a bit. We will just change the idea a bit.

Collaborative writing strategy. As discussed earlier, Group 1's active collaboration pattern with high equality and mutuality contributed to a flexible adaptation of collaborative writing strategies across multiple tasks. In the narrative task, the group used a sub-team collaboration style with main writers and discussion leaders. Figures 6.2 depicts the AuthorViz visualization chart of their three group texts. In the narrative task (Figure 6.3a), the two scribers (purple, blue) mainly wrote the text in a synchronous hands-on style, whereas the other two members, who facilitated the discussion (green, orange), occasionally revised parts of the sentences for better expressions or grammatical errors. This revision occurred both during and after typing up the main text.

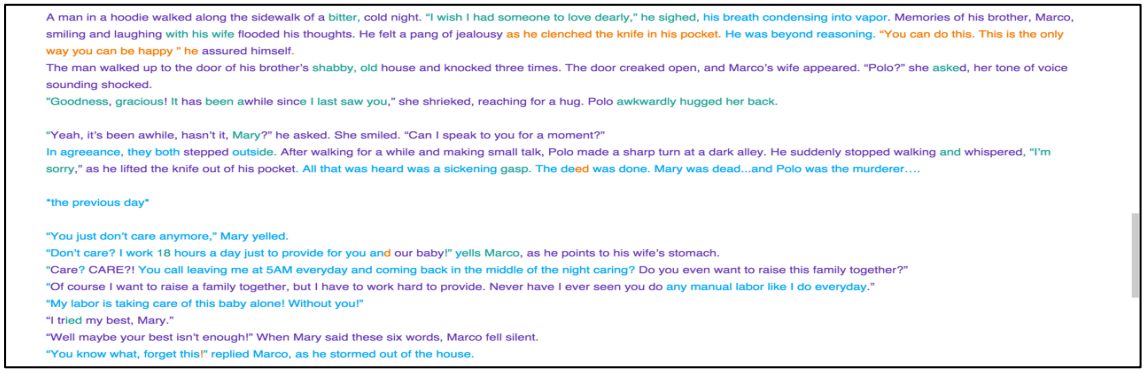

Figure 6.2. AuthorViz view of Group 1's narrative task

As visualized in Figure 6.3a, the noteworthy characteristic of this style was the reactive nature of synchronous typing that occurred sentence by sentence. Figure 6.3a shows an intense mingling of colors (indicate each author) as group members composed a sentence

together synchronously during the narrative task. In Excerpt 6.10, the members openly discussed on how to compose a sentence (lines 1-5) and sought mutual agreement on each sentence (lines 6-7) before typing it up on Google Doc. This collaboration style is similar to what Bikowski and Vithanage (2016) categorized as the *Explicit Collaborators* style, which refers to sustained collaboration throughout the writing process (e.g., brainstorming, planning, writing, editing), rather than collaborating in specific stages of writing, such as in peer review. This style is also characterized by "periodic collaborative checks to ensure that the plan was being followed or revised as needed" (P. 89).

Excerpt 6.10

Male 1: Okay, next sentence. It's kind of hard to transition from relationships with other countries to relationships with individuals.
Male 2: No, because we're going to narrow it down. So, first we start with allies…So, we can say in a less broad spectrum relationships can eventually be narrowed down to individuals.
Female 1: Should we write that down?
Female 2: No, later.

However, in argumentative and informative essays, Group 1 changed their collaboration strategy by engaging in the style of cooperative revision (Figure 6.3b and 6.3c). They still jointly constructed the introduction and conclusion sections, but they decided to divide the sections and write one individual body paragraph each. Subsequently, they engaged in a peer review during the later stage of writing. In contrast to the narrative task— which does not involve a clear division of sections (Figure 6.3a)— the argumentative (Figure 6.3b) and informative (Figure 6.3c) tasks are characterized by more balanced written contributions (i.e., division of sections indicated by different colors). Although the sections of the texts were divided, the groups engaged in a significant revising and editing of each other's text. In Excerpt 6.11, one member explains how her group adopted the cooperative revision style for the argumentative and informative writing, and why they found this style easier for collaboration.

Excerpt 6.11

Well, for narrative that was the most different because we didn't use any pieces of text for evidence so it was more creative, but we still planned it out and brainstormed, drafted, and edited. For the informative and argumentative we more of everyone doing a certain piece of text and then we'll divide up sections.

In Excerpts 6.12 and 6.13, two members further discussed their preference for source-based writing tasks (e.g., argumentative or informative essays) that allowed room for individuality. Unlike the two tasks, the narrative genre was more open-ended and promoted creativity and in-depth collaboration throughout the group process.

> Excerpt 6.12
> Personally, I prefer the argumentative because we are able to work individually and with a group. With the narrative there is too much room for where the story can go. At some point we fed off of each other's ideas, but then at other times it was like "I want this story to go this way", or "I want this story to go that way."

> Excerpt 6.13
> Joy: I prefer argumentative as well because it has more independence and the social aspect together. Narrative has too much space to be creative, so by committing ourselves to one paragraph and working together to working on our own paragraphs then it creates a much more dynamic effect for the story overall.

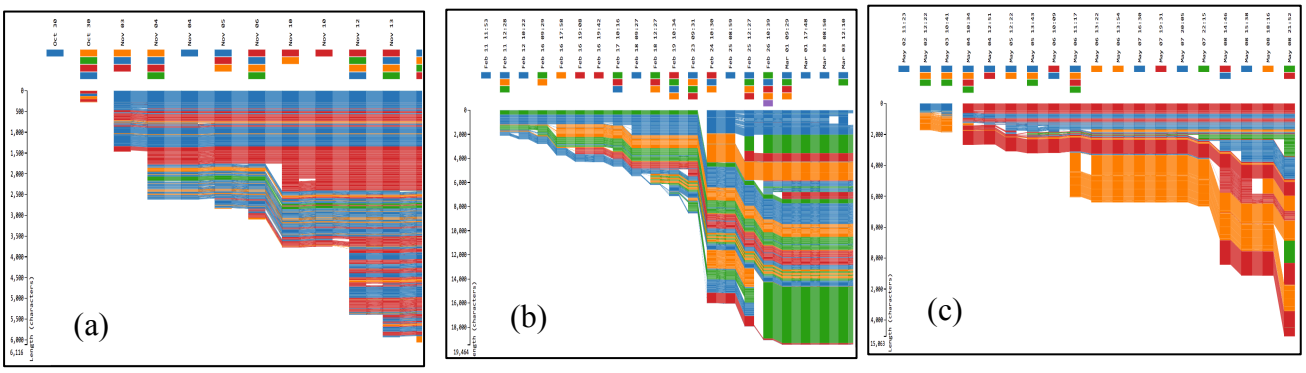

Figure 6.3. DocuViz charts that visualize collaboration patterns of Group 1 during narrative (a), argumentative (b), and informative (c) essays.

During specific revision acts, such as correcting grammatical errors, no one assumed the expert or peer tutor position, but rather the role of expert was fluid. This characteristic was reported in previous studies that highlighted the value of collective scaffolding (Donato, 1994; Storch, 2002; Swain & Lapkin, 1998). Group revisions occurred at multiple levels of composition: vocabulary, grammar, cohesion, etc. In the following excerpt (6.14), members made sure that the grammatical changes any member planned to make in the group text were clearly explained.

Expert 6.14

Male1: Since this is a run-on sentence, why don't we delete this part..
Female 2: What?
Male 1: This is a run-on.
Female 1: It's not a run-on sentence.
Male 2: Well, I think it is. See, here, it's missing a conjunction.
Male 1: How about 'how these victims respond'
Female 1: Oh, okay. That makes sense.

Overall, Group 1 exhibited salient characteristics of productive collaboration (Castek at al., 2012; Fung, 2010), which include mutual engagement in collaborative conversation, negotiation, joint acknowledgement and decision making, and shared understanding based on collective inquiry. Exhibiting high levels of both mutuality and equality, members of Group 1 developed flexible writing strategies that differed across tasks.

Pattern 2: Expert/Novice Pattern (Group 2)

Group 2 demonstrated an expert/novice pattern of collaboration where there is moderate to low equality but moderate to high mutuality. This group consisted of four females with similar backgrounds: they were all intermediate-level writers and shared similar language and ethnic backgrounds (i.e., bilingual Asian immigrants). Although their writing abilities were similar, one member (Elena), who had a high motivation for writing outside of school, took the role of expert and guided the other members through teaching and mentoring. Another member (Pauline), who was initially not confident in writing, gradually emerged as a co-leader/mentor of the group. The degree of equal contribution was low to intermediate, as the two mentors took more control over the task—particularly in the narrative task (evenness of participation: 0.1). However, the pattern became more balanced (argumentative: 0, informative: 0.06). Group 1 also displayed a high level of mutual engagement, as manifested in high frequencies of language acts related to exchanging support (help seeking: 97 episodes, feedback seeking: 78 episodes, help giving: 91 episodes), as well as those related to mentoring and leadership (explaining/elaborating: 82 episodes, initiating activities: 81 episodes). Interview and observation data also revealed that the co-leaders sought to involve the other members in the collaboration process and provided necessary assistance, explanation, and scaffolding to help the apprentices learn from the interaction. In a responsive manner, the other members willingly accepted the suggestions

made by their peer tutors and appreciated the help they received, building a high level of mutuality and positive group rapport.

Equality. Group 2 displayed a moderate to low level of equality since the task control was not equally distributed among the members. Two members of this group assumed the roles of expert mentors and led the task. Elena, one of the leaders, was shy and uncomfortable about the group process at first (from observation notes), but eventually built confidence in leading the group and enjoyed mentoring the other members during the group writing processes. She explained that she had a high motivation for online writing outside of school. Her online writing experiences made her feel familiar with the interactive nature of collaborative writing projects in class. She commented that "I enjoy writing diaries and also writing with Wattpad to get people's comments. I am a very shy person, and I'm not very confident about academic writing…but I do enjoy writing and giving comments." Once she got familiar with the other group members, she led the group process and was willing to scaffold the group task, for example, by having the other members answer pre-writing questions and thus making it easier for the group (Excerpt 6.15).

Excerpt 6.15
We first create our introduction. We all come together with our ideas. The first thing we did was…Elena wrote all the questions like a prompt and each of us answered it so we can look at our ideas and combine it.

The following segment (Excerpt 6.16) illustrates Elena's active mentorship role as she initiates activities and leads the group. She sets the timeline, and provides directions for the group (lines 3-4), and reminds them to consider the pre-writing questions as they write (line 5). She also suggests that she reads aloud the text in a narrator voice so that the group can check the flow of the content (line 7). Her suggestion was well-received by the group members (line 8).

Excerpt 6.16
Female 3: I posted a thing for all the readings so you can see what points you need to add.
Female 4: So don't think about the thesis statement yet?
Female 3: No, we're doing that tomorrow. Each of us are going to create something close to the sample. We have to consider the questions of the situations. So finish this by tomorrow. Make sure you're considering these questions while you're creating your response.
Female 3: Now, do you guys want me to read the introduction in a narrator voice?

Female 1,2,4: Sure, go ahead.

Another member, Pauline, was hesitant to participate at first, but soon emerged as a co-leader and mentor of the group. She explained that she was initially uncomfortable about the synchronous writing task because she lacked confidence in writing and also lacked experience with simultaneous typing. However, once she felt comfortable and safe interacting with her fellow group members, she participated more and actively led the group, taking an emergent leadership role. She discussed that her personality and previous leadership experiences contributed to her taking this new role in group writing, saying, "I'm in leadership, so I guess it's expected I get that sense that people need help." In the next excerpt (6.17), she discussed how her emergence as a leader can be attributed to her interactions with Elena. She perceives that her writing gradually improved and that she gained more confidence due to Elena's mentoring, particularly in developing cohesion and editing skills.

> Excerpt 6.17
> My writing improved. More of my editing. I try to edit the way Elena does and try to see if everything has to do with the thesis because she always reminded us so that we don't go off topic. I am more confident about my writing now and try to contribute more.

Together with Elena, Pauline assumed the role of a main writer tasked with writing most of the narrative task. The other two members acknowledged Elena and Pauline's leadership and assumed different roles from the two leaders, such as editing and providing input (Excerpt 6.18). This division of roles was perceived as unequal, but was considered as a positive and effective way to complete their task (Excerpt 6.19). The degree of task control was perceived as unbalanced since the two leaders tended to decide 'what to write' and 'how to write' it.

> Excerpt 6.18
> I feel like the leaders might be Pauline and Elena because they participate more and they know how to guide us to make it better. We did more of the editing and giving more ideas. They did the writing.

> Excerpt 6.19
> I feel like it wasn't as even. I think sharing our ideas was about equal, but the writing was not as equal probably because we didn't have that much time so it was easiest for who ever could write the quickest. They tell me what to write about and how to write it. They help me edit and tell me what to do.

In the next segment (Excerpt 6.20), the two leaders (Female 3, 4) mentor Female 2 on using textual evidence and writing a conclusion. Elena (Female 3), in particular, takes an active role in providing feedback (lines 1-3) and explanation (lines 10-14), which are very specific and informational. Her feedback is acknowledged and received well by the apprentice member (lines 6, 9, 14), even though the degree of task control is unbalanced.

Excerpt 6.20

Female 3: Take out this one. So that if you take this out it will combine. [Reads text] Oh and for this one I would explain your evidence because it's kind of confusing on where you're going. And then—
Female 2: What evidence?
Female 4: Like why you included this evidence?
Female 2: Oh, I see.
Female 4: And then for this one I would connect this somehow because it's a little bit abrupt…what do you think?
Female 2: Yeah.
Female 3: Oh, and have a concluding sentence on how the selection applies to the claim. Okay, so the conclusion is the ending paragraph or section of an essay. In an argumentative text the conclusion reviews the thesis or claim, so I'm just going to take this one…repeats the claim… and most important evidence.
Female 2: Got it. So I should highlight the claim by repeating it.. summarizing it..

Mutuality. Group 2 demonstrated a moderate to high level of mutuality. In performing the mentor roles, the two leaders actively scaffolded the novice members through multiple strategies such as direction maintenance, instructing, recruiting interest, intersubjectivity, and contingent responsivity. In their interactions, all members were mutually engaged with each other's thoughts, actively seeking and providing help. Although their contributions and the degree of task control were unequal, they shared reciprocal responses and exhibited positive group rapport. They were open to incorporating different writing styles and constantly checked with each other to ensure that they reached a mutual consensus.

Excerpt 6.20 above is an example that displays Group 2's characteristic of high mutuality. When providing her opinion, the mentor did not only impose their views, but tried to provide detailed explanations for their feedback (liens 2-3, 11-13) and invite the novice member's contributions (lines 7-8). The apprentice then confirmed and repeated the suggestions made (line 14), demonstrating a high level of contingent responsivity. In their interactions, the expert sought to involve input from the apprentice and provided necessary assistance. The expert members are authoritative, but not authoritarian (van Lier, 1996). Rather than merely directing or assigning tasks, the two leaders provided a cognitive apprenticeship and guided the novice members through the thought process of the task. The apprentice then confirmed and repeated the suggestions made. Thus, despite the low level of equality, the level of mutuality was moderate to high.

In another example below (Excerpt 6.21), Elena facilitates the discussion by using the scaffolding strategy of recruiting interest (i.e., arousing group members' interest in the task, lines 1-2). The group then collectively engages with her suggestion to find an attractive hook (intersubjectivity). The mentors provide a safe environment for the apprentice members to experiment with a new sentence (lines 8-9). Upon being confirmed and encouraged by the expert (lines 4-5), the apprentice member regains her confidence and seeks help from the expert as she tries to 'test out' her idea (lines 8-9). This just-in-time support helped the apprentice integrate and extend the information to reach a fuller understanding. Research suggests that an environment of trust promotes continual change and experimentation, resulting in positive problem-solving (Edmonson, 1999; Johnson, 2001).

Excerpt 6.21

Female 4: How can we make it more interesting? What is the example? So we need to complete our hook today and start on our conclusion.
Female 3: Mine is not as long as Elena's.
Female 1: I don't know what to start it with to make it interesting.
Female 3: I think it's good, if we were to change it, it wouldn't—
Female 1: Wait, what if I create— "For centuries…"
Female 3: Isn't it in times of need?
Female 1: I know, I was thinking that maybe we can add more text before it. I'm just going to test it out. Cathy, can you help me?
Female 3: Yeah.

All members, regardless of their roles, appreciated the benefit of gathering different resources and strengths for their group task. During an interview, one of the mentors discussed how she learned different writing styles, commenting that "There are a lot more ideas when you work with others, so I learned a lot. My writing style is much different from hers and his so I started to learn different types of writing style."

Group cohesion. Group 2 demonstrated high levels of mutual respect and positive group rapport. The interview and group discussion data revealed that all members made efforts to seek mutual agreement. The coding results of the group discussion data demonstrated that the members frequently engaged with interactive language acts such as monitoring group effort (N=53), explaining/elaborating (N=82), help seeking (N=97) and giving (N=91). The apprentice member discussed how the mentors valued her input, stating that:

Excerpt 6.22
Pauline would always ask us, 'Can you read mine?' because she wanted to know if we all approved of her paragraph, and Jua and I would always ask Elena to read ours. We don't want to mess up the flow of our essay.

During an interview, another apprentice member emphasized that the mentor's polite and pleasant way of providing directions made them responsive to their suggestions, sharing

that "I think it's because Elena does it in such a nice way. Like 'I think this would sound better…" The expert member also reflected that she makes efforts not to be intrusive, saying, "Well, each person is supposed to have their own writing, so if we directly did, we would intrude on that. So, we just have suggestions." Compliments and appreciation helped the group build a warm and supportive community, so members felt a sense of affiliation and solidarity within the group.

Scaffolding strategies such as affective involvement also contributed to the smooth flow of collective thoughts evident in Group 1. The following excerpts illustrate that all members provide mutual support and encouragement. In Excerpt 6.23, the apprentice members encourage the mentor, praising her excellent editing skills, whereas in Excerpt 6.24, the mentors reassure the apprentice in her efforts to complete her own paragraph. Encouraged by the mentors, the apprentice figures out herself how to develop her paragraph on her own:

Excerpt 6.23
Female 2: No, I'm actually really bad at editing.
Female 1: Don't say that! Dude, Elena, you're like the best editor!
Female 3: I feel like mine already took up the whole page.
Female 1: You should be Editor of Chief!

Excerpt 6.24
Female 2: Is it bad if there is a lot of textual evidence?
Female 4: That makes it a lot better.
Female 2: Oh, okay.
Female 1: How can I… guys I can't think of any.
Female 3: What do you mean?
Female 1: Oh maybe I should start with the thesis!
Female 2: Wow! It's useful though!
Female 3: I know it's going to help me write a lot better.

In the next excerpt (6.25), the members also reflected that the collaborative writing experience drew them closer to each other, helping them build friendships outside of class. This indicates how members not only negotiate the topic, but also negotiate their relationships during the process of successful collaboration (Palloff & Pratt, 1999).

Excerpt 6.25

> Yeah, because I feel like it does help our writing together, but it also helps our relationship together outside of school. I didn't really talk to Elena or Pauline outside class, but I guess the collaboration brought us closer together. So now we can talk more and relate to each other more.

Group 2's mutual engagement and positive group rapport—as demonstrated in encouraging, explaining, and elaboration—are the core communication activities of effective learning groups (Soller, 2001). In the excerpts discussed above, group members harmoniously made joint efforts to check for agreement and achieve the shared task, illustrating a high level of interdependency among the group members (Salomon, 1992). This interdependency reduces challenges in team coordination, such as dealing with conflicts and demanding accountability (Chiu & Hsiao, 2010).

Collaborative writing strategy. Similar to Group 1, members of Group 2 experienced changing patterns of collaboration across task types. In the narrative, they engaged with the main writer style (Figure 6.4a), where the mentor took the lead role in drafting the group text whereas the other members pitched in their ideas through group discussion. In Excerpt 6.26, one member discusses how all group members contributed their ideas in the narrative task. Unlike Group 1, however, Group 2 acknowledged the leadership role of the expert member in the simultaneous group process.

Excerpt 6.26

> So we would start with one person does one sentence and then another person contributes.. and like elevates it. I don't know how to describe it. So that's

how we would start out and we'll all contribute towards it and help each other out with it. Elena would always lead us and ask our opinions along the way.

As discussed in Excerpt 6.27, Group 2 planned their narrative task by answering the pre-writing questions proposed by the mentor, and discussed the rough outline of the plot. They added details to the story in an 'as-you-go' writing style (Excerpt 6.28). This style appeared to work for Group 2 since all members effectively engaged in collaborative conversation with a high level of contingent responsivity and intersubjectivity. As their group had a strong group rapport and high level of mutuality, they perceived that their writing style worked very well. In Excerpt 6.29, one member specifically discussed how the narrative genre demanded a closer, in-depth collaboration, and fostered creativity and strong group cohesion.

Excerpt 6.27

We basically like before we started writing made what's going to happen first, what's the character's personality like, what's going to happen in the middle, how's the climax going to be. So we talk about that and as we write the story we kind of just bring more ideas and then we take out more ideas, like oh it's not that important to the story.

Excerpt 6.28

In narrative, we didn't really divide it. We all just worked together. We just wrote out our plot and used that to create our story. We then came up with more ideas as we wrote and added to the story. We got our ending as we went and when we got it we knew that was the one.

Excerpt 6.29

I actually really like it [narrative] because I'm more of a creative person. I thought it would help more with social skills because in informative you would just be like I'll talk about this part, you talk about this part. Then we will come up with conclusion and finish it. This part we had to discuss which situation will be better.

In contrast to the narrative task dominated by the mentor, Group 2's work pattern became more equalized in the argumentative and informative task (Figure 6.4b and 6.4c, participation ratios: 0.05 and 0.06 respectively). Group 2 contrasted the writing processes among the tasks, commenting that the argumentative essay was a compilation of each member's individual work, whereas the narrative task made them construct texts jointly and make reciprocal decisions throughout the writing process. This illustrates how different tasks may afford different group dynamics and subsequently affects the group's collaborative writing strategy (Li & Kim, 2016). In the argumentative and informative tasks, each member of Group 2 worked on separate sections in the body paragraph, compiled them together and engaged with peer review, which exemplifies the use of cooperative revision strategy (Excerpt 6.30). For example, in Figure 6.4b, the two mentors (blue and orange color) made additions to the paragraph assigned to one apprentice member (red color). Mingling of colors is not evident as Group 2 typically exchanged comments to suggest changes rather than directly edit peer's paragraph.

Excerpt 6.30

> We had different parts. We worked on one paragraph first together. Then we started adding more sentences. Other people did their own part and tried to add it in later. So we made the main part of the introduction first, like a base and then we kept adding individual sentences. Before we write, we came up with the decision to write about confiding and trusting in others. We basically came up with the ideas from these different stories and how they relate to confining in others and I guess we cut all those notes and compiled it into our introduction. We all pitched in our ideas.

Group 2 engaged with a similar style of collaboration in the subsequent informative writing task, and perceived that their written participation became more equal, as seen in the following excerpt. Interviews reveal that the division of sections in the argumentative and informative tasks provided the novice members with opportunities for stronger ownership

and leadership of their assigned text while still making room for joint writing in the introduction paragraph.

> Excerpt 6.31
> I think it definitely makes you have to participate more because you have to write your own body paragraph and you have to research this article or story. I'm doing *Dear Ms. Breed* in the argumentative essay and it is completely different from the narrative because in narrative you build your entire story together and it's like your ideas, but when you try to write argumentative, you have to research on your own and then you have to write your own section.

However, as discussed in Excerpt 6.32, one member further differentiated the task demands between argumentative and informative, raising a point that there is less need for in-depth discussion in the informative task. This appeared to promote a cooperative work style rather than a collaborative style.

> Excerpt 6.32
> For argumentative, we are trying to persuade a point, but for informative it was already a known fact so it's more of just informing the audience about the situation and to just give them more information. I think it was easier for this one [informative essay] because we all had the same point of view. It was easier for everyone to agree on the same thing. So you didn't have a lot of time discussing your differences.

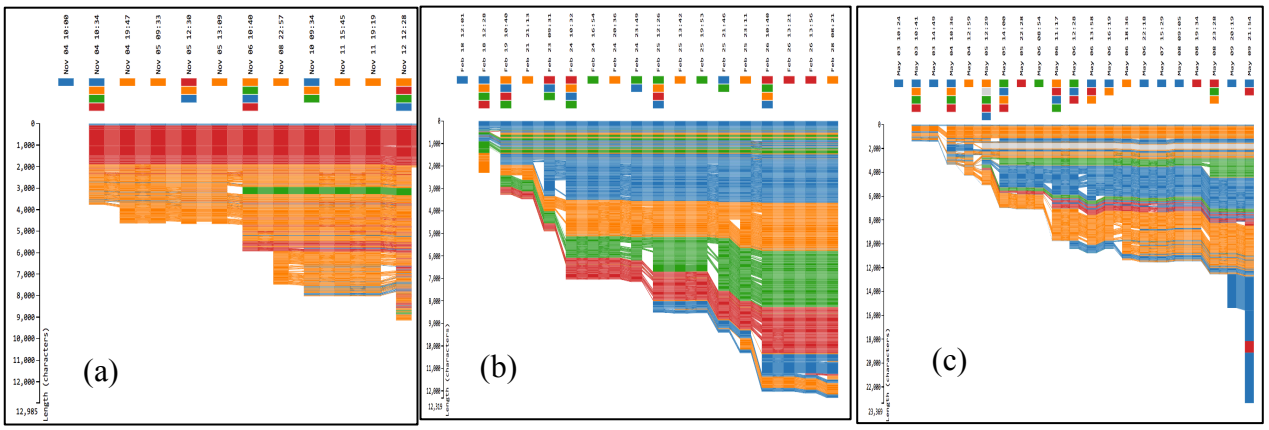

Figure 6.4. DocuViz charts that visualize collaboration patterns of Group 2 during narrative (a), argumentative (b), and informative (c) essays.

Pattern 3: Authoritarian/Passive Pattern (Group 3)

Group 3 demonstrated an authoritative/passive pattern of interaction with moderate to high equality and moderate to low mutuality. This group is consisted of five male members, three of whom were at intermediate level of writing proficiency and two who were at low-level. The group had a headstrong leader (Daniel) who played an explicit authoritarian role as a task manager and assigned tasks and roles to the rest of the group members to keep them on-task. As seen in Table 6.2, the language functions in their group discussion were far less frequent and of narrower range compared to the previous two groups. Digressions dominated their discussion (non-task related talk, 97 episodes) and one-sided communication for task management occurred: monitoring group effort (56 episodes), organizing work (38 episodes). This tendency to focus on planning was similarly observed in Arnold et al's (2009) study that revealed the characteristics of groups with low levels of collaboration. In their study, the group's extensive planning behaviors hindered focus on the project itself rather than help the group embrace collaboration. Although the team made sure that the workload was equally distributed (high equality), there were few instances of elaboration or explanation present to scaffold collective learning, as wells as limited attempts to involve members' reciprocal responses, which indicates low mutuality..

Equality. This group involved a clear role of divisions, under the leadership of Daniel, who voluntarily assumed the role of an explicit leader. The leader had a strong belief in the necessity of a leader, and valued fair distribution and efficiency of group work. In the next excerpt, Daniel described his leadership role as a task manger, rather than a guide or tutor who provided guidance or scaffolding support, as in the case of Group 2.

Excerpt 6.33

Daniel: They were disorganized at first and I just kind of assigned them [to tasks]. I don't want to say I told them, "you do this, you do that" I just kind of thought it would be easier. I don't tell them what to write about, I just tell them to put their stories in. I don't completely write their paragraphs for them. I just make sure that everything is done on time; I'm more like a task manager.

He felt strongly that a leadership role is indispensable for productive and effective group work. He deemed his role crucial, but he reflected that the experience was not enjoyable. In the next excerpt, he discusses the concept of 'power,' which he perceives essential to facilitate the progress of group task.

Excerpt 6.34

I think the group members; they work at their own skill levels and rates, and sometimes they just need a little push. So I say maybe you should write this words instead of that. I just try to get them to work faster? Letting someone lead is definitely less stressful. You don't have to think when are we going to meet; what're we going to do when we meet. It's not like I enjoy leading. I see it as a necessary role. There needs to different roles. Everyone should be put what they're best suited to do, but no one should be given more power than others. Well, there should be power. But the ones who have power—but they should be the ones that know how to use it. They don't necessarily have to know how to lead, but I think in the leader, the most important part is when to push things; when to step into situations.

His main concern as a leader was to make sure there was equal distribution of work and task control. In describing his role, he said, "Sometimes it can help having slow people and fast people, but it's important not to let the fast people overtake the slow or the slow people to do things that the faster writing people wouldn't understand." The following excerpt of the group discussion (Excerpt 6.35) illustrated Daniel's frequent use of 'direction maintenance' strategy to facilitate the group process. He dominated the conversation, and giving directions concerning, for example, asking the members to answer the pre-writing

questions that he assigned (lines 3-4) and completing the reflection sheets (lines 11-13). He emphasized that all members should equally contribute to the task, stating that he tried to 'making it even (line 4)' in assigning tasks and that 'they deserve to write it out (line 13).' In this dialogue, Daniel dominated the dialogue and appropriated the task, without making efforts to invite the other members' input.

> Excerpt 6.35
> Male 1: So you guys should start reading your books. Do you want me to set up a forum for you guys?
> Male 1: I'm going to be reading- one I feel like you have to go more in depth. I tried to make it even. I got one really short one and one really long one.
> Male 1: It's the short one.
> Male 2: Since his is short, Ryan, why don't you take "Hitler Youth" That way it's easier.
> Male 2: What am I doing then? Do you have headphones? I have to read.
> Male 1: When you guys are writing try not to just do the bare minimum, like try to go in depth. You read both of those and answer questions for now.
> Male 1: I created reflection sheets for all of you. Everyone help each other out, make sure you talk to the person when you change the question because it is their question and they deserve to write it out.

The leader further explains that he took into consideration the members' writing abilities when dividing the roles. He explained:

> Excerpt 6.36
> Like Ryan and Jun did a lot of the study activities, and they just read a lot of them and summarized them into a really short thing and gave it to us so we can understand it faster. It was a lot of our ideas and we did a lot of editing. Ryan and Jun still added to the project they just didn't do as much. More of the pre-writing activities, and answering questions.

The members with low-proficient writing skills (Ryan and Jun) were assigned to do simpler tasks such as summarizing or answering pre-writing questions that Daniel set up for them. Arnold et al.'s (2009) study on wiki-based collaboration similarly pointed out that the

authoritarian stance of an explicit leader tends to make other member's contributions streamlined and less active.

Mutuality. This group displayed a low level of mutual engagement, characterized by one-sided directions, lack of reciprocal responses, and scattered pattern of interaction that often steers the conversation away from the common goal. Although the other members passively responded to the leader's direction, they were generally disengaged from discussing ideas and often expressed frustration. In the following interview excerpt, the leader reflected that he did not seek other members' input to reach mutual agreement, and instead, "made the decisions for everyone." His attitude illustrates that the group failed to engage with intersubjective meaning-making, which occurs when multiple participants contribute to constructing 'inter-related interpretations' (Suthers, 2016).

> Excerpt 6.37
> I don't really see myself--I kind of just make the decisions for everyone. I don't really ask; I just, you know, like we should do everything like this or you should try it like this or something.

The members occasionally provided help by revising each other's texts, but this kind of assistance was often unsolicited and lacked explanation or justification. This represents a *lack of awareness*, which is an important characteristic of inefficient collaboration. For an interactive, intentional, and mutually beneficial collaboration to be successful, it is imperative that all the participants be aware of each other's actions and contributions. This helps to establish trust among participants (Shah, 2010). In the following excerpt (6.38), Male 4 had apparently revised the group text, but did not tell the other members. When another member, who later found out about Member 4's revision, followed up, Male 4 did not provide any explanation. He criticized the length of the text instead.

Excerpt 6.38
Male 1: Did you revise all of it?
Male 4: Yeah.
Male 1: You read through it all? Even my paragraph?
Male 4: Yeah. Well, I read yours, but I forgot everything about it because it was ridiculously long.
Male 2: Dude, yours was ridiculously long.

A lack of explanation or elaboration during group discussion often leads to frustration. As illustrated in the next excerpt (6.39), Group 3 did not provide explanations when they engaged with peer-editing. Member 3 is frustrated about the unexplained change to what he perceives as 'the perfect ending hook (line 2)' and feels offended. However, Member 2 (Ryan) does not respond to his frustration and ignores his request for an explanation.

Excerpt 6.39
Male 3: Ryan, what happened to the last five lines of the conclusion. What did you do? I wrote like the perfect ending hook and everything.
Male 2: Press command Z. You can just go to see changes.
Male 2: Daniel, you can add it in. I finished.
Male 3: He wrote in the wrong one.
Male 2: Why'd you bring all of us then?!
Male 3: (sigh) Just one more class.

When asked about the reason why he did not provide any explanation for the changes that he made, Member 2 defended the changes since they did not affect the content, especially when there was a Google Docs revision history to track the changes (Excerpt 6.40). However, when asked if he thought the other members would have the same attitude toward the peer edit, he said the group never discussed it and he did not care about other members' reactions.

He explained:

Excerpt 6.40

> I don't care how much they change mine because if I read it and it doesn't sound off, then I don't even notice they changed it. Then it's fine. If you read it and nothing seems off, and it doesn't sound wrong and all of your ideas are there, then your writing is fine. What are you going to do about it? And if anything, there's a feature and you can get your writing back.

The following excerpt (6.41) further illuminates Group 2's lack of mutual engagement. Their group discussion was mostly checking the progress of work, and was concerned superficial features rather than in-depth, reciprocal discussion about the content. The group unduly focuses on efficiently getting the job done and does not make an effort to provide feedback to improve the quality of their group task. During the conversation below (Excerpt 6.41), the low proficient writers' (Member 3, Member 5) requests for discussion (line 2) and feedback (lines 4-5) were ignored by other members (lines 3, 7-8), who instead encouraged them not to be concerned about the quality ('it doesn't have to be good'), and urged them to finish the task. This dialogue exemplifies the characteristics of less productive collaboration, which is marked by a lack of active listening and mutual responses (i.e., contingent responsivity), with each partner focusing on individual inquiry rather than intersubjective meaning-making (Castek et al., 2012).

Excerpt 6.41
Male 4: Are you done?
Male 3: What's it about?
Male 4: Why are you asking what it's about if you already read it?
Male 3: I read it two weeks ago. Wait, I can just quote him, right?
Male 5: For mine, I don't know if mine fits because how she responds isn't exactly good…she just accepts it.
Male 1: Then write it. It doesn't have to be good; just say how they respond. Sam, start writing.

When asked about this episode during an interview, one of the low-proficient writers reflected that he often felt ignored and unvalued by his peers. He explained that, "They just

don't say anything. I don't think they take into account my comment or my opinion. We don't share that much comment in the group. They don't really care about the comment." My year-long observation revealed that such perceptions ultimately limited the low proficient writers' engagement in group discussion and even made them withdrawn. They were constantly checked for completion of their own portion of the work and passively responded to the leader's expectations. A similar concern was raised in Hale's (2003) study that revealed that groups with self-appointed, authoritarian leaders tend to be productive, but suffer from low morale and stifled creativity.

Group cohesion. Qualitative analysis of interviews, group discussion, and observations indicated the low level of group cohesion in Group 3. There were frequent instances of communication that illustrates negative group rapport and low levels of safety and trust. These are key factors that lay an important foundation for successful collaboration (Bikowski, 2016; Duarte & Snyder, 2001). For example, Group 2's discussion often involved negative comments such as blaming and complaints, which led to 'disputational talk (Wegerif & Mercer, 1996).' In the following segment of group discussion (6.39), one member complained about the other member's deletion of his text without any explanation (line 3), but his question was ignored by other peers (line 4). Rather than engaging in collective inquiry upon the request for explanation, members of Group 2 were obsessed with making progress on their group task according to the schedule. They complained about a low-proficient member who has a slow work pace (line 1), and consequently leave him behind (lines 5-7). This lack of effort in involving the all members subsequently led to the exclusion and non-participation of members with a slower work pace.

Excerpt 6.42

Male 2: Finish yours already? You still have one question. Two. Sam never finished it.
Male 3: Did you delete my question? Daniel did you delete my question?
Male 2: Dude, it's just a question.
Male 3: Is everyone done?
Male 2: Wait? Can we go without him or do we have to wait?
Male 1: We can go without him he only has two questions.
Male 2: Okay, let's just go without him.

The following group discussion (Excerpt 6.43) shows another example of Group 3 engaging with the 'blame game,' which often causes the conversation to derail. Scaffolding strategies such as affective involvement were frequently observed in collaborative groups (Groups 1, 2); however, they were absent in Group 3's discussion. Members complained about the leader's criticism and authoritarian attitude (lines 1-3). Male 2 attempted to initiate a group discussion about textual evidence (lines 4-6), but the conversation derailed and was interrupted by Male 4 (lines 8-9). As cautioned in previous studies, teams with lack of trust and safety typically end up focusing on individual work with little collaboration; they also suffer from non-participation and team attrition (Edmonson, 1999; Johnson, 2001). Observation notes mention that members of this group often raised their voices and frequently expressed feelings of dissatisfaction and frustration.

Excerpt 6.43
Male 3: Let's just let Daniel write it. He always says we don't do anything and he doesn't do anything. He blames everyone else for his action.
Male 3: Everything that Daniel says in his introduction doesn't make sense.
Male 2: There's two World War IIs; which one are you going to use? We'll go with the shorter one then. Oh, they're in different sentences.
Male 3: It doesn't go with the thesis statement.
Male 4: Are we actually going to work on the body paragraphs or are we going to play the blame game? Seriously we should stop playing the blame game.

Group 3's negative group rapport is also manifested in the members' lack of politeness strategy in providing feedback. The members rarely generated constructive criticism, potentially because they did not build a safe and trusting environment to encourage and accept exploratory talk (Bikowski, 2016). In the following excerpt (6.44), Male 2's feedback was not accepted with contingent responsivity (lines 1-2), and was avoided with a defensive attitude by Male 3 (lines 2, 3). This pattern of discontinued discussion is observed repeatedly in Group 3. This group often gets distracted by unnecessary details and loses focus on the topic at hand, revealing their inability or unwillingness to negotiate and reach consensus. It shows a lack of collaboration strategy such as *aggregation*, which refers to the group mechanism that is critical for turning individual inquiry into a collective decision (Surowiecki, 2004). In the following excerpt, Male 1 commented on Male 3's text in an offensive manner, criticizing it as 'so undermined' and 'exaggerating' (lines 5-6). Observation revealed that Member 3 felt offended by the other members' apparently rude criticism and did not make any revisions. The members felt awkward about Member 3's silence, and went back to focus on their individual work. The members in Group 3 remained distant with each other and rarely engaged in collective inquiry.

Excerpt 6.44
Male 2: Daniel, I think you should improve your points. Some are weak.
Male 3: I only made one point, how can it be weak?
Male 2: I haven't read through the whole thing yet.
Male 3: Then read through the whole thing.
Male 1: What did you mean in Creed? In the first question you answered. It sounds so undermined. It sounds so under exaggerating.
Male 3: (Feeling offended and does not respond)

Collaborative writing strategy. Despite the low level of mutual engagement, Group 3 ensured that their written contribution had to be equal. Their emphasis on fairness and efficiency consequently led them to adopt the parallel writing strategy (i.e., divide and conquer) in all three tasks. In the following excerpt, the leader stressed that completing the individually assigned section by the deadline was the group's key concern.

> Excerpt 6.45
> Usually a couple of us will write the intro and the rest of us will write the conclusion, and then we'll switch to look at each other's. We just thought it would be more efficient because we can do both paragraphs at once, and we can just switch everything. That's the beauty of the setup we have going. So as long as we have a date, like, let's finish by Monday we'll be fine.

As visualized in Figure 6.5a, the revisions on individually assigned sections were not cooperative, but rather dominated by the leader (blue); particularly in the narrative tasks. Apparently, the other members, with the exception of the leader, did not spend much time revising the combined text after they compiled the individual sections. At the later stage of the draft, the leader (blue) deleted the texts written by the other members (red, green) and rewrote them, which explains why the evenness of participation is low (0.13) despite the group's focus on equality.

Group 3's consistent style of writing was different from the previous two groups', which typically showed changing patterns across different genre demands. For the narrative task, other groups engaged with the synchronous hands-on or main writer strategy. In Group 3, however, the leader discussed that having the main scriber or writer for the group was not fair, so he was cautious about dominating the writing process. For the narrative essay, Group 3 then decided to "all work on different branches of the story and try to merge them

all together" so that the work would be evenly distributed. He discussed that he tried to adjust to the pace of the other members, stating:

> Excerpt 6.46
> I'm not usually the first one to write. I type at my own pace too but I just think if I'm gonna write at my own pace, then others shouldn't-- Watch them to make sure they aren't slower than me."

During the interview, the leader explained that he had his group spend sufficient time planning for the plot and structure so that all members could work their assigned sections independently (i.e., parallel writing strategy) without further discussions. Therefore, collaboration did not occur throughout the writing process, but instead, was concentrated in the planning stage. He discussed the following:

> Excerpt 6.47
> We kind of just tried to stick to the same idea because we had a pretty thorough pre-write, we kind of just went from there and added details along the way. If we didn't like them we would take it out and put more in.

Although the lack of discussion may have increased the group's task efficiency, it was negatively perceived by other members, particularly those with lower writing proficiency. In Excerpt 6.48, one struggling writer discussed how he felt that his ideas were not incorporated during the process, and as such, he preferred individual writing. Previous studies have warned against the drawback of involving an authoritarian leadership in collaborative group work. A group with a strong, dominant leader does not benefit from mutual interaction (Thompson & Chisamore, 2007; Wang, 2010).

> Excerpt 6.48
> Most of the time I just like writing by myself. In the narratives, everyone is always telling me what to do. My ideas were often not incorporated. I feel more comfortable writing my own thoughts and I can do that in argumentative writing.

In the argumentative and informative essays, members' written contributions were more balanced (Figures 6.5b and 6.5c, respectively) since the division of sections became more transparent in the two genres (i.e., the five paragraph format) than in the narrative task with open structure (participation ratios: narrative 0.13, argumentative 0.09, informative 0.07). In the following interview excerpt (6.49), one member discussed how he found informative writing to be the easiest since there were fewer conflicts over different ideas. He further explained that he had a strong textual ownership for his own section and didn't want others to edit his text.

Excerpt 6.49

> I feel like this one [informative] went a lot smoother because there weren't people shouting at each other trying to get their ideas forward. I kind of like the fact that once you're done with writing, you can't edit. So people can't really judge you for what you say because you can change it later on.

Research has suggested that this tension between collaboration and individual ownership typically occurs in group tasks and may cause critical issues if left unresolved (Caspi & Blau, 2011). In Group 3's case, the low level of mutual engagement and negative group rapport contributed to the members' reluctance in providing and accepting each other's comments or peer edits. The members' strong textual ownership is reflected in their use of parallel writing style (i.e., divide and conquer) based on cooperation rather than collaboration. The use of parallel writing style also reflects how the group views the collaborative writing product as the mere sum of individual work rather than a collective product resulting from mutual engagement.

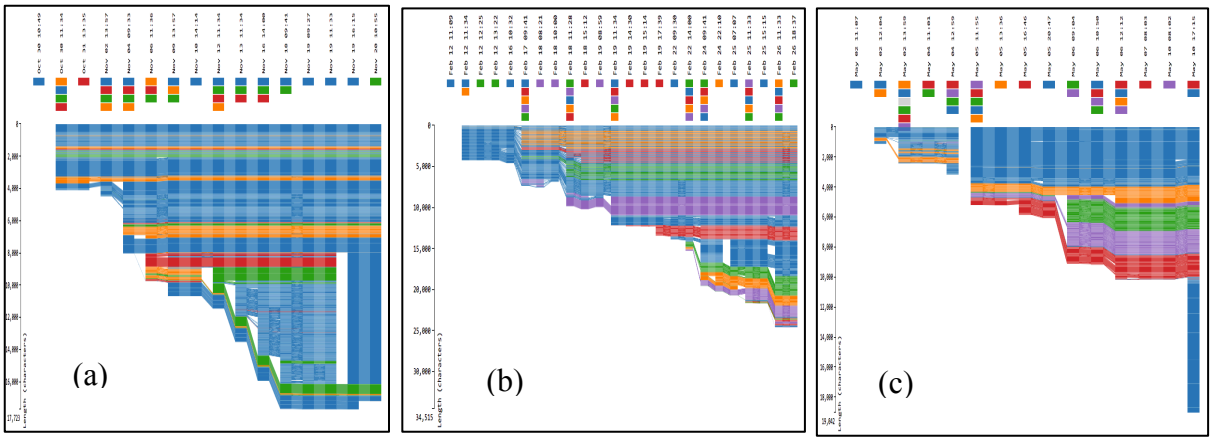

Figure 6.5. DocuViz charts that visualize collaboration patterns of Group 3 during narrative (a), argumentative (b), and informative (c) essays

Pattern 4: Reluctant /Withdrawn Pattern (Group 4)

Group 4 demonstrated a dominant/withdrawn pattern of interaction that involves imbalanced individual contributions (low equality) and lack of reciprocal responses (low mutuality). This group was a mixed-ability group with the widest range of ability gaps among members (i.e., high, intermediate, low level of writing proficiency). It consisted of one male member (John) with the highest writing proficiency, a female member with an intermediate level of writing proficiency (Yuri), and two male members with low writing proficiencies (Inho, an English language learner, and Dan). In contrast to Group 3, this group did not have a leader or an explicit division of roles. The two members—the male member with the highest writing proficiency and the female member with an intermediate proficiency—reluctantly took on the responsibility of compensating for their fellow members' lack of contribution. The group also failed to engage with each other's ideas and reach a shared understanding.

Analysis of the group discussion demonstrated that they had a relatively low distribution of language functions of all types, and instead engaged in irrelevant social talk (77 episodes). There were a few instances of initiating activities (22 episodes) or executing

group skills (21 episodes), demonstrating the lack of active and voluntary leadership. Negative group cohesion also characterized this group. The members who had to assume the roles of main writers were discontent with their groupwork and felt that the limited contribution from other members was unfair. In contrast, the withdrawn members felt excluded and burdensome, which led them to assume passive, subservient roles.

Equality. This group demonstrated a low level of equal contribution and degree of task control. Unlike Group 3, there was no explicit discussion about role divisions or plans for group writing. The participation ratio was extremely unbalanced, particularly in the narrative task (0.25). In the next excerpt (6.50), the male writer with the highest writing ability discusses how he reluctantly took the main writer role, and complained about uneven contributions from the other members.

> Excerpt 6.50
> I wasn't really the leader; we didn't decide it was going to be our job. I told them (the two male students with lower writing abilities) just read and add whatever they wanted to and then the rest of us would go through it and add more like vocabulary words, or fix grammar mistakes, or just add more to it.

Without establishing norms and rules on how they wanted to proceed with their groupwork, the group members felt confused and unprepared at the beginning. Even though they were confident about using the tool (i.e., Google Docs), they were new to synchronous group writing and editing. In the first narrative essay, the main writers attempted different strategies, but the use of writing strategy was not fully discussed among the members. For example, they tried the sequential writing strategy in the narrative task, as one member explained: "One person would type and then we would have another person revise and continue to type. We do not plan or make an outline." In Excerpt 6.51, members were confused about who was doing what (lines 4-7), since there was no clear direction and

mutual agreement in the planning stage. It illustrates their lack of awareness of group activity (Shah, 2010), a particularly important component of effective collaboration in synchronous settings.

> Excerpt 6.51
> Male 1: Are you guys almost done?
> Male 3: Dude, we didn't even start yet.
> Male 2: Hey, what do we do?
> Male 2: I type whatever I want.
> Male 3: Who is doing this?
> Male 1: I have no idea. It's actually kind of—
> Male 3: It must be Inho. He's doing it.
> Male 1: I know, but how would you do it?
> Male 1: No, but seriously how do you do it?
> Male 3: I don't know. Ask Lauren. It must be her.

Group 3 soon realized that the sequential writing strategy did not work because of the limited writing ability of an ELL peer, who found it challenging to spontaneously write a sentence in a second language. One member explained that synchronous typing was too confusing, stating, "I think the best way to do it is to divide it up instead of having everyone type all at once because then it would have been too confusing." Group 3 subsequently decided to use parallel writing strategy (i.e., divide and conquer) so that the work would be evenly distributed. The main writer stressed the importance of equal contribution, defining good collaboration as, "working together and having everyone do their equal share." However, his opinion was not communicated openly with the group members, and he ended up complaining about unfair participation. He expressed his frustration, commenting the following:

> Excerpt 6.52
> It's kind of unbalanced. Some of them don't really participate. It's kind of frustrating because it's two people doing all the work. The other people. They just

> talk and don't do much. It's just that the smartest people do all the work and the others are just on the side.

The two main writers particularly stressed that the ability gaps among the members caused the problem of unequal contribution. Even after changing the collaborative strategy to separate writing, the problem remained. Lauren, one of the main writers commented that the low-proficient peers need help, pointing out the following:

> Excerpt 6.53
> "They're not as experienced. A lot of them are from Korea and we have to help them. It's because Jun was new to America so he is still learning to write. We just helped him write. Dan is good at writing, but John and I edit his writing a lot. Sometimes it was too short so we just wrote it for him."

She further discussed that the main writers do not usually explain or provide feedback to the low-proficient writers, but instead "just write for them," unfairly taking over their assigned portions of writing.

Similar to Group 3, this group also prioritized work efficiency over shared understanding. At first, they decided that each person would write the introduction of the group essay so that they could later pick the best parts from individual texts. However, Excerpt 6.54 illustrates that they soon dropped the idea for the sake of work efficiency (lines 6), and decided to have one proficient writer (John) take over while others 'just add on (lines 7, 9).' In this discussion, they emphasized 'progress (lines 3, 4)' of group work. Previous studies have warned that conflicts may arise due to different work paces and writing fluency, particularly in groups with low proficient writers (Wang, 2010). Time pressure often posed challenges to these groups, as members may not be prepared to engage with discussion and reach a common consensus during a short period of time (Wang & Woo, 2017). These challenges hindered members from participating and contributing

equally, as in the case of Group 4.

> Excerpt 6.54
> Female 1: So, John I was just wondering for your text you're going to use that as evidence, right? And you're not going to call Dan anything? Any names? I'm going to leave this here just so we can keep track of your progress.
> Male 2: Your progress is very important to us, John.
> Female 1: We need to look up the word, 'pungent.'
> Male 3: Why are we all making our own introduction; that just takes more time.
> Male 1: You can just add on to mine. I already started.
> Female 1: Because that's just going to take too much time.
> Male 1: That's why I'm saying, just add on to mine.

Mutuality. A lack of mutual engagement was also salient in Group 4's interaction. As reflected in Table 6.2, their group discussion had the lowest language functions across all categories and is characterized by irrelevant social talk (97 episodes). In Group 4, there were very few instances of help sought or offered (17 and 13 episodes, respectively). Occasional requests to jointly solve the problem were not responded by the members and, therefore, did not lead to divergent thinking or shared understanding. As illustrated in the following group discussion (Excerpt 6.55), the higher-level peers complained about the poor quality of the text written by Male 3, an ELL peer, but did not provide suggestions or solutions on how to help him. Instead, they decided to write the rest of Male 3's text (line 9) without consulting with him or providing assistance so that he could revise his own text. The other peers made a quick decision to write for him due to time constraints. Male 3 felt uncomfortable and awkward about seeking help (observation notes).

> Excerpt 6.55
> Male 2: [Complaining about Male 3's text] It's so stupid though, how it ends.
> Male 1: [Whispering] I won't tell him.
> Male 2: [Whispering] It's so stupid though.
> Male 3: Is it too late to change my text?

Male 2: Well, if you're already finishing it.
Male 3: There's too much to write about. When's it due?
Female 1: Monday morning.
Male 2: Hurry up, man. Monday morning.
Male 1: Shouldn't we write the rest of it?

The two main writers did not provide any explanation or guidance to help the writers understand and learn from their feedback. One of the main writers discussed that she believed providing explanation would not be efficient or expected because the lower-level writers may not understand it (Excerpt 6.56). She further commented that the low proficient writers were okay with peer edits since they understood that they needed some help.

Excerpt 6.56
It was hard for him to write because his English is not developed. We edited it and added sentences to parts we didn't agree on. Well I didn't tell them, I just edited it. They said that we could change it because they knew that there needed to be some changes.

Not realizing the need to engage in group discussion, the members remained relatively silent throughout the writing process. There were especially few contributions from the passive, withdrawn writers. Snippets from members' interactions further illuminated this group's disorganized and confusing communication pattern. In the following segment (Excerpt 6.57), the members were confused about designated responsibilities and were unable to exchange any constructive feedback. Their conversation did not lead to collective inquiry, and became argumentative and defensive (lines 8-9). Such deficiency in the discourse quality was often observed in the technology-supported collaborative work among passive or reticent groups (Chiu, 2003).

Excerpt 6.57
Male 1: I can help with introduction still. You need to work on the body paragraph.

Male 2: Dude, this isn't my introduction it's my body.
Male 1: It's not going to be exactly the same. A thesis is a broad statement.
Female 1: The thing I wrote wasn't the paragraph it was part of the introduction.
Female 1: You do type a, okay? I didn't even edit it yet.
Male 2: Dan, I was editing this. Chill. I'm just going to edit it.
Female 1: This is what I have so far, he edited--
Male 1: What have you done so far?
Male 2: Nothing! I didn't do anything.

Group cohesion. Group 4's negative group cohesion was implied in several episodes introduced earlier. Their interaction consisted of mostly negative content, characterized by lack of trust and feelings of frustrations. Unlike the collaborative groups (Groups 1 and 2), there were few instances of affective involvement or positive encouragements. Instead, they often engaged with irrelevant social talk and blame, as seen in the following excerpt (6.58). The members found it hard to keep themselves focused on central ideas.

Excerpt 6.58
Male 2: Why did you write this?
Male 1: I'll give you twenty bucks if you find it.
Female 1: I have a headache. I'll work anyways.
Male 3: Can I sit there, please?
Female 1: Wait, why? What does it have to do with seating?
Why do you want to switch seats?
Male 1: It's for the project. What did you do?
Male 2: Internet!
Female 1: Why do you write so tiny?

Group 4 did not have any norms or strategies for providing feedback. Similar to Group 3, the members of Group 4 were not skilled in providing feedback and ended up offending the writer's feelings. In the following excerpt (6.59), the higher-ability peers pointed out an error in an ELL peer's (Male 3) text and expressed frustration over the struggling writer's

lack of grammatical knowledge (lines 3-5). Observation notes revealed that peers' harsh and impolite critique about the grammatical mistake apparently hurt the struggling writer's feelings.

Excerpt 6.59
Male 1: Hey Inho. Do you see this?
Male 3: What?
Female 1: Just don't use contractions.
Male 3: I don't even know what those are.
Female 1: [In a harsh, ignoring tone] Oh my God. Can't, cannot. Don't and do not.
Male 3: [Feeling offended] You know what, I got this.
Female 1: Okay.

During a follow-up interview after this episode, the ELL peer discussed feelings of discomfort, saying he felt like he was a 'burden' to his group (Excerpt 6.60). He also mentioned that he prefers individual work because he feels more comfortable with it. He did not feel supportive or safe about collaborating; he felt offended and ignored. In an apologetic tone, he further discussed that he did not feel ready or prepared for this groupwork, and would rather want to ask his tutor for help. The lower-level peer was struggling with his own limitations as an ELL and felt sorry for the group.

Excerpt 6.60
If I make a grammar mistake or it doesn't make sense I feel like I'm a burden. I just want to do individual because if I get something wrong I can just ask my tutor for help and that makes me the most comfortable.

However, the higher-level peers did not understand or sympathize with the struggles of ELLs, and rather blamed them, saying "I think they are just lazy. I'm pretty sure they can do it. I did the introduction and Lauren did the conclusion. It's not really fair." The contrasting perceptions from the peers with ability gaps suggest the instructional need for helping

students understand each other's challenges and strengths, as well as teaching them on the components of effective feedback and scaffolding strategies.

The case of Group 4 illuminated the importance of positive group rapport and sufficient planning, which can be a foundation for conflict resolution, mutual interaction (Dale, 1997), and negotiation (Fung, 2010). These are particularly important for promoting participation and inclusion of struggling writers who have multiple challenges: lack of writing confidence and ability, as well as challenges of adapting to new writing platforms and groupwork norms.

Collaborative writing strategy. Group 4 exhibited changing patterns across the different tasks. As discussed earlier, they initially attempted to engage in a sequential writing in the narrative task, where members take turns to complete a paragraph while others edit. Excerpt 6.61 explains how the group used synchronous editing and writing features to have each member take turns to write one paragraph while the other members edit it.

> Excerpt 6.61
> One person writes the paragraph then the next person reads it. Then they write a paragraph while the other people are editing whatever was written down. While the next person is typing the paragraph, they edit the one that was written before it, so that they could correct it.

However, the group did not have sufficient planning and discussion about their collaboration strategy. The sequential writing strategy did not work very well with the group, potentially due to the writing proficiency gaps among the members (see the earlier discussion on Equality, for more details). As seen in the figure 6.6a, halfway through the writing, the main writer with the highest writing proficiency (orange color) deleted the text other members had contributed and dominantly rewrote the text. During interviews, the

main writer further discussed the difficulty in having to 'write together' the narrative essay, which he perceived to be too open and unstructured. In Excerpt 6.62, he explained that narrative writing was confusing and led him to assume the role of the reluctant main writer. He preferred the argumentative and informative tasks since members can divide sections and work individually, for example, as in a separate writing style.

> Excerpt 6.62
> Because argumentative and informative, it's better because everyone is writing their own and it's not everybody trying to write together like narrative. I definitely wouldn't recommend that because it's so free and open, but everyone is trying to-- it's really bad. That's why in the end I was like guys just tell me everything and I'll type it out.

The member's contributions became more balanced in the argumentative and informative tasks (Figure 6.6b and 6.6c, respectively), as they adopted a parallel writing strategy where each person was assigned to write one body paragraph (participation ratios: 0.07 and 0.09 respectively). However, the contribution from the lower-ability peers (red, green) remained minimal, particularly in the argumentative task (Figure 6.6b), and the main writers (orange, blue) ended up adding significantly to their texts. In the informative task, such one-sided help (e.g., addition) did not occur. Even though the first paragraph (i.e., introduction, in green) was written by the main writer (green) in addition to his own assigned section, members generally kept to their own sections and rarely crossed into the text someone else wrote (Figure 6.6c).

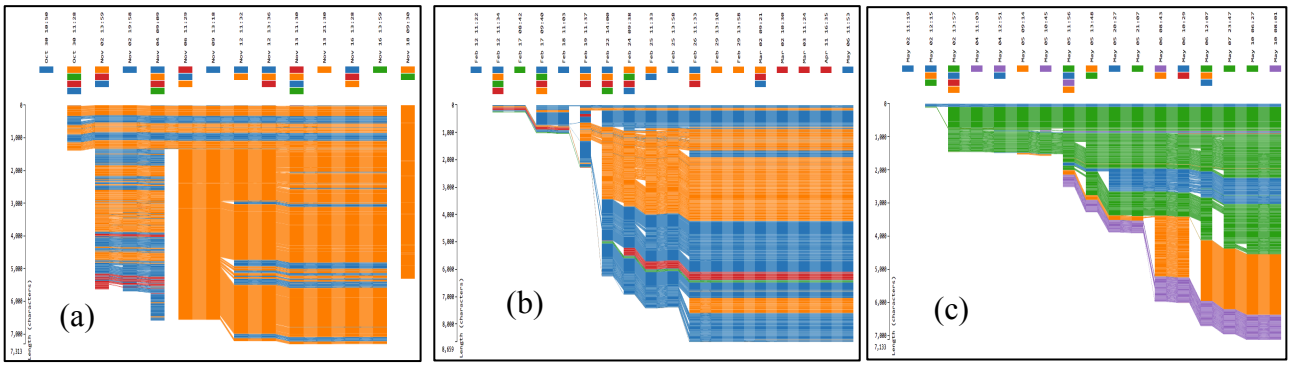

Figure 6.6c. DocuViz charts that visualize collaboration patterns of Group 4 during (a) narrative, (b) argumentative, and informative (c) essays

CHAPTER 7

Results for RQ 3: Textual Outcomes of Collaborative Writing

To understand the outcomes of students' collaborative writing practices, I examined how collaboration characteristics are related to the quality and linguistic traits of the group texts. Specifically, I conducted multivariate regression analysis in which the different characteristics of collaboration (e.g., evenness of participation, editing amount, collaborative writing strategies, ability grouping) were related the two different measures of group text outcomes: 1) analytic scores of human-graded textual quality (i.e., content, organization, language, mechanics) and 2) computational measures (i.e., Coh-metrix) of the linguistic traits (i.e., lexical diversity, textual cohesion, syntactic complexity).

Three separate sets of multiple regressions were performed to examine these relations in each task type (i.e., narrative, argumentative, and informative), controlling for document lengths, group members' writing ability gaps, and number of authors. As explained earlier, this approach was chosen over a single regression with task types as dummy variables, as I am more interested in understanding the distinct patterns across task type, rather than overall patterns where task type is controlled as a covariate.

In all regressions, document length, number of authors, and groups' ability gap (i.e., Ability means: group means of writing proficiency, Ability range: gap among member writing proficiencies) were controlled as covariates. During the process of building the model, I used a step-wise regression approach and trimmed variables that had no significant effect on the results in order to preserve parsimony and gain maximum explanatory power.

For example, interaction terms by grouping status and editing amount were removed in case of no significant effect. In the final model, the beta coefficients were reported in order to compare the relative strength of the multiple predictors within the model. In addition, I used robust standard errors clustered by strategy type since each essay was classified as one of the five strategy types. The use of adjusted standard errors accounted for the multi-level nature of the essay data.

Lastly, I performed the False Discovery Rate (FDR) correction to account for multiple comparisons, which can lead to inflated estimates of the statistical significance of findings (Clearinghouse, W.W., 2014) . I used Benjamini and Hochberg's (1995) Linear Step Up procedure to control for the False Discovery Rate (FDR) associated with multiplicity of both predictors and outcomes. The BH correction reduced the possibility of making type I error. The calculation process was supported by WWC Phase I computation tool (Clearinghouse, W.W., 2014). The BH adjusted p-value (*pi'*) is calculated as follow: the rank of unadjusted p-value is first multiplied by alpha (0.05), and then divided by number of comparisons within the domain. Table 7.1-7.3 shows the initial results based on the unadjusted p value, with the BH-adjusted *pi'* value marked in bold. After the BH correction, the cut-off alpha was adjusted. The results were significant if $pi' < 0.0029$ and $pi' < .0.0007$ for narrative and argumentative, respectively. There was no statistically significant finding in the informative genre after the BH correction. Below I discuss only the significant findings based on the BH correction. Qualitative findings from analysis of interviews, surveys, and observations were also provided to strengthen the interpretation of the quantitative findings.

Narrative Task

As seen in Table 7.1, imbalance of participation (note: higher value indicates imbalance) predicted higher quality in organization (*β=1.273*, *p=0, pi'*=0.0018). The more evenly members contribute to the narrative task, the weaker organization the group text has. Next, the number of authors in the group text was strongly associated with overall text quality. Interestingly, having more authors was associated with lower overall scores (*β*=-1.34, *p=0, pi'=0.0014*). Given the genre characteristics of the narrative task that involve an open and creative structures, it appears that having too many authors engaged in group writing processes can be confusing and present a significant challenge. Another noteworthy finding is that more self edits predicted stronger organization (*β*=2.54, *p=0.001, pi'=0.0029*). This implies that polishing the organizational structure can be effectively done when members engage more actively in self edits.

Regarding the effects of collaborative writing strategy, the use of synchronous hands-on strategy found to be more effective than main writer strategy in narrative composition, particularly in terms of content (*β*=0.79, *p=0.001, pi'=0.0021*). The results suggest that in the narrative task, strategies soliciting spontaneous inputs from authors, such as synchronous hands-on style might be effective for building narrative storyline and fleshing out the content as they go. It should be noted, however, that this could be influenced by the prompt. As seen in Table 4.4, the narrative prompt was much more open and uncontrolled than the other two tasks. This may indicate that group composing of open-structured, creative tasks that involve constant and flexible development of ideas can be more suitable for utilizing the simultaneous writing and editing features of new technology tools, than academic essays with formal structures.

No statistical significance was found regarding the association between ability grouping status and textual quality. However, there was an interaction effect between grouping status and the amount of peer edit in one computational measure: lexical diversity. For same ability group, the amount of peer edit was more strongly associated with stronger lexical diversity ($\beta=0.24$ for same ability group, $p=0, pi'=0.0014$).

Argumentative Task

In contrast to the narrative task, there was no significant relationship between even participation and writing quality. This may be due to the different genre structures. Compared to the narrative genre that involves open structure, argumentative task typically has a more formal and closed structure and may be less sensitive to the participation evenness. There was also no statistical significance in the editing amount, number of authors, document length, and the quality of planning.

With regard to collaboration writing strategy, the results showed that the use of the parallel writing strategy was more effective than the main writing strategy in the argumentative genre. Compared to the main writer strategy, writing strategies characterized by equal distribution of work (i.e., parallel writing) appeared to be more effective in the argumentative task, particularly in the area of content ($\beta=1.69, p=0.001, pi'=0.0007$). This may suggest that the pooling of different ideas in the structured format can lead to enhanced content of a group essay, despite the explicit division of work.

Similar to findings in the narrative genre, no statistical significance was found regarding the association between ability grouping status and textual quality. There was no interaction effect between collaboration characteristics (balance, editing) and ability

grouping status. None of the computational measures were associated with collaboration characteristics.

Informative Task

In the informative task, participation balance did not associate with textual quality. The rest of the variables regarding collaboration characteristics, collaborative writing strategies, and ability grouping status were also found to have no predicting power for the textual quality.

Overall, the analyses relating the multiple aspects of collaborative writing practices to textual outcomes suggest that the degree of these associations may differ significantly across task types. Particularly, the narrative task that involves a genre characteristic of an open structure was different from argumentative or informative tasks in several aspects. First, balanced participation negatively affected organizational structure in the narrative. However, no such relationship was found in the other two genres. The use of collaborative writing strategies also differed; strategies displaying a cooperative orientation (i.e., parallel writing) were effective in the argumentative writing, whereas the synchronous hands-on style were found to be effective in the narrative genre.

Qualitative Findings

Analysis of interviews and survey data revealed students' positive perceptions of collaborative writing as a classroom practice effective for improving their academic writing skills. When asked if collaborative writing was particularly beneficial for a specific aspect of writing (see Figure 7.1), most students agreed that it helps their revision/editing skills (4.15), followed by the areas of idea/content (4.03), expression/ vocabulary (3.95), planning (3.56), mechanics (3.54), and organization/ structure (3.45). During the interviews, students

discussed how collaborative writing using Google Docs supported reiterative and fluid revision and writing activities, which will be discussed in depth in the following subsection (Ch.9). Students also appreciated the benefits of strengthened content, as one student commented: “It lets me see from other people’s perspectives and see how they were thinking, and it gave me new ideas.” Other students further discussed how it helps them develop a clearer thesis: “When I would get a topic or prompt I would allude to it but not really go to it. I would say that collaborative writing helps me stay on track. I became more of a straightforward writer.” Students also highlighted the benefits of being exposed to diverse vocabulary: “If there’s like not a good word he chose, someone can correct it and put a better word. My sentences aren’t the best descriptively. They all add different things to my sentences.”

When it came to the organizational aspect of writing, the quantitative analysis results of this study—particularly the results on the narrative task—revealed a challenge of synchronous collaboration ending up in weak organization. This echoes the results from a previous study on undergraduates’ synchronous, collocated collaborative writing practices (Yim et al., 2017). During the interviews, students expressed concerns about the negative impacts on organization, commenting that “I think solo writing is still a little easier because collaborative writing has more people, so there’s more organizing… Some people might not understand the topic and they might write something irrelevant.” However, other students discussed that having multiple readers helped them ensure the cohesive flow of their own writing as shown in the following comments: “I’m bad at organizing the text. I just tend to write a lot when I write, so my partner helps me cut the unnecessary ideas.”

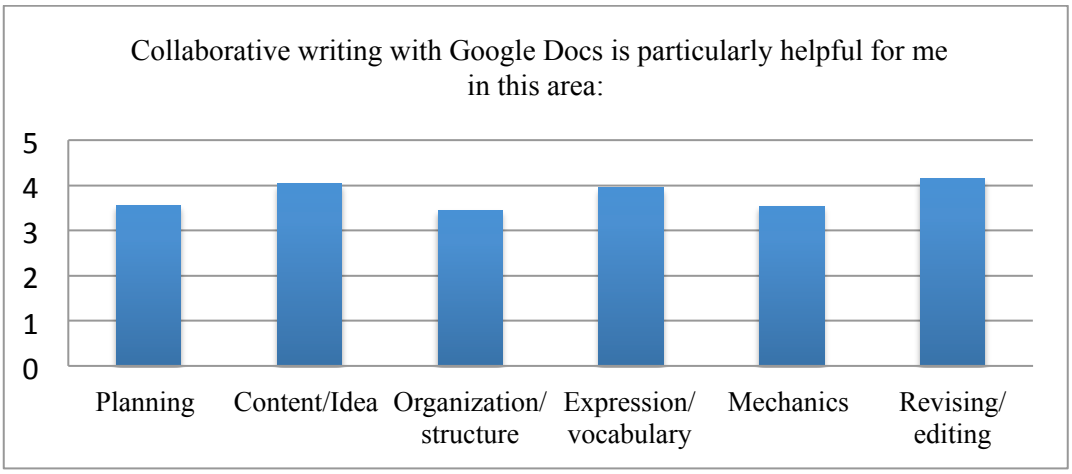

Figure 7.1. Post-survey Results: Benefits of Collaborative Writing on Specific Composition Area

Table 7.1. *Regressions Predicting Textual Outcomes: Narrative*

Collaboration Characteristics	Text Quality					Computational Text Measures			
	Content	Organization	Language	Mechanics	Overall	Lexical Diversity	Syntactic Complexity	Textual Cohesion	Academic Vocabulary
Imbalance	-0.3	**1.273*** **	-0.435	0.125	0.116	-0.195	0.919	0.323	-0.552
	(0.236)	(0.06)	(0.436)	(0.051)	(0.297)	(0.619)	(0.345)	(0.338)	(0.298)
Peer Edit	-1.819	-0.218	-0.306	-6.302	-3.087	14.213**	-3.413	0.681	0.404
	(1.622)	(0.436)	(2.167)	(3.438)	(2.574)	(1.7)	(1.276)	(2.242)	(1.064)
Self Edit	1.182	**2.542*** *	0.784	3.163	2.547	-0.706	0.356	-0.321	-0.326
	(0.482)	(0.3)	(1.241)	(1.184)	(1.22)	(1.672)	(0.759)	(0.131)	(0.315)
No. of Authors	-1.064*	0.447*	-1.740*	-1.226**	**-1.344*** *	0.951	-0.742	-1.551	0.304
	(0.24)	(0.152)	(0.432)	(0.224)	(0.066)	(0.793)	(0.481)	(0.653)	(0.708)
Document Length	0.743**	0.046	0.856*	0.335	0.882**	-0.018	0.397	0.455*	-0.063
	(0.098)	(0.078)	(0.257)	(0.159)	(0.188)	(0.306)	(0.16)	(0.141)	(0.192)
Planning	1.644*	-0.212	1.006	1.066	1.439	-1.123	-0.676	0.582	0.336
	(0.565)	(0.101)	(0.77)	(0.694)	(0.859)	(1.075)	(0.482)	(0.372)	(0.127)
Strategy									
Parallel Writing	-1.032*	-0.607*	-0.345	0.581*	-0.349	1.612	0.274	1.279	-0.263
	(0.27)	(0.18)	(0.612)	(0.208)	(0.491)	(1.196)	(0.893)	(0.778)	(0.484)
Cooperative Rev	-0.317	-0.449	0.441	-0.229	-0.479	1.273	2.167	2.179	0.932
	(0.615)	(0.489)	(1.025)	(0.435)	(0.686)	(1.808)	(1.535)	(1.751)	(1.192)
Synchronous hands-on	0.798**	**0.921*** *	-0.143	0.541*	0.834*	0.331	0.709	0.054	0.639
	(0.094)	(0.105)	(0.206)	(0.147)	(0.223)	(0.383)	(0.323)	(0.194)	(0.351)
Sequential Writing	-0.505	0.329	-0.253	0.801	0.053	-0.385	3.472*	0.913	-0.421
	(0.625)	(0.246)	(1.304)	(0.729)	(1.142)	(2.062)	(1.107)	(1.097)	(0.567)
Ability grouping									
Ability Means	-0.445	2.330***	-0.839	0.546	0.507	-0.805	-0.006	-0.54	0.005
	(0.923)	(0.088)	(0.961)	(1.33)	(1.324)	(0.37)	(1.078)	(0.355)	(0.94)

Ability Range	0.872	-0.951*	1.18	0.087	0.647	-0.591	0.405	0.445	0.126
	(0.428)	(0.269)	(0.427)	(0.632)	(0.485)	(0.621)	(0.614)	(0.374)	(0.271)
Mixed group	-1.544	-0.602	-1.698	-2.487*	-2.268	7.036	-7.011*	-1.82	2.679
	(1.357)	(0.759)	(2.733)	(0.79)	(1.347)	(4.163)	(2.319)	(3.535)	(2.258)
Interactions									
Imbalance X Mixed	-0.231	-0.548	1.742	-1.17	-0.478	1.147	2.944	2.265	-2.832
	(1.776)	(1.093)	(2.799)	(2.1)	(2.729)	(5.636)	(2.909)	(4.286)	(2.583)
Peer Edit X Mixed	1.416	-0.024	0.465	5.882	2.816	**-13.858*****	3.604*	-1.079	-0.466
	(1.422)	(0.425)	(1.995)	(3.188)	(2.337)	(1.294)	(1.012)	(2.227)	(0.956)
Self Edit X Mixed	0.169	-1.21	-0.198	-0.79	-0.564	0.79	2.409	1.415	0.898
	(1.084)	(0.619)	(1.111)	(0.741)	(0.7)	(1.167)	(1.79)	(1.696)	(1.709)
Cons	8.879	-7.791*	13.578*	6.886	8.122	-10.001	11.993	11.986	-6.264
	(5.27)	(1.81)	(4.256)	(5.153)	(3.108)	(8.57)	(6.244)	(9.057)	(8.604)
N	24	24	24	24	24	24	24	24	24
R2	0.953	0.925	0.84	0.779	0.918	0.78	0.708	0.634	0.655

Note: Standard errors in parentheses. Unadjusted p values are marked with asterisk (* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$) whereas the BH corrected pi' values with statistical significance are marked in bold.

Table 7.2. *Regressions Predicting Textual Outcomes: Argumentative*

Collaboration Characteristics	Text Quality					Computational Text Measures			
	Content	Organization	Language	Mechanics	Overall	Lexical Diversity	Syntactic Complexity	Textual Cohesion	Academic Vocabulary
Imbalance	0.111	0.834	-1.226	0.061	-0.281	-1.652	-0.51	-1.89	-1.477**
	(0.763)	(0.224)	(0.654)	(1.341)	(0.576)	(0.585)	(0.945)	(2.359)	(0.203)
Peer Edit	-0.022	-0.064	0.348	-0.086	-0.104	0.129	-0.284	-0.142	0.164
	(0.069)	(0.053)	(0.185)	(0.365)	(0.143)	(0.174)	(0.325)	(0.384)	(0.23)
Self Edit	-0.079	0.036	0.125	0.102	-0.056	-0.223	0.440*	-0.129	0.041
	(0.093)	(0.182)	(0.102)	(0.395)	(0.3)	(0.121)	(0.136)	(0.392)	(0.149)
No. of Authors	0.142	0.116	0.097	0.222	0.347	0.08	-0.215	0.134	-0.329
	(0.12)	(0.056)	(0.333)	(0.55)	(0.286)	(0.32)	(0.497)	(0.906)	(0.133)
Document Length	0.014	0.049	0.073	-0.066	0.005	0.216	-0.176	0.048	-0.01
	(0.077)	(0.085)	(0.134)	(0.244)	(0.093)	(0.104)	(0.16)	(0.274)	(0.049)
Planning	-0.012	0.412**	-0.034	0.532	0.357	-0.161**	0.078	-0.19	-0.047
	(0.195)	(0.066)	(0.063)	(0.239)	(0.17)	(0.018)	(0.071)	(0.212)	(0.089)
Strategy									
Parallel Writing	**1.699*****	0.253	0.560*	0.403	0.764*	0.530*	-0.275	-0.395	1.238
	(0.113)	(0.103)	(0.156)	(0.559)	(0.227)	(0.166)	(0.423)	(0.499)	(0.498)
Cooperative Rev	2.229*	0.990**	0.852**	0.46	1.187	0.985**	0.512	-0.438	1.26
	(0.422)	(0.126)	(0.091)	(1.105)	(0.523)	(0.117)	(0.467)	(0.543)	(0.836)
Synch hands-on	0.741*	-0.164	0.728*	1.095*	0.573*	0.422	-0.87	-1.395	0.453
	(0.175)	(0.259)	(0.22)	(0.298)	(0.14)	(0.257)	(0.476)	(0.876)	(0.685)
Ability grouping									
Ability Means	-0.935	0.299	0.049	2.273	0.854	-0.57	1.254	-0.967	-1.026
	(0.753)	(0.102)	(0.317)	(0.741)	(0.696)	(0.388)	(0.398)	(1.419)	(0.492)

Ability Range	0.234	0.31	0.302	0.422	0.394	0.489*	0.076	0.039	0.012
	(0.331)	(0.125)	(0.164)	(1.075)	(0.445)	(0.114)	(0.392)	(0.153)	(0.746)
Mixed group	0.888*	-0.545*	-0.216	-0.893	-0.687	-0.624*	-0.479	-1.325*	-0.92
	(0.174)	(0.168)	(0.168)	(1.453)	(0.531)	(0.121)	(1.149)	(0.398)	(1.207)
Interactions									
Imbalance X Mixed	-1.053	-0.209	0.359	0.63	0.216	0.888	0.586	3.111	1.951
	(0.785)	(0.311)	(0.533)	(1.62)	(0.68)	(0.625)	(1.466)	(3.109)	(0.976)
Peer Edit X Mixed	-0.780*	0.600*	0.683	-0.235	-0.163	0.478	0.353	0.174	0.893*
	(0.159)	(0.18)	(0.383)	(0.69)	(0.261)	(0.356)	(0.527)	(0.546)	(0.224)
Self Edit X Mixed	0.146	0.124	-0.191	0.376	0.331	0.112	-1.180*	0.135	-0.042
	(0.116)	(0.06)	(0.136)	(0.695)	(0.389)	(0.182)	(0.303)	(0.633)	(0.234)
Cons	-0.747	-0.951**	-1.394	-7.258	-4.141	1.283	-2.249	4.545*	4.906
	(2.078)	(0.147)	(1.636)	(3.418)	(2.345)	(1.333)	(2.762)	(1.251)	(2.09)
N	24	24	24	24	24	24	24	24	24
R2	0.931	0.964	0.947	0.657	0.906	0.924	0.742	0.406	0.719

Note: Standard errors in parentheses. Unadjusted p values are marked with asterisk (* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$) whereas the BH corrected pi' values with statistical significance are marked in bold.

Table 7.3. *Regressions Predicting Textual Outcomes: Informative*

Collaboration Characteristics	Text Quality					Computational Text Measures			
	Content	Organization	Language	Mechanics	Overall	Lexical Diversity	Syntactic Complexity	Textual Cohesion	Academic Vocabulary
Imbalance	-1.540*	0.109	0.048	-0.105	-1.199	0.192	-0.047	0.842	-0.182
	(0.317)	(0.487)	(0.275)	(1.112)	(0.317)	(0.178)	(0.046)	(1.015)	(0.257)
Peer Edit	-0.245	-0.171	0.591	0.685	0.461	0.331	-0.874	0.047	0.513
	(0.37)	(0.14)	(0.544)	(0.529)	(0.43)	(0.474)	(0.969)	(0.878)	(1.04)
Self Edit	0.108	0.171	0.188*	0.033	0.138	0.049	0.01	0.368	0.109
	(0.281)	(0.144)	(0.032)	(0.238)	(0.079)	(0.074)	(0.287)	(0.355)	(0.309)
No. of Authors	-0.119	-0.151	0.035	-0.181	-0.267	0.475	-0.367	-0.016	-0.256
	(0.065)	(0.064)	(0.073)	(0.447)	(0.108)	(0.467)	(0.616)	(0.411)	(1.12)
Document Length	0.066	0.300*	-0.031	0.28	0.116	0.114	0.236	0.386	0.26
	(0.096)	(0.042)	(0.05)	(0.101)	(0.068)	(0.145)	(0.27)	(0.323)	(0.097)
Planning	0.133	0.615	0.076	-0.133	0.325*	0.019	0.383	-0.328	0.021
	(0.272)	(0.168)	(0.108)	(0.106)	(0.059)	(0.009)	(0.242)	(0.243)	(0.079)
Strategy									
Parallel Writing	0.531	1.259*	-0.315	0.153	0.467	-0.378	0.483	1.225*	-0.023
	(0.557)	(0.219)	(0.241)	(0.303)	(0.15)	(0.142)	(0.214)	(0.254)	(0.447)
Cooperative Rev	0.54	1.364*	-0.12	0.556	0.534	-0.083	0.458	0.735	-0.224
	(0.855)	(0.225)	(0.124)	(0.21)	(0.15)	(0.169)	(0.329)	(0.445)	(0.362)
Ability grouping									
Ability Means	0.096	0.069	-0.841	-0.858	-0.49	-0.392	-1.504	0.806	-0.081
	(0.828)	(0.4)	(0.366)	(1.311)	(0.332)	(0.445)	(0.71)	(1.424)	(0.555)

Ability Range	0.543	0.266	0.184	-0.05	0.299	0.168*	1.165	0.544	0.366
	(0.356)	(0.226)	(0.45)	(0.711)	(0.313)	(0.036)	(0.668)	(1.328)	(0.728)
Mixed group	0.556	2.383*	-1.252	0.835	-0.239	0.268	-2.511	0.9	3.14
	(0.292)	(0.257)	(0.297)	(1.808)	(0.421)	(0.542)	(1.2)	(0.606)	(3.027)
Interactions									
Imbalance X Mixed	-1.215	-2.875*	0.49	0.012	0.038	-1.079	1.665	-3.328*	-4.415
	(0.462)	(0.35)	(0.624)	(2.141)	(0.367)	(0.895)	(0.669)	(0.586)	(2.976)
Peer Edit X Mixed	0.348	0.228	-0.346	-0.782	-0.461	-0.133	0.805	-0.247	-0.149
	(0.563)	(0.193)	(0.602)	(0.668)	(0.483)	(0.367)	(1.209)	(1.242)	(1.197)
Self Edit X Mixed	-0.568	-1.085*	2.35	0.505	0.843*	1.145	1.692	0.921	0.364
	(0.999)	(0.246)	(0.729)	(0.796)	(0.115)	(0.325)	(2.672)	(1.659)	(3.642)
Cons	-2.493	-5.868*	4.853**	2.274	2.214	-1.053	9.904	-5.804	-4.613
	(1.956)	(-1.322)	(0.296)	(5.541)	(1.172)	(3.892)	(6.736)	(3.451)	(12.463)
N	24	24	24	24	24	24	24	24	24
R2	0.875	0.899	0.952	0.603	0.94	0.869	0.626	0.694	0.635

Note: Standard errors in parentheses. Unadjusted p values are marked with asterisk (* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$) whereas the BH corrected pi' values with statistical significance are marked in bold.

CHAPTER 8

Results for RQ 4: Phases of Building Communities of Practice (CoP)

In addition to the quantitative analysis of writing outcomes, I qualitatively explored another critical form of learning outcome: establishment of community of practices (CoP). According to Hanks (1991), learning is "the acting in the world," which occurs via "the increased access to performance" (p.22). To understand students' learning during group processes, it is necessary to examine the social practices (the activity itself) of intersubjective meaning making, which refers to how people in groups make sense of situations and of each other, and ultimately develop inter-related interpretations (Suthers, 2016). In this framing of learning, it is therefore important to examine the group processes of building communities of practices (CoP), during which learners engage with intersubjective meaning making through co-participation. To achieve the mastery of knowledge and skill, learners participate in the community of practice and move between different modes of participation (Lave & Wenger, 1991): from asymmetrical (i.e., legitimate peripheral participation) to a symmetrical form of participation (i.e., full participation).

In this year-long study, investigation into the groups' collaboration practices using the theory of communities of practice was particularly suitable considering that language, practices, resources, and membership, which are important constituents of learning, develop over time (Squire & Johnson, 2000). In addition, this development is difficult to understand without a thick description of various factors that interplay between the individual learner and the context. My qualitative data—observations, interviews, group discussion, open-ended surveys—provide deep insight into the processes of building CoPs, particularly how students negotiated individual differences and established membership within the group. In

addition, I examined the trajectories of student perceptions of their collaboration experiences as they went through different stages of CoPs. This analysis was supported by multiple sources of data (i.e., interviews, group discussion, open-ended survey, observation data) collected at different times across the year. As Ke and Hoadley (2009) pointed out, very few studies of online learning communities are longitudinal, especially at different temporal stages of community development. To my knowledge, there is no existing study that longitudinally explored the CoPs of classroom-based digital literacy practices. Examining the trajectories of students building communities of practice is important as members move through various stages of development characterized by different levels of interaction among the members and different kinds of activities (Wenger, 1998).

In this analysis, I applied Palloff and Pratt's (2001) four phases of community building: (1) the initial (testing the waters) phase, (2) the conflict phase, (3) the intimacy and work phase, and (4) the termination phase. I discuss the salient themes within each phase, overall trajectories of community building, and the subsequent levels of collaboration and perceived learning benefits. Based on the themes and subthemes that emerged from the qualitative analysis, I presented the conceptual map delineating the phases of communities of practice (Figure 8.1). The different phases can also be interpreted as the process of moving from legitimate peripheral to full participation. Specifically, I discussed how several factors shape different types of participation (e.g., non-participation, stagnated peripheral participation, full participation). It should be noted, however, that the movement between these phases is not linear (McCure, 1998; Palloff & Pratt, 2001). As Palloff and Pratt discussed, conflicts may arise at varying points of developing CoPs, and it is not uncommon for them to occur almost immediately. In addition, they warn that the phases are not distinct,

and groups may or may not go through all of the ascent stages, particularly the last stage. They cautioned that groups rarely reach the termination stage, which is a true performing stage of CoP, particularly in online settings. In an attempt to understand the resulting outcomes of CoP during the termination stage, I used Shah's (2010) nested model of collaboration that illustrate the differing levels of collaboration. I referred back to the cases of four focal groups (for details, see Chapter 6) in order to illustrate how different factors (mutuality, equality, group rapport, etc.) may affect the groups' community building processes across multiple phases, and ultimately the levels of collaboration and perceived learning benefits.

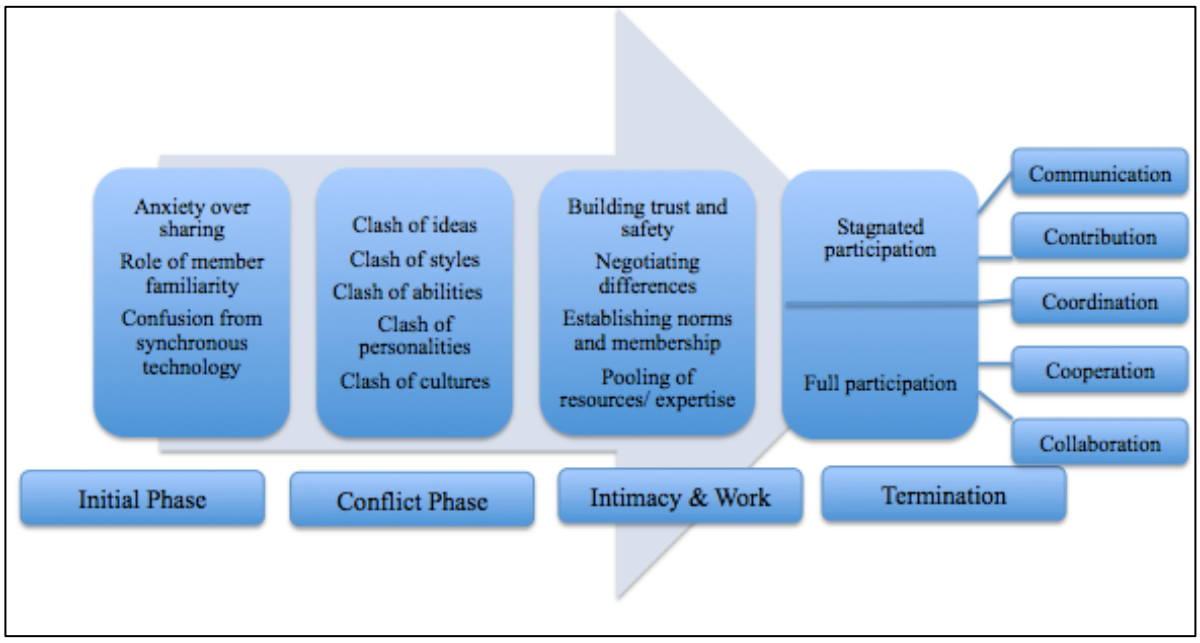

Figure 8.1. Conceptual map: phases of communities of practice and resulting levels of collaboration

Initial Phase

During the initial phase, group members adjust to each other and to the new technological environment, and they often experience feelings of anxiety, confusion, and reluctance to participate. Analysis of student interviews, observations, and open-ended survey data reveals that most of the students, even though they are familiar with using Google Docs, expressed initial discomfort as they were new to composing a group essay synchronously. Since all group members are novices in this phase, members often engage with non-participation or peripheral participation. Students cited several sources that made it hard for them to participate: 1) anxiety over sharing their text, 2) lack of member familiarity, and 3) confusion from using synchronous technology.

Initial anxiety over sharing and peer editing. Most of the students interviewed discussed their initial discomfort with sharing their work with other members they are not familiar with. Regardless of their writing proficiency, most of the students revealed an initial hesitation as a legitimate peripheral participant. For example, one student explained that "Honestly…sometimes if I have an idea, I'm kind of scared to show it…if I want to correct something I'm kind of afraid that everyone is just going to be like.. Oh no, that's bad." This feeling of discomfort was evident when they engaged with peer edits. One student said, "they might get mad when you correct something." One ELL student explained in an apologetic tone for her lack of participation, commenting that, "I would feel like I would just ruin their work because I know I'm really low in English, so I just didn't talk that much and I kind of stayed out." Previous studies have also reported that language learners' insufficient language capacity—which includes the inability to detect errors or offer valid feedback, and lack of experience and unfamiliarity with peer evaluation—often leads to the pattern of non-

participation (Tsui & Ng, 2000). These concerns seem more salient in the synchronous environment since members can simultaneously access and monitor each other's typing activities.

Students also expressed feelings of discomfort since they did not have full control over their own text in synchronous settings. For example, one student commented that "In the form of a collaborative writing, many people can adjust or change your thoughts and ideas without your consent. Similar to social media, group members can comment or criticize your work." Another student discussed how he felt confused and annoyed when other members "corrupt[ed]" his text without his consent, saying, "Sometimes people edit what you write without asking… sometimes it gets confusing. I came to the conclusion and that's when they started corrupting me." Strong textual ownership and consequent negative feelings about getting feedback from peers were often discussed in previous collaborative writing research (Rollinson, 2005; Yang, Badger, & Zhen, 2006), with potential reasons including lack of trust in their peers' writing skills and reservations about each other's advice. As the student interviews revealed, groups may need specific training or open discussion about their strategies to enact peer edits; for example, by providing appropriate explanations and justifications for changes made.

Lack of member familiarity. Studies have suggested that member familiarity is a critical factor that affects nervousness and anxiety in the initial phase of collaboration, which can ultimately shape a group's interaction pattern. For example, Janssen et al. (2009) found that member familiarity led to more positive perceptions of online collaboration and helped members devote less time regulating their task-related activities. When asked if working with familiar members would help them overcome feelings of nervousness and discomfort, some

students said that it would, commenting that "I feel that this is more effective because we are able to communicate better since we know each other and we are able to feel comfortable with each other." However, others maintained that too much closeness or group familiarity can pose another challenge, as illustrated in the following excerpt.

> Excerpt 8.1
> I think too much closeness is kind of hard. A few of them were close friends and so it was kind of hard because we have such a close relationship. It was easy to do everything, but it was just hard to stay on task. Sometimes you had to decide whether you want to focus on the academics or your friendships. Your friends may be fooling around and at the same time you really want to tell them to keep working, but you don't want to offend them.

As discussed in the above excerpt, students' concerns about offending each other have been observed in previous studies. Borthick and Jones (2000) referred to this concern as a *politeness syndrome* and cautioned that it causes writers to exchange positive, yet superficial comments, rather than constructive, critical feedback. This syndrome is more salient among groups with low member familiarity, and collaboration tends to be richer among students who are familiar with each other and have mutual trust (Oliver et al., 1998). However, most of the interviewed students discussed their negative past experiences working with familiar members, and preferred to build relationships together during the process, which they perceive as a long-term product of collaboration itself.

Confusion from using synchronous technology. The synchronous writing and editing features available in Google Docs were perceived as confusing to several students. One student discussed that she felt lost at first, as she explained: "I felt it was kind of hard when I first started because everyone was typing in the same paragraph. It was new to me." The open structure and lack of control over each other's simultaneous typing sometimes led students to

feel frustrated, as illustrated in the next excerpt. As one student commented in Excerpt 8.2, synchronous writing, despite its potential benefits, often creates confusion and feelings of frustration when the group lacks clear rules and strategies.

> Excerpt 8.2
> I think we found out how annoying we could be to each other when we type over each other. Sometimes in the introduction and conclusion people would write at the same time and if we're trying to write at the same time it's kind of hard because you don't know what the other person is thinking. We did have a lot of repetitive sentences in there.

A few students also discussed that they felt anxious because of their lack of technology proficiency. One student who recently transferred from another school reflected that, "When I first came here I couldn't even type, so I would only use two fingers and everyone had to help me. It was my first time using a laptop by myself. It felt so new to me, particularly the simultaneous typing." Particularly in a synchronous environment, where discussion occurs in real time, keeping up with the pace established can pose a challenge for some members. Ward et al. (2001) used the term *technology shock* to describe learners' anxiety and feelings of surprise, disorientation, uncertainty, and confusion as they adjust to the use of new educational technology (as cited in Kim, 2011). Considering the generally high technology proficiency at the school, there were only a handful of students who experienced this. However, it appeared that this technological challenge would likely to be posed to students in other socioeconomic contexts with insufficient technological infrastructure.

Due to the multiple difficulties discussed above, most of the students showed a pattern of legitimate peripheral participation or even non-participation in the initial phase. Wenger (1998) underscored that the experience of non-participation is a critical step for members to understand the unfamiliar social practice, which triggers the transition from peripheral to full

participation. In this sense, non-participation is an "enabling factor of participation" (p.56). For novice participants, the skill to participate and contribute to the task is gradually gained by engaging in legitimate peripheral participation, in which members go through limited participation, a somewhat asymmetrical co-participation, and eventually masters the skills necessary for full legitimate participation (Kilmanova, 2013). Previous studies have cautioned that learners can become confused and overloaded in online communication if they do not have clear guidelines for participation in the beginning (Palloff & Pratt, 1999; Kessler & Bikowski, 2010). To facilitate students' progression from peripheral to full participation, teachers may provide explicit guidelines that help students overcome the challenges from the identified sources (i.e., anxiety over shared ownership, member familiarity, synchronous technology) in the initial phase of collaboration.

Conflict Phase

As the group continues to move forward in its tasks, it is almost inevitable that disagreement or conflict will emerge (Pallof & Platt, 2005). The conflict stage, also termed the *storming* stage (Palloff & Pratt, 1999), is essential to the development of group as members need to negotiate their differences in order to build the community. The establishment of a *groupthink* mentality— where everyone agrees to avoid conflict—often results in many members being withdrawn and dissatisfied with the group experience. As such, conflict is an inherent and necessary part of all workgroup evolution. Depending on whether the group successfully resolves its conflicts, it can move into the next phase (i.e., intimacy and work phase), where members are most productive as they begin to navigate a path from peripheral to full participation. In this sense, conflict is not necessarily negative; it is an indispensable part of

collaboration for them to achieve group cohesiveness and intimacy in the next phase (Pallof & Pratt, 2007).

Previous studies have identified several sources of conflicts in face-to-face group settings. For example, Johnson et al. (1998) stressed that conflict in collaborative learning groups stems from the social aspects of the group: disagreements between group members, unwillingness to participate, or poor group planning concerning activities and completing assignments. However, very few studies have examined the sources of conflict in online collaboration, particularly with the frame of CoPs. In the current study, similar sources of conflict were identified during synchronous group work: clash of ideas, clash of writing abilities/ styles, and clash of personalities (lack of accountability). In addition, the unique contextual factors of this study, including the synchronous environment and predominantly bilingual culture posed additional challenges: clashes from different cultural backgrounds.

Clash of ideas. For groups to proceed with writing, it was essential to negotiate different ideas about the topic, as well as the writing process and product. Some students expressed frustration over their ideas not being accepted by other members. When there were conflicts of ideas, some groups simply gave up on extending or synthesizing different ideas, as the following interview excerpt illustrates.

> Excerpt 8.3
> When I want ideas I can hardly have others accept my ideas, so then I can't really use my own ideas. We first had like two versions… one was about the haunted hotel and the other one was about the haunted house, and there was a room, but then the haunted house, they couldn't extend it any further, so then they said to give up that and we had to use the haunted hotel idea, which worked.

In other groups, students perceived disagreements as intellectually challenging and time consuming. For example, one member discussed both benefits and challenges of pooling

different ideas, saying that "I kind of like that we could bounce off ideas from each other, but then sometimes the thing that kind of lacks with collaborative writing is that you could spend too much time bouncing off each other and then it could eventually result in not writing at all." As Meyers (2010) cautioned, students appeared to enjoy and fully engage with negotiating different ideas so long as the benefits are not overshadowed by the time and effort spent on coordinating and managing the interaction.

In addition, lack of communication among members made it more complicated and difficult to resolve disagreements in ideas, as one student commented: "We don't really discuss what the subject is, but if we do discuss too long it might take us behind on our writing. Spending too much time." As Duarte and Snyder (2001) suggested, communication serves a critical role in group functioning, by which members felt included and valued in the collaborative process. However, it was also noteworthy that students felt pressured about time management, as the student discussed. Even though they perceived the benefits of sharing ideas, they welcomed them as long as they occurred within the goal of completing the in-class writing assignment on time (Meyers, 2010).

Clash of writing styles and abilities. Students expressed concerns over adjusting the gaps in members' different writing styles and abilities. This has caused significant conflict in some groups, particularly those prioritizing fairness and equal contribution as the goal of collaboration. In the following excerpt (8.4), one member discussed how this problem created conflicts in his group, specifically as they collaborated in a synchronous setting. He was particularly concerned about members who type quickly dominating the group essay on Google Docs.

Excerpt 8.4

> When two students have different writing styles and abilities, the student who writes down his ideas first on Google Docs is able to keep writing in his style, while the other has to revise his ideas to match the style before writing. Therefore, the first student is able to contribute more to the writing.

Students also expressed frustration over ability gaps. For example, one student commented that "your story wouldn't be as great if you just have like "baby" kind of vocabulary, so I feel like the fact that you have changed what you are writing is better. I was very confused, because I would have vocabulary and I would have to explain what it meant." The conflicts caused by writing ability gaps were well represented in Groups 3 and 4's interaction patterns (Ch. 6). In these two mixed-ability groups, low proficient peers were excluded and ignored by the other group members, which is in contrast to Group 2's cognitive apprenticeship, which involved all members. Another student reflected that her group had difficulty proceeding with their essay as one member with limited writing skills needed some support and explanation to understand specific parts of their essay. One student discussed her frustrating experience, commenting:

> Excerpt 8.5
> There was a part where we were writing the ending, she didn't understand what we were talking about, so we had a conflict about explaining it. So we explained it and she still didn't understand so we explained it again.

In the following interview excerpt (8.6), one student further stressed the importance of power relationships and fairness in collaboration. His comment indicated that the concern of equality in group work complicates the clash that inevitably comes from individual differences, including gaps in writing abilities or styles.

> Excerpt 8.6
> Disadvantages [of collaboration] were unbalanced roles, power, style, and ability. Students who have more power because of unbalanced roles, tend to be able to

contribute more than others with the same amount of effort. Style and ability can cause students to not contribute equally.

The issue of power and its negotiation among members is an important ingredient of community membership (Kilmanova, 2013). According to Lave and Wenger (1991), power is the main factor that determines the learner's moving forward to full participation in a community of practice. As such, the conflict stemming from individual differences, unless resolved positively, may lead to a fixed form of power relationships and may keep novice learners from participating fully in a community. Lave and Wenger emphasize that it is critical to negotiate the individual differences and ultimately build a diversity of relationships so that members can legitimately participate.

Clash of personalities. Another factor that frequently caused conflict was personality differences. As Suthers (2006) argued, collaboration imposes an additional task on the learners: it does not merely involve negotiating the task, but also involves negotiating relationships. Therefore, group members must also manage interpersonal relations and group functioning in addition to solving the group task at hand. (Whitworth, Gallupe, & McQueen, 2000). Since students have different learning aptitudes, motivation, and expectations for writing and collaboration, groups often struggle to negotiate relationships—particularly with unmotivated, non-participating members. During an interview, the teacher explained that:

> Excerpt 8.7
> There are some students that just soak it up; they engage, contribute, and have no fear. There are others who are very hesitant to put it out there and contribute too much on Google Doc because that's a very public kind of setting for them, and they struggle with that for sure.

As one student underscored during an interview, negotiating different personalities is an artifact of group effort: "Personality is really important. If you have someone that's just

stubborn or doesn't want to do anything…They have to be willing to be open to new ideas because it's a group effort." Previous studies that reported conflicts between headstrong leaders and introverted, withdrawn members have emphasized the role of teacher intervention. For example, Bikowski and Vithanage (2016) suggested that teachers incorporate class discussions to make students aware of the need to collaborate with individuals with diverse learning styles and personality types, particularly in the knowledge economy. He also suggested strategies to facilitate the participation of more introverted, independent-minded students, for example, by giving them time to build comfort with their teammates and the learning text in the beginning stage.

The issue of accountability and responsibility was also discussed as a major source of conflict. Students complained about irresponsible attitudes of free loaders, as can be seen in comments such as "I feel like my group just didn't work well together. Some people just didn't finish their paragraph, and that would affect our grade as a whole," and "I think it's hard if you get into an irresponsible group, like people who don't finish their work or don't really care about the quality." Similar to Mulryan's (1992) finding on small groups in face-to-face settings, the distracted members or intentional loafers might not necessarily demonstrate passivity, but they tend to focus on off-task behaviors.

Clash of cultural backgrounds. Conflicts stemming from different cultural backgrounds and expectations toward groupwork have been discussed among students, particularly recent immigrants. For example, in Excerpt 8.8, one ELL who emigrated from Korea three years ago, discussed her lack of familiarity with collaborative group work and initial feelings of frustration about the intensive use of technology in writing.

Excerpt 8.8

> In Korea, we just use the workbook and you don't do a lot of group projects unless it's crafts. We just usually do paper-based workbook and don't use a lot of technology. So it's more independent. Groupwork was so hard for me at first. I didn't know how to do a lot of things at the same time. At first I couldn't even type so it was hard. And talking in English was hard too.

She reflected that she had to overcome multiple challenges as she coped with new learning practices involving technology and getting used to group work, on top of her language barriers. In the following interview excerpt (8.9), another student from Korea added that her mental representation of writing conflicted as she engaged in group writing. In her local culture, writing was considered as individual activity that involves strong personal ownership.

Excerpt 8.9

> In Korea, it's very individual, they don't do group work. If it's group work, it's only for science and stuff but they don't do it in like ELA or Korean language. They have a topic and they write their own essays. Here all the peers work together. That's different from what I expected about writing.

She went on to discuss how she still felt confused about the collaborative writing product, commenting that she was not sure whom it belonged to and the level of revisions she could make to the group text. Research on second language writing has highlighted that international students' different attitudes and expectations towards collaboration and group mechanisms often create conflicts (Carson & Nelson, 1996, Hanjani & Li, 2014) and, therefore, special attention is needed to help the L2 writers, as well as their peers, to understand and openly discuss their expectations and struggles.

In collaborative group work, members often confront each other with alternate strategies, solutions, or points of view. As discussed above, conflict, when not resolved appropriately, may increase uncertainty and lead to negative emotional experiences and disjointed group processes (Meyers, 2010). However, when resolved successfully, the

challenges can take the form of *social cognitive conflicts*, which facilitate the group process that entail critically reflection and reassessment of members' different viewpoints (Meyers, 2010). Key components that support the effective resolution of conflicts are discussed in the next phase of CoP: Intimacy and work phase.

Intimacy and Work Phase

Analysis revealed several components that enable group members to resolve conflicts and move forward to full participation as they develop well-functioning CoPs. During this phase of intimacy and work, collaboration routines and resources develop into an ideal state, and therefore, is most critical in CoPs as a *learning* community emerges only in this phase (Haythornthwaite et al. 2000, as cited in Palloff & Platt, 2005). This is also when people in groups make sense of situations and of each other, which is referred to as the *intersubjective meaning making* (Shah, 2006). My qualitative analysis revealed that this phase is composed of several key group tasks: (a) building trust/safety, (b) negotiating differences (c) establishing norms and membership, and (d) pooling resources and constructing shared expertise. As discussed earlier, these components do not occur in linear steps, but are inter-related. The extent to which each group successfully resolves conflicts and engages with these components appears to ultimately determine group's level of collaboration and subsequent perception of learning.

Building trust and safety. As delineated in chapter 6 (i.e., interaction patterns), trust and safety are core part of positive group rapport, and it develops over time. Several studies have underscored the importance of creating an atmosphere of safety and trust to develop a learning environment in both face-to-face and online groupwork (Bikowski, 2016; Buarte & Snyder, 2001; Palloff & Pratt, 1999). Here, the role of communication is particularly important, since it helps group members to interpret each other's intentions and co-construct knowledge

(Johnson, 2001). During student interviews, many discussed how they gradually developed mutual comfort and trust, which laid the foundation for efficient group work. Some students emphasized that they needed sufficient time to build mutual trust, as one student commented in the following excerpt:

> Excerpt 8.10
> I think that the main difficulties are faced when the individuals in the group have varying skill levels and face disagreements while working. It was sort of hard to explain my ideas and communicating with them at fist. But it got easier the second time we collaborated. I got to know them better as time went by.. Now I know each other better so it's easier to run off ideas. Simply getting to understand the group allows for an effective collaborative writing process.

In the following excerpt (8.11), one student discussed that she got to know her peers better by understanding their writing. She further discussed how each member's writing style represented their personality and, therefore, group writing provided a way to socialize and develop friendships despite the fact that they were not close outside of the writing group.

> Excerpt 8.11
> I guess because when you write, it's not only your writing. You are building the group's opinion... so you get to know them by their thoughts. I feel like it kind of matches with her personality because she's very responsible. In her writing, you can see how she's always on task and how she always finishes her work on time.

Another student added that the group task got more efficient as members bonded. This point is reflected in the experiences of collaborative groups (Group 1 and 2, see research question 2 for more details), who built strong interdependency and mutual understanding and, therefore, needed little effort in team coordination such as dealing with conflicts, demanding accountability, or monitoring for member activities (Salomon, 1992). As discussed in Excerpt 8.12, understanding each other's writing and work style group members promoted work

efficiency. Previous studies suggested that active, well-functioning groups tend to achieve greater collaboration productivity (Soller, 2001).

> Excerpt 8.12
> I thought it was easier because I got to know them better so I was already used to them. I know what their style is and how they work. I was really pressured because at first when we started the paragraph, I didn't know them at all. Yeah, it's easier and you understand the person more and you bond.

In an environment of trust and safety, members engage with continual change and experimentation, exchanging constructive feedback. As one student discussed above, members, particularly those with low writing efficacy, feel more open to seeking and receiving peer support: **"**because I'm still not really confident in my writing, so I would be a bit scared to ask my teacher, but if my friends gave me advice I think I would be able to trust them and make my essay better." Another student reflected that building trust and safety within a group was critical for her participation, commenting that "I think I got much better in group writing because I'm kind of shy with new people, but now as I am comfortable with my group, I am more willing to speak up and tell them my opinions." In the following excerpt (8.13), one student discussed how her group members overcame the fear of offending each other and instead engaged in constructive criticism. During the conflict phase, the shared experience of struggling with each other and the group processes also strengthens "the sense of connectedness and coalescence" (Paloff & Pratt, 1999).

> Excerpt 8.13
> In the beginning for our first project, we were not as strict, but as time passed, we became more strict and I think that actually helped with our writing. As we became more comfortable with each other we started getting more comfortable pointing out their flaws and that improves the writing.

Negotiating differences. Based on mutual trust and safety, students became more open to each other's ideas, and prepared to engage in what Jenkins (2009) termed as the process of

deliberation and negotiation across differences. One student commented how collaboration skills gradually developed during this process, commenting that "Other than writing, we develop the skills to be able to collaborate with each other. If we are all writing on the same sentence it would get frustrating almost, but then we start to learn to accept other people's ideas." According to Jenkins, this is when the most meaningful learning begins. During this stage, members learn to accept each other's differences and agree to some rules of conduct. This allows them to negotiate their similarities and differences in perspective. He explains that such an approach does not ignore differences. Rather, members learn to acknowledge that diversity of perspective is essential if the process of collective knowledge construction is to occur. This realization helps members to appreciate and value differences stemming from cultural backgrounds, experiences, and resources, all of which contribute to a richer pool of knowledge.

The teacher was also well aware of the criticality of negotiating differences and, therefore, had her groups stay together in her year-long collaborative writing project. During an interview (Excerpt 8.14), the teacher discussed how she wanted her students to 'work out' their differences and 'grow together' from the group experience.

> Excerpt 8.14
> I did deliberately have they stay as a team the whole year because I thought that would foster a stronger collaboration. Building good rapport and having that team to grow together for a year as opposed to now it's a new group, now it's a new group. And if you're in a team with someone you don't really work well with, you got to work it out.

Student interviews also reflected that the year-long group experience helped changing members' attitudes toward initial conflicts. In well-functioning groups that established trust and safety, members were able to overcome the feelings of initial frustration and moved forward to accepting their differences. One student reflected that being exposed to different ideas and

writing styles was particularly beneficial, commenting that, “There is a lot more ideas when you work with others, so I learned a lot. My writing style is much different from hers and his so I started to learn different types of writing style.” In the following excerpt (8.15), another student acknowledged that conflicts and confusion were initially perceived as downside to collaborative writing, yet he realized that they are inevitable and need to be resolved.

> Excerpt 8.15
> One downside to collaborative writing with Google Docs is that sometimes, multiple people type at the same time and it can get confusing/hectic. Another downside is not being able to settle on one idea or one way of writing a sentence, but that problem is a problem that you will inevitably face when working with others in a group. You cannot get away with it. You need to work them out.

Students’ efforts to negotiate the differences and adjust to each other have been observed in many areas of collaborative writing. For example, several students reflected that they adjusted to different writing styles: “I get to learn other varying writing styles that could help me gain a wider range of writing. It would also help me learn how different people operate.” Another student further discussed that she adjusted her vocabulary so that her text flowed with other members’ text: “Looking back to argumentative [with individually assigned paragraphs], you can see the difference from their writing to yours, so you kind of have to change it up so it flows better. So I would change my vocabulary more.” In mixed-ability groups, some students felt motivated to ‘try harder’ in order to keep up with the group’s performance, as shown in the following comment: “I think there’s always an idea that someone is better at you at writing so you kind of have to try harder and try to like go to their standards and try to be better than that.”

Establishing norms and membership. One of the most critical achievements in the intimacy and work phase is building norms, rules, shared responsibility, and eventually

establishing membership (Palloff & Pratt, 1999). Johnson (2001) explains that members have different interpretations and expectations of conflict resolution, and thus need to share a common understanding of the situation and formulate a consensus. As the group progresses, members navigate and set up their goals, communication styles, and strategies, which helps them lay a strong foundation for developing a community. Particularly, establishing group norms up front is critical to community development as the consensus on how to handle conflict can head off problems (Johnson, 2001; Palloff & Pratt, 2007). Through the process of negotiating differences, members transform their collaboration experience into *artifacts* that are comprised of group procedures, rules, and products (Wenger, 1998).

According to Trentin (2009), it is critical to define general group rules for the shared document. This process includes building the stylistic coherence of the group document and identifying effective strategies for facilitating learning and achieving the learning objective. Building shared norms and rules is particularly critical in synchronous collaborative writing, given the high equivocality of writing process. By nature, collaboration heightens the equivocality of the writing process, particularly those aspects that require complex communication (Kraut, et al.,1992). For instance, planning, which is already an equivocal task in independent writing, is likely to increase in equivocality when it is done collaboratively. This is because co-authors tend to share their incomplete ideas, yet need to agree on a unified plan (Kraut et al., 1992). The simultaneous access and writing practices in synchronous collaboration are likely to involve even higher equivocality and thus pose additional challenges on the co-authors. This partially explains the interviewees' confusion during the initial phase. In order to help members overcome the challenges of high task equivocality, therefore, establishing shared norms is particularly crucial in synchronous group work.

During interviews, students discussed how they organized rules for structuring group interactions. For example, one student discussed the necessity for in-depth group planning process. She explained that group writing requires more planning than in individual writing, commenting that, "We're forced to plan more because there's so many different ideas. If you plan it wrong, you could be doing the same exact thing. So we were very cautious. For myself, I don't think I do as much planning, but maybe with others." Other groups established rules for their group revision. One student commented that his group agreed to avoid simultaneous writing and revision as it can be confusing. Instead, they decided to make peer revision only after the draft was completed, as he commented: "In our team, we revise and edit the paragraphs of other teammates after writing is complete. I think it work best for my group."

The four focal groups that displayed distinct patterns of collaborative writing (Chapter 6) also exhibited different ways of building rules and norms. For example, in Group 2, members agreed to provide specific explanation for the feedback they provided to each other, as they found that lack of consulting on the changes made ended up 'mess[ing] up' the flow of their essay. In Group 1, members made it a rule to discuss each sentence to seek mutual agreement before typing, and they found it more efficient for the group to designate one or two main scribers rather than have everyone type at the same time. In contrast, Group 3's priority on ensuring equal contribution led the group to use the collaboration strategy of separate writing (i.e., divide and conquer).

One member from Group 3 discussed how the established norms enhanced the efficiency of group work. In the next excerpt (8.16), he discussed the benefits of working with the same group for the entire year, as it provided the time the group needed to build an agreed-upon system for group work. His point is in line with previous studies that underscored the

necessity and importance of establishing group processing strategies to improve teamwork coordination and productivity (Johnson et al., 1990; Chiu & Hsiao, 2010).

> Excerpt 8.16
> [Once we decided on the group rules,] throughout the essay everyone collaborates smoothly— like a machine… if you put it in long gear it won't spin. I feel like holding the same group for a whole year was a really good idea. I really agree with that. Because even if there isn't much variety, you [need to] get used to each other.

Another critical component of the intimacy and work stage is to establish one's membership in the community. This component is critical in the transition from peripheral to full participation (Lave & Wenger, 1991; Kilmanova, 2013). The failure to claim one's membership may lead to a learner's disengagement in the community practices (Shah, 2006). For legitimate participation in a community, it is critical for a member to navigate the 'multiple, varied, and inclusive ways of being part of a community' (Lave & Wenger, 1991, p. 36). In this sense, learning begins with an act of incorporating a novice into the activities of a particular community of practice. During this process, the learner is first recognized only as a member on the edges or periphery of a certain activity (i.e., peripheral participant), and gradually becomes a legitimated member of the community as the learners assume increasingly expert roles (Lave & Wenger, 1991).

Research has shown that role usage promotes group cohesion and responsibility (Johnson et al., 1991), as well as fosters positive interdependence and individual accountability (Brush, 1998, Chiu & Hsiao, 2010). Several studies particularly underscored that *stewardship,* which promotes a mentor-mentee relationship between the expert and novice members, is critical during the initial configuration and developmental stage of the CoP, and gradually becomes redundant in the later phases of community building (Wenger et al., 2005). In this

sense, the presence of a leader in the beginning stage may significantly influence the group dynamics and the consequent degree of collaboration within a group (Arnold et al., 2009). My analysis also revealed that groups found it effective to include a leader or tutor, particularly when they needed to solve conflicts and coordinate the group process. As one student commented, the presence of a leader or manager was necessary to cope with the non-participating, freeloading attitudes of certain members: "If someone is not participating, maybe someone else can ask them questions and maybe they could start answering questions and participate. And giving them tasks to do." During the post-study interview, one student reflected that the failure of her group was due to the absence of a leadership role, commenting, "I wish she [the teacher] would assign a leader so that our group would be more focused." The student's comment also illustrated the need for teacher's direct involvement and help with forging group dynamics. Research shows that effective leadership can attribute to effective group work (e.g., Lea, Pogers, & Postmes, 2002) and to more task-oriented interactions in collaborative online settings (Strijbos et al., 2004).

However, it should be noted that malfunctioning leadership models negatively influence group dynamics. Research on collaborative group work suggests that there are two types of leadership: a socio-emotional and democratic leader who prioritizes supporting other members, and an authoritarian leader who prioritizes organizing and managing group tasks (Johnson & Johnson, 1994; Curtis & Lawson, 2001). While the presence of authoritarian leaders may promote productivity and efficiency, it may end up stifling members' creativity, straining their contributions, and harming group morale (Arnold et al., 2009; Hale, 2003). For example, as seen in Group 3's case, a strong dominating leadership model that does not involve mutuality is likely to undermine members' mutual contribution (Thompson & Chisamore, 2007; Wang,

2010). The product of such collaboration was either dominated by the leader or a mere sum of individual contribution. Therefore, it is necessary to have distributed and fluid leadership (Wenger, 1998; Li & Zhu, 2013, Storch, 2012) characterized by shared understanding and pooling of different expertise. As one student commented, leaders should be authoritative, yet not authoritarian: "We actually had a leader, but most of it was done by our own ideas. There wasn't anyone that was greater than anyone else. We discussed about everything. We wrote the story per sentence and revised it over and over. After finishing a paragraph, we read it and discussed about how we could improve it." A similar point was raised by Wenger (1991), who argued that effective leader must work with communities of practice from the *inside* rather than merely attempt to manipulate them from the *outside.* In well-functioning teams with distributed leadership, members do not rely on expert members to direct them what to do and determine what is worth knowing (Jenkins, 2009).

Groups with a collaborative stance of interactions often involved specific yet flexible role distributions. In these groups, members recognized the necessity of pooling different resources, as one student commented: "I feel that not everyone has all the skills, but there's different skills in each person so they all come together." In the case of Groups 1 and 2, members had differing roles, such as discussion facilitator, main scriber, and editor. These roles were not predominantly occupied or fixed by certain members, but were fluid, particularly as the groups engaged in multiple tasks over time. In describing conditions for successful collaboration, Surowiecki (2004) stressed the importance of *decentralization*, which refers to members' interdependence on each other's expertise and use of local knowledge. The flexibility and fluidity of roles enabled novice participants to *re-negotiate the relations of power*, (Lave & Wanger, 1991), moving from a limited degree of co-participation to a symmetrical participation.

This process occurs in response to changing contextual circumstances. One example can be found in Pauline's case in Group 2— an initially unconfident, novice writer who gradually emerged as a leader. Without a diversity of relationships in which a member can legitimately participate, however, the novice writers remained as stagnated participants, as in the case of Group 3 and 4.

As students established membership, they appeared to have an increased sense of shared responsibility. In the following excerpt (8.17), one student discusses that she felt responsible to do her own part' in group work, which she perceived as empowering, rather than burdened by feelings of obligation. As observed in Group 1 and 2's interaction patterns, the distribution of responsibility is increasingly equal in well-functioning teams. Responsibility for the exploration of resources and the discourse about them is distributed equally between them, with quick shifts from one to the other (Castek et al., 2012).

> Excerpt 8.17
> When you're by yourself you think, "Oh man I have to get this whole thing done by myself", but when you are with four other people you can share the responsibility and it feels like we are all in this together. I was motivating in a sense, too. I didn't necessarily feel like "Oh yeah, there's other people in my group I can just slack off and do nothing," I felt a responsibility to do my own part.

Resource pooling and shared expertise. Individuals bring in a wide array of experiences, knowledge, and skills as they engage in group work. Leveraging these distinct skillsets and ideas to co-construct a joint product is referred to as *resource pooling* (Lave & Wenger, 1991; Meyers, 2010). During this social practice, students learn how to expand their own intellectual capacities. To serve as meaningful participants, members also need to build *collective intelligence*, which refers to the group's ability to "reconfigure knowledge across

traditional categories of expertise" (Jenkins et al., 2009, P. 42). During an interview, members who worked in well-functioning groups discussed the benefits and necessity of resource pooling. For example, one student commented as follows:

> Excerpt 8.18
> I think a lot of us have different strengths and our strengths put together makes a really strong group. Say this person has really great writing skills, this person is good at editing, and this person gives good ideas, having those people combined in a group can create a better text.

In another interview (Excerpt 8.19), one student emphasized that collaborative writing should be a *mutual effort*, in which all members, regardless of their skill levels, should contribute and tap into different resources the group has. The student's argument echoes with Jenkins et al.'s concept of *collective intelligence*. The authors argued that the community can accomplish a better outcome when the group as a whole tapped knowledge and resources from individuals. In this sense, the co-construction of collective intelligence can "progressively reduce the distance between the task and individual abilities" (Donato, 1994, p. 46).

> Excerpt 8.19
> I don't think it matters what skill level you're in to look up to someone in writing. I think it's a mutual effort. It's not like a great writer doesn't make mistakes- even if they've written like 40 books. Some of the lower level students don't know why it's wrong but that's the benefit they learn from each other. No one is better at writing. Everyone makes mistakes and everyone has to grow from their mistakes. You can't really judge if someone is better at writing even if they have better grammar or spelling. It's not how they write but what they write. It's like-- it's what they write. If they have meaning behind it.

Termination Phase

In the termination phase, different patterns of participation (at the individual level) and collaboration (at the group level) emerged. As Palloff and Pratt (1999) maintained, the termination phase is not fixed. Rather, there can be a renewal of the CoP process if the

termination phase is followed by re-grouping, or by additional tasks to be completed further into the task. During the termination phase, students either moved forward to full participation or remained as non-participants or stagnated peripheral participants, depending on the group's ability to negotiate their conflicts and build intimacy in the earlier phase. Wenger (1998) maintains that both participation and non-participation are important sources of identity-building in a community of practice. However, if the practices of a certain community limit members' participation, as seen in the cases of Group 3 (Authoritative/ Passive) and 4 (Reluctant/ Withdrawn), the identity of peripheral participation may become ingrained in their practice, leading to the outbound trajectory away from full participation towards non-participation.

Levels of collaboration. Different trajectories of member participation appeared to shape the level of collaboration each group engaged in, which can be observed more clearly during the termination phase. When the hindering factors that cause conflicts during CoPs have been resolved successfully, students moved forward from peripheral to full participation, reaching a high level of collaboration. However, several students, particularly those with lower writing proficiencies, identified themselves as marginal or peripheral participants. They reflected negative experiences of feeling rejected and excluded from their group. For example, one member discussed his feeling of rejection, commenting that, "other students don't usually agree to my ideas, and then if they don't agree, they don't write my ideas." His peers in the group, however, justified their decision for rejecting his idea, explaining that:

> Excerpt 8.20
> [W]e gave him a chance to speak his ideas but most of the time his ideas were irrelevant and totally off topic. We have to kind of stay on track. We accepted some of his ideas and we worked together but some of his ideas on the intro and conclusion was totally off-topic.

Several causes of conflicts that challenged member's participation have been discussed earlier. They include (a) multiple sources of clashes (e.g., clashes of idea, writing style/abilities, cultural backgrounds, personalities), (b) failure to establish group norms and strategies necessary to resolve conflicts and enhance efficiency, (c) failure to establish membership due to dominant, fixed group dynamics, (d) lack of mutual trust and consequent negative group rapport, and (e) time pressure. Analysis also found that the intimacy and work phase and its sub-stages (i.e., building trust/safety, establishing norms/membership, pooling of resources/ expertise), were critical in resolving conflicts and, ultimately, shape the path leading to members' full participation. Of particular importance was the critical role of group cohesion, or what Zhao et al (2014) termed as *social presence*. It helps establish a collegial learning community, in which members are encouraged to participate and interact and, ultimately, determines the extent to which members realize collaboration. The contrasting cases of groups with high mutuality (Groups 1 and 2) and low mutuality (Groups 3 and 4) exemplify the different paths leading to the termination phase.

Therefore, the varying levels of collaboration can be interpreted as the outcomes of CoPs. I examined the levels of collaboration using Shah's (2010) nested model of collaboration (see Figure 8.2). This model has five components that are nested within the next level: communication (information exchange), contribution, coordination, cooperation, and collaboration. In Figure 8.2, the definition of each component is provided. As seen in the graphical representation, the different components are not mutually exclusive, but rather on a continuum of increasing levels of collaboration. For example, coordination is a subset of collaboration: it indicates that groups need coordination of norms and plans for a meaningful collaboration to occur. According to Shah (2010), communication, contribution, coordination,

and cooperation are essential sub-steps toward collaboration, which implies that a true collaboration entails a tighter form of integration. It is important to note that cooperation, which typically involves division of labor, is distinguished from collaboration, which entails the creation of a solution or a product that is more than the sum of each participant's contribution.

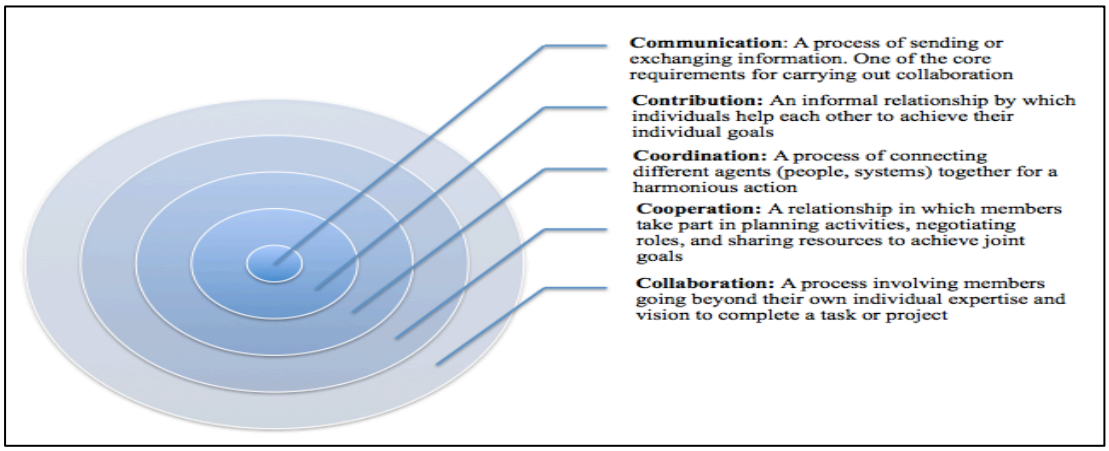

Figure 8.2. A Nested Model of Collaboration (Modified from Shah, 2010)

Cases of the Four Focal Groups. In this section, I re-examined the cases of four focal groups introduced in Chapter 6 using the nested model of collaboration. Particularly, the groups' similar or dissimilar patterns of group work during the termination phase were examined in multiple aspects: their participation and collaboration levels, and the members' perceptions of learning benefits.

Participation. According to Henri's (1992) interactivity framework, members' participation is an important component that ultimately shapes the level of collaboration. The participative dimension, such as the editing amount, may provide quantitative evidence for the level of collaboration (Zhao et al., 2014), but its role is limited in that participation does not necessarily lead to collaboration. For example, members' effort to participate, for example, by making suggestions or requests for help, may not be responded to by peers, as seen in the cases

of Group 3 or 4. In this sense, participation should be considered as a pre-condition for interaction and collaboration.

In terms of examining students' participation, previous studies on asynchronous collaboration typically measured the level of participation by the number and distribution of messages (e.g., Arnold et al., 2009; Zheng & Warschauer, 2015). In this study on synchronous collaboration, I utilized the user statistics available from DocuViz to report participation evenness (i.e., imbalance score) and members' editing amount as indicators of their written participation. It should be noted that editing amount represents merely one dimension of participation (i.e., participation through writing), since the contribution through verbal discussion (i.e., participation through speaking) is not considered in this quantitative information (for more information on the participation evenness measure, see Chapter 4. Methods). Although this quantitative information can be surface indicators of participation, they provide a glimpse into the group dynamics and reflect the heterogeneity of participation (Johnson & Johnson, 1996; Arnold et al., 2009).

As seen in Figures 8.3a-d, the four focal groups exhibited different levels of participation (i.e., individual editing amount divided by total editing amount) across the three tasks. While the general variation across task type should be considered (with narrative involving less balanced participation; see Ch.5 for details), it is noteworthy that there are flexible shifts in individual member's participation levels in Group 1 (Figure 8.3a, evenness of participation: 0.05-0.09-0.01, in narrative, argumentative, and informative, respectively) and 2 (Figure 8.3b, evenness of participation: 0.1-0-0.06) across task type, whereas the participation level is relatively stagnated in Groups 3 (Figure 8.3c, 0.13-0.09-0.07) and 4 (Figure 8.3d, 0.25-0.07-0.09). For example, in Group 2 (Figure 8.3b), one of the expert writers (purple) started at

the intermediate level of written participation, but showed a significant increase in her written participation, whereas the novice writer (blue) demonstrated a dramatic increase and decrease in her written participation. This may indicate how collaborative groups may provide room for the members to experiment with diverse participation patterns. This is potentially due to the collegial environment where members are able to establish safety and mutual trust. In contrast, in groups displaying a lack of collaborative stance (Groups 3 and 4), the participation of struggling writers remained stagnant. Particularly in Group 4 (Figure 8.3d), it was noteworthy that even the most active participant (i.e., main writer, red) significantly reduced his written participation in the latter two tasks. This may indicate the negative influence of group dynamic characterized by low mutuality and group rapport on members' participation and productivity.

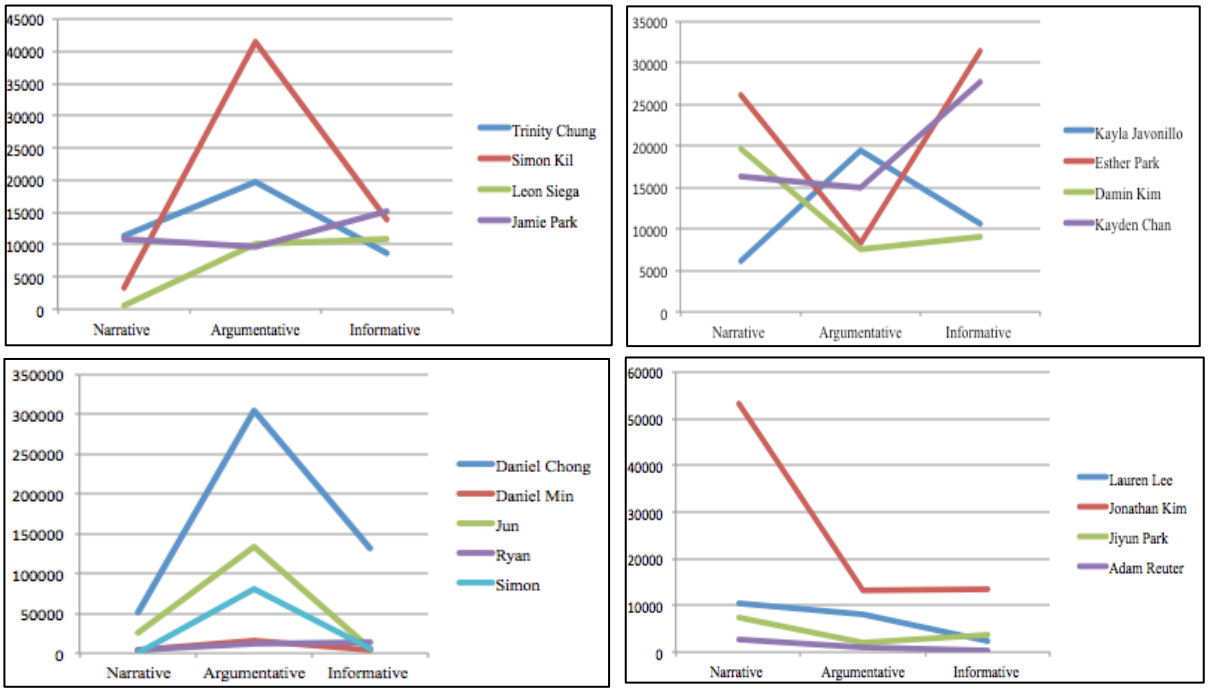

Figure 8.3. Changes in members' textual participation across the three tasks

Collaboration. To understand the level of collaboration, the interactive and social aspect of each group needs to be examined in addition to the component of participation at the

individual level (Henri, 1992; Zhao et al., 2014). The quantitative evidence of participation alone cannot sufficiently explain the level of collaboration and needs to be supplemented with an in-depth analysis of peer interactions (Zhao et al., 2014), for example, with group's verbal discussion data. Figure 8.4 depicts how the five different components of collaboration introduced in Shah's model of collaboration can be related to the multiple factors characterizing its social nature: interaction, trust, level of awareness, and symmetry of benefits (Shah, 2010). For example, the concept of interaction is manifested through the levels of mutuality and the use of scaffolding strategies. Trust is an important component of group rapport and cohesion. Level of awareness refers to the extent to which members are aware of each other's actions and contributions. This also helps to establish trust among participants. Symmetry of benefits refers to the extent to which each member of the group perceives his or her learning experience as mutually beneficial (Shah, 2010).

Analysis revealed that students' perceived learning benefits from their year-long synchronous collaboration are significantly shaped by their group dynamics and the level of collaborative engagement. Shah (2010) explains this diverging perception of learning benefits by using the concept of symmetry of benefits. In well-functioning, collaborative groups, members perceive the learning experience as mutually beneficial, yet the amount of perceived benefit may vary depending on participants' roles and responsibilities. The four groups examined in Chapter 6, reflected differing perceptions toward what they have learned from each other and from the collaboration experience.

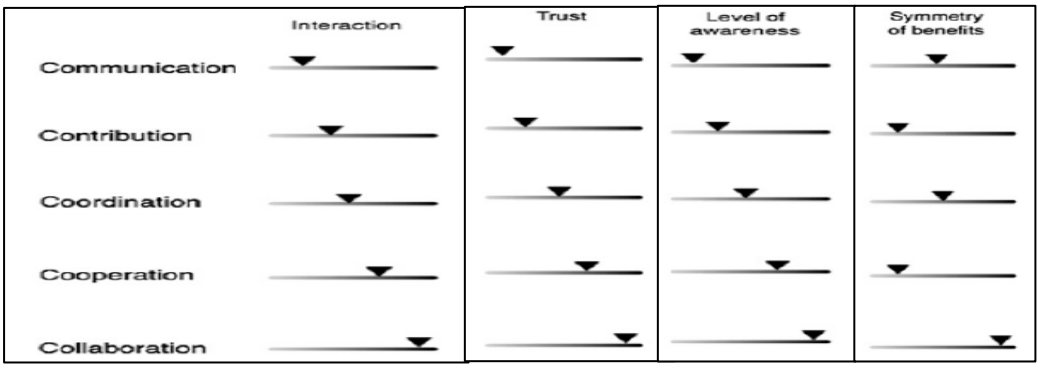

Figure 8.4. Components of collaboration explained by multiple factors. A level of given factor is represented with a bar going minimum to maximum from left to right. (Modified from Taylor-Powell et al., 1998; Shah, 2010)

First, Group 1 (collectively contributing/ mutually contributing) displayed the highest level of collaboration: high levels of interaction (exhibited through high mutuality and use of scaffolding strategies), trust (exhibited through positive group cohesion), awareness, and symmetry of learning benefits. In Group 1, learning took the form of *knowledge generation*, which can be characterized by complete interdependence among members (Misanchuk & Anderson, 2001). In this learning relationship, the writing product was the result of 'four brains (according to one member's interview)', rather than the mere sum of individual products. As the following excerpt (8.21) displays, the members acknowledged the symmetry of benefits (Shah, 2010). They perceived learning as mutually beneficial rather than as a one-way knowledge transmission. As discussed in more depth in Chapter 6, their interaction showed a pattern of collective inquiry, and approached issues at multiple levels of composition with mutual responsiveness.

> Excerpt 8.21
> I don't think that really matters because even if they seem low-level, they still have their strong suits that they can bring to the table. I don't think it's right to judge someone by how smart they are because they might have the greatest ideas.

Next, Group 2 (expert/novice pattern) also reached the highest level of collaboration, demonstrating positive evidence of communicative interaction, mutual trust, and level of awareness. Members in Group 2 also showed symmetry in perceived benefits. However, the pattern of learning took the form of knowledge transmission, as the expert members provided directions and guidance to the novice writers. However, the leaders actively encouraged and

involved the participation of novice members, displaying a high level of mutuality and group rapport. In the following excerpt (8.22), the leader discussed how she benefited from the process of providing necessary support and scaffolding.

> Excerpt 8.22
> Like the people who have better writing I was able to learn more from them so it was really helpful. I don't know what I learned from lower peers, but I was able to guide people who may not be as strong as me. I'm not saying I'm a strong writer either but we were all able to collaborate together no matter what our ability levels were.

Even though most of interactions in Group 2 displayed a pattern of peer teaching, the expert members perceived the symmetry of benefits gained from 'learning by teaching' as they provided feedback and editing each other's texts. This was especially so as the two expert members did not perceive themselves as confident academic writers, but gradually gained confidence in their writing skills by taking on more explicit leadership roles. As seen in Group 2, the act of teaching or explaining to others can help learners construct a more coherent representation of their knowledge (Van Lier, 1996). In terms of the pattern of inquiry, Group 2 showed collective inquiry. Particularly in the narrative essay, they engaged with group composing and sought approval from all members to make decisions. As discussed in the following excerpt (8.23), interaction based on collective inquiry helped them overcome writers' stumbling block, and move on with further ideas. These two collaborative groups positively evaluated their group process and outcome. Upon the solid foundation of mutual trust and safety, these groups were able to "constructively explore their differences and search for solutions that go beyond their own limited vision of what is possible'' (Gray, 1989, p. 5).

> Excerpt 8.23
> It was cool, just like people came with different ideas and together we just thought up an idea, so that was kind of cool, and then what I like about working in a group is that—it's like if you're stuck with something, you can just ask them. Like if you don't know your

plot you can just collaborate with other people. We can always just talk to each other, like "Could we make it this way?" so it all comes together. We can always learn from each other.

In contrast to the cases of Groups 1 and 2, the other two groups displayed a lack of collaborative orientation. Group 3 (authoritarian/ passive pattern) failed to reach higher level of collaboration, but rather remained between coordination and cooperation stages, due to their undue focus on task efficiency at the expense of mutuality and group rapport. Consequently, members in Group 3 expressed relatively low perceptions of learning benefits. Learning occurred in the weaker form of information transmission, with the dominant leader directing the collaboration process and giving other members brief instruction about grammatical errors. In terms of inquiry, they did not engage with collective inquiry, but instead displayed a pattern of delegation of tasks as they emphasized task efficiency and equal contribution. In Group 3, the perceptions of learning benefits depended on each member's roles and responsibilities, displaying an asymmetry of benefits, as discussed in Shah (2010). During an interview, one member with lower writing proficiency reflected that he managed to contribute his fair share of work, mostly by summarizing texts so that other members can easily incorporate it into the group text. He explained that his contribution, despite being simple, was valuable, commenting that "I mean I can see that some people are stronger or weaker in writing but they all have their strengths and weakness like one might be better at editing and one might be better at summarizing. We all learn from each other." However, the leader of the group, who has the higher-level writing ability, reflected that he did not gain much from collaborating with lower learning peers. In the following excerpt (8.24), he discussed that his group failed to achieve 'a mutual gain' due to the ability gap.

Excerpt 8.24

> That's like a hierarchy but people with more academic ability can teach stuff to lower ability but lower ability can't teach anything to the higher people. Most of the time. In order to maximize the efficiency it should be people who can learn from each other. It's a mutual gain because both people are gaining stuff from each other. Instead of one person gaining a lot, and one person gaining little to nothing. Again, in terms of writing.

Lastly, members of Group 4 (reluctant/ withdrawn pattern) involved the lowest level of collaboration since they lacked shared norms and rules necessary for team coordination. Therefore, Group 4 was not able to reach appropriate level of interaction, mutual trust, and awareness of group activity. This group also exhibited asymmetry in benefits. In this mixed-ability group, higher-level peers who reluctantly assumed to role of main writers blamed and complained about low-proficient peers' lack of participation and unequal contribution, as discussed in depth in Chapter 6. In the following excerpt (8.25), the intermediate level peer discussed that she learned vocabulary and transitions from a higher-level peer, but did not perceive any benefits from the lower-level peers.

> Excerpt 8.25
> Interviewer: What do you think you learned from John?
> Lauren: Just vocabulary and better transitions.
> Interviewer: Do you think you learned some things from the other two members too?
> Lauren: Not really. I learned nothing from them.

As the excerpts introduced earlier illustrated (e.g., Excerpts 6.48-6.50), Group 4 experienced the most superficial form of learning: *information sharing.* The members did not strive to co-construct or transfer knowledge, but instead merely shared information that may or may not be accepted by other members. In terms of inquiry, Group 4 shows a pattern of individual inquiry. They did not share a collective inquiry or mutual discussion to approach the problem and solution. One member with higher writing abilities discussed his reluctance to provide feedback and help, because assignments would be individually graded and he did not

care about the other members' portions of text.

Overall, the examination into the termination phase re-confirmed the important role of group cohesion and mutuality. Analysis has revealed that even though synchronous technology provided enhanced language socialization and affiliation opportunities, it was the group's capacity to effectively engage in the sub-tasks in each phase and create positive group rapport that ultimately enabled each group to reach higher level of collaboration and mutual learning benefits.

CHAPTER 9

Results for Research Question 4: Collaborative Writing Perceptions

In this section, I discuss students' perceptions of the affordances and challenges of using synchronous technology in collaborative writing, and also highlight the contextual factors that shape their experiences. The post-study survey results provide a general understanding of students' perceived affordances and challenges of students' collaborative writing experiences using Google Docs. In addition, qualitative analysis of student interviews, observations, and open-ended survey items enabled a more in-depth description of students' perceived experiences. From iterative rounds of analyses, several themes emerged regarding the affordances of synchronous collaboration (i.e., affordances for academic literacy, multiple entry points for participation, apprenticeship for 21st century literacy skills, support systems for struggling writers), as well as the challenges (i.e., efficiency over quality, tension between collective vs. individual ownership, conditions for deep learning). In this chapter, the focus of analysis was to understand how the integration of *synchronous technology* shaped students' perceptions of their *long-term engagement* with collaborative writing, which have been little studied in the literature. Qualitative analysis also revealed several contextual factors that shaped students' collaborative practices: technology-supportive context, collaborative school culture, and curriculum integration.

Perceived Affordances of Synchronous Collaborative Writing

The post-study survey results inquired about students' perceived benefits of synchronous collaborative writing with Google Docs, particularly with regards to (a) the technological affordances of Google Docs and (b) the relevance to learning. As seen in Figure 9.1, the easy access (4.5) and sharing features of Google Docs (4.48) were most favorably perceived as

benefits (with a response scale of 5: 1 strongly disagree, 5 strongly agree). Automatic version saving (4.25), simultaneous writing and editing features (4.04), and communication features (3.98) were also perceived as technological affordances that Google Docs provide particularly for writing. In terms of relevance to learning, students perceived that technology-based writing skills will be important to their future (4.6), and also viewed their collaboration experience as beneficial for enhancing their social skills (4.28), writing skills (3.93), and building knowledge (4.01). It was noteworthy that students acknowledged the relevance of collaborative writing to improving social skills, even more strongly than its relevance to writing skills improvement. Also interesting was that the students did not perceive the collaborative writing experience as particularly motivating (3.12), which may suggest that the technology-savvy participants in this study were already used to synchronous writing practices and did not find them novel enough to further motivate them to write. These points were further discussed in the following sub-sections on my qualitative analysis results.

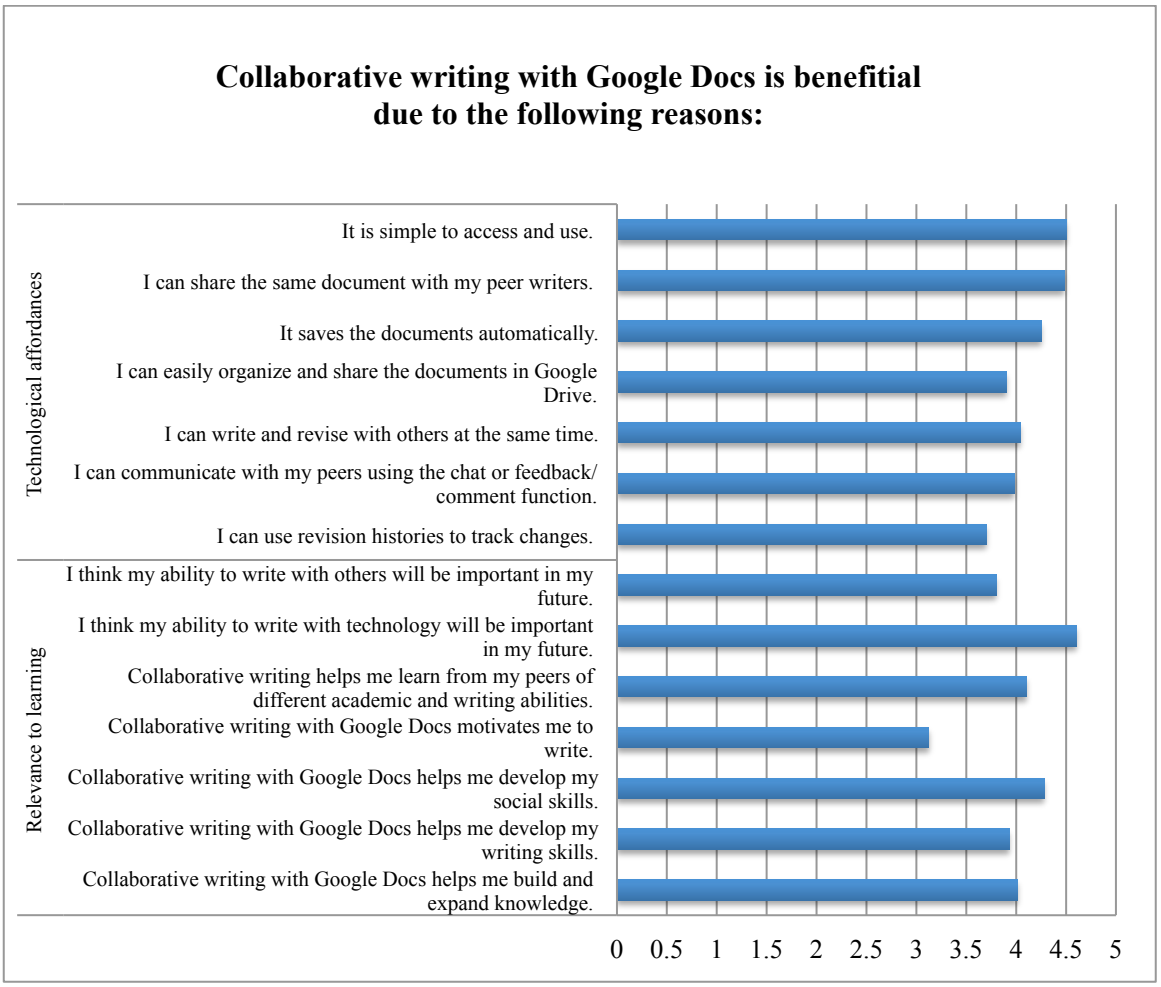

Figure 9.1. Post-survey Results: Benefits of collaborative writing with Google Docs (1: strongly disagree, 2: disagree, 3: neutral, 4: agree, 5: strongly agree)

Affordances for academic writing.

Student and teacher interviews and open-ended surveys have revealed the following three aspects of synchronous collaborative writing that helps enhance academic writing skills: (a) *fluidity in writing and revision, (b) reflective and critical thinking, and (c) built-in audience and shared responsibility.*

Fluidity in writing and revision. During interviews, the students and the teacher discussed how collaborative writing using Google Docs provided more opportunities for writing and revision. Compared to face-to-face group work situations, where more time and effort are

invested in logistics and coordination (Warschauer, 2006), the synchronous access and writing features available in Google Docs considerably sped up the feedback, revision, and communication process between the writer and multiple readers. In the following excerpt (9.1), the teacher underscored this point, explaining that collaborative writing using Google Docs helped students enhance the productivity of their writing due to its easy revision and editing features.

> Excerpt 9.1
> I think when I first started in a one to one school the biggest change was just the amount of writing students produced. So they can write so much more, not on quantity, but productivity. So we can get something done and move on. We could address revisions so much more efficiently where as if it was an essay written in pen and I told them to fix this, this, and this, then rewrite… it didn't get done. So this is much more immediate, much more efficient, much more productive and I think that it just builds their confidence and levels the playing field so everybody has access. For example, if someone doesn't have good handwriting, that won't be an issue anymore. It reduces a lot of challenges or excuses people might use to not be as productive.

One student compared how students' revision practices differed in Google Docs-based collaboration from individual writing or asynchronous peer review (Excerpt 9.2). Students do not usually spend enough time for reflective revision during the peer-review that typically occurs at the end of the writing stage. Studies on asynchronous collaborative writing similarly cautioned that students often engage with collaboration in specific parts of writing only, such as, during review stage (Storch, 2002). This may lead to superficial engagement of collaborative writing, resulting in more surface-level feedback than content-related feedback. In contrast, the integration of synchronous technology in the current study appeared to help students engage with the continual, in-the-moment revisions throughout the writing process.

> Excerpt 9.2

> I think my writing did improve because before I wasn't really comfortable with writing in general, but I think it improved. I had a lot more opportunities from the collaborative essays. We would usually write other stories by ourselves. Sometimes you would get a partner, switch, and read theirs, but you would have five minutes to do that so you don't have much time to see what they write. With the collaborative writing it's there and every time you go on you can build on and see what other people are writing.

In the next excerpt, another student elaborated on this point, explaining that group revision at the last stage would create conflicts due to issues such as time constraints and lack of motivation to accept the changes. As she discussed, the simultaneous access and group revision in a synchronous environment promoted collaboration throughout the entire writing process. This could help groups avoid potential conflicts at the later stage of writing and provide members with more opportunities to navigate different perspectives and enhance the text.

> Excerpt 9.3
> I think it kind of opens our eyes to other ideas and perspectives because normally when you're writing it's just your thoughts, and by the time you completely finish the essay a lot of people won't want to edit it too much, to make you angry, but then if you're all working together writing the same story then you're already getting the idea so that way you can make the story better and enhance the actual story in general.

Reflective and Critical Thinking. Students also discussed how the collaborative dialogue promoted their reflective and critical thinking skills. They perceived that gathering ideas from multiple members helped them develop open attitudes to different perspectives, which was also illustrated in the survey results (Figure 9.1). In the next excerpt (9.4), one student highlighted that working with 'four minds' helped her deepen her thought process.

> Excerpt 9.4
> I think we write much better because we build off of each other's ideas and working together really helps me focus on what the task is. Instead of having one mind working we have four minds working on it, which makes us think about the topic critically…and from different perspectives.

Research has also suggested that in collaborative group work, students continually assess their own performance in comparison to that of their peers (Jacobsen & Mueller, 1998), which promotes self-reflection and evaluation. During interviews, students discussed how the editing and discussion practices they engaged in during the collocated collaboration transferred over when they write individually. The following student comments illustrated this point: "when you're writing individually, sometimes you don't have different voices reading over it so having this [collaboration] experience, you can go back on your writing from a different perspective." Similarly, another student discussed how the editing and revision techniques transferred over to her individual essay: "[During group work,] we do a lot of things together and when I read to edit, I look over the essay and learn how words go together and I kind of use the techniques to edit the other parts [in my individual essay]."

Several students stressed how the practice of verbal composing helped them critically evaluate the content and logic of the text. One student whose group used the synchronous hands-on strategy commented that, "You actually verbally talk while you are writing and you are also thinking about what you are going to write." While this practice did not occur in all groups, members who engaged with the sentence-by-sentence verbal composing (e.g., Group 1, 2) positively evaluated its benefit on multiple levels (e.g., vocabulary, topic interpretation, revision). The following excerpt illustrated this point.

> Excerpt 9.5
> We discussed about everything. We wrote the story per sentence and revised it over and over. After finishing a paragraph, we read it and discussed about how we could improve it. It was time consuming, but I learned a lot about how to write a sentence.. which word to use… how to revise, and how to think about the topic.

Research has long suggested that the collaborative process allows for more opportunities

for self-reflection (Hirvela, 1999; Bikowski & Vithanage, 2016). Student interviews indicated that these opportunities were more salient in synchronous technology since students simultaneously wrote and monitored each other's writing. This process assisted the learners as they analyzed their own and peer's writing as readers. This may amplify the students' collective understanding that there exist multiple interpretations of the same topic or discussion point (Cunningham 1991).

Built-in audience and shared responsibility. Students reflected that they cultivated a higher level of reader awareness and responsibility as they wrote collaboratively. Some expressed that this ultimately enhanced their motivation for writing. In the next excerpt (9.6), one student discussed how her attitude toward a boring school assignment has changed as she became more aware of the readers in collaborative writing.

> Excerpt 9.6
> Usually I just think that it's a school assignment so I just do what I'm supposed to do. When it's a school assignment I usually don't really think a lot about the reader. Most times it's just, "Oh, my teacher is going to read this," and it's boring. But in collaborative writing, I think I try to make my writing better because other people are going to read it. So I want to make sure that they can understand my writing.

In the next excerpt, the teacher also echoed this point, explaining that group works can be more engaging for students because of a built-in audience and accountability.

> Excerpt 9.7
> Definitely. I think it does make them more engaged because they are working closely with peers and it kind of makes a built-in audience, a built-in accountability because you have a team counting on you.

During interviews, students also discussed how the shared responsibility that they developed during group work affected their motivation for writing. In the next two excerpts, students

mentioned that the sense of community (Excerpt 9.8), along with peer pressure (Excerpt 9.9), motivated them to be accountable. Some students appeared to have a particularly strong sense of accountability due to the progress-check and monitoring features available in Google docs—for example, through revision histories (Excerpt 9.9). In Google Docs, all writers could access revision histories and track the changes made by each author. Given that accountability is an important prerequisite for successful cooperative group work (Rogers & Finlayson, 2004), the availability of the tracking feature is useful both for the teacher and group members. In traditional group work, teaching and assessing student accountability have been difficult due to the abstract concept.

> Excerpt 9.8
> Personally, I like working in groups better even in other parts not associated with writing so I really like collaborative writing. For one it's motivating. When you're by yourself you think, "Oh man I have to get this whole thing done by myself", but when you are with four other people you can share the responsibility and it feels like we are all in this together.

> Excerpt 9.9
> I didn't necessarily feel like "Oh yeah, there's other people in my group I can just slack off and do nothing," I felt a responsibility to do my own part, especially when we can track what each other's doing on Google Docs. Probably peer pressure and fear of holding each other back, too. Because I don't care about getting a B but if I get eight people B's and to other people that's like a C. How am I going to feel about what I do? He's going to feel bad that he didn't help even though he should have. Caring about yourself and caring about other people is totally different.

Multiple entry points for participation. Synchronous collaboration settings enabled *distributed editing* (Trentin, 2009). Earlier studies on computer-mediated communication have identified equalization of participation as one of the most pervasive and beneficial effects of using computer-mediated communication in writing instruction (Hale, 2003; Ortega, 1997; Warschauer, 1996;). This can be attributed to increased opportunities for simultaneous many-to-

many writing in varied locations and time (Kessler et al., 2012). In networked online environments, texts are "not finite or finished but function as resources for expansion, reconfiguration, and new syntheses" (Lund, 2008, p.50). In the current study, students discussed two factors of synchronous group writing that contributed to proviing the multiple entry points for participation: (a) distributed control, and (b) diverse channels of communication.

Distributed control. Students reflected that the use of synchronous technology allowed them distributed control, which facilitated easy access and equal participation. In the following excerpt (9.10), one student commented about the particular advantage of Google Docs-based collaboration in one-to-one laptop environment.

> Excerpt 9.10
> It helps you work together as a group because before this project, we would usually have to be on just one laptop and only one person could access it. I think it's really helpful because you don't need to be crowded around one laptop, but still work together at the same time.

The distributed control promoted the flexibility and fluidity in the collaborative writing process. For example, one student discussed that synchronous technology allowed 'simultaneous branching' of ideas, commenting that "I think it was divided equally and each person would just go to different paragraphs. Then we can always jump in and add ideas." Using the sequential or synchronous hands-on writing strategies, students often added and expanded each other's text. One student discussed how her group members utilized the synchronous technology in order to strengthen the main idea by adding contextual evidence: "Because you can see what you're typing, and sometimes you can just add on to that. Most of them are adding more contextual evidence to make your main idea clearer."

In contrast to the studies on asynchronous collaborative writing (e.g., peer review) that suggested students' tendency to engage with micro-level feedback (e.g., Yim et al., under

review), the revision practices described above appeared to involve more in-depth revision at the macro level (e.g., content, organization)—particularly in groups with a collaborative stance (Table 6.3., see Ch.6 for more discussion). As one student commented during an interview, the simultaneous revision practices with Google Docs also involved flexibility and continuity: "Writing on Google Docs, we were able to type so I think it was easier to just put whatever and then go back and revise it." The benefits of continual revision were noted in previous studies on Google Docs-based collaborative writing (Bikowski, 2016; Kessler et al., 2012). As Lee (2010) posited, collaborative technology serves as a mediating artifact for the writing process that involves collaboration and scaffolding at multiple stages. The strength of continual revision and collaboration was emphasized in the following interview excerpt (9.11). One student described her experience as 'collaboration as one,' which contrasts with mere division of work.

> Excerpt 9.11
> Google Docs, you can all collaborate as one, so you have to get used to it. A person can edit one word and you would know why. You watch everything that happens on the screen and it helps us to discuss on so many different things. Even though you are not that involved, you at least have a general sense of what is going on throughout the entire process.

Her description is in line with what Storch (2012) suggested as a 'truly collaborative writing activity (p. 113),' -- the process in which all participants work together throughout the writing process, and contribute to the multiple sub-tasks, including idea generation, deliberation, and revision. Although variations across the task types (Ch. 5) and groups' interaction patterns have been revealed, the use of synchronous technology appeared to provide opportunities for more in-depth collaboration than cooperative group work, in which each participant produced discrete segments or contributed to only some phases of the writing process. The above excerpt explained that the group product is the final written output of the collaborative effort and one

that cannot be reduced to the separate input of individuals, which has often been observed in paper-based, or asynchronous collaborative writing (e.g., peer review).

Diverse channels of communication. Particularly in synchronous, collocated setting, students were able to engage with multiple channels of communication as they co-constructed collective ideas. Multiple channels of expression and communication expanded the scope of their collaboration. According to Kraut et al.'s (1992) contingency hypothesis, when task equivocality is high, such as in collaborative writing, it is essential to secure multiple channels of communication to engage in effective communication. During interviews, students discussed how technology mediated their communication in a way that traditional paper-based writing or standard word processing tools could not have done. For example, one student commented on how her generally quiet group utilized the commenting feature for effective communication: "Even though we might not talk often, we pitch in comments on Google docs, comment on each other, revise other people's individual paragraphs. That was very helpful because if we did that on paper, I don't know how you'd get to where we are now."

Some students emphasized that the dual channels of communication in collocated collaboration (e.g., in-text collaboration, verbal discussion) diversified how members can participate and contribute. For example, one student suggested that the level of verbal participation a member engages in was as equally important as the textual contribution: "If they are talking a lot in the discussion and adding more ideas, I think they are really participating and helping others know what to write about." These diverse options for participation available in the one-to-one laptop environment were perceived as motivating to some members, particularly those who are quiet, novice writers who are not confident about their writing skills. However, the use of synchronous technology can also lead to less participation because it is easier not to

be noticed in online settings than in face-to-face communication (Hale, 2003). Particularly in groups with low group cohesion, as illustrated in qualitative analysis of group interactions (Ch. 6, Ch. 8), members who are less motivated or confident tend to fade into the background (Arnold et al., 2009). This calls for more active teacher involvement or instructional arrangements that facilitate participation from less interactive group members. For example, teachers may assign specific roles and responsibilities to different members, especially when members are not familiar with collaborative group work.

Apprenticeship for 21st century literacy skills. According to Jenkins et al. (2009), literacy skills for the 21st century are skills that "enable participation in the new communities emerging within a networked society" (p. 55). In addition to building strong academic writing skills, students reflected that collaborative writing practices helped them develop broader learning skills ultimately essential for their effective functioning in the 21st century. Particularly, students discussed the value of (a) engaging in culturally relevant practices, (b) developing social/communication skills, and (c) being equipped with college and career readiness skills.

Culturally relevant practices. Students reflected that synchronous collaborative writing was culturally relevant to the literacy practices that they are used to. Culturally relevant practice refers to instructional arrangements relevant and responsive to the languages, literacies, and cultural practices of students (Ladson-Billings, 1995). In the next excerpt (9.12), one student discussed how she felt distant and disengaged when writing on paper. In contrast, she emphasized how the collaborative writing practices using Google Docs aligned with 'the way we (i.e., her technology-savvy generation) read and write.'

> Excerpt 9.12
> The way we read and write… I guess we grow up one way to do certain things. I feel like writing is people adding to it. Writing on paper was a lot harder for me because I'm just not used to it. Revising I had to erase everything and if I wanted

> to add more there wasn't enough space to do that so I would have to move everything down by erasing everything and rewriting it.

Another student explained in the following excerpt (9.13) how the in-class synchronous collaboration had overlapping components with her out-of-school literacy practice around social media, which include feedback exchanges, strong reader presence, and collaborative creation of content.

> Excerpt 9.13
> Because on social media it's like a variety of people that you can comment to. I also read and write on WattPad. It's like a reading and writing app in the iPhone or laptop. People write stories and you can write stories yourself. It's more like story writing and I'm used to getting feedback and sort of building stories together.

Research has suggested the importance of integrating students' repertoires of practice in classrooms (Gutierrez & Rogoff, 2003), underscoring the need to meaningfully value and maintain the practices to include dominant language, literacies, and other cultural practices. Similarly, Knobel (2001) asserted that "focusing solely on school literacies at the expense of literacies that students practice out of school is for many students a grave injustice because it invalidates those literacies in which they are fluent and effective out of school" (p. 405, as cited in Yi & Hirvela, 2010).

In this sense, synchronous collaborative writing practices may serve as a bridge that connects traditional literacy practices with the emerging outside school literacies typically characterized as more simultaneous, fluid, and communicative practices. As suggested in Black (2005) and Jenkins et al. (2009), the new digital cultures provide support systems to help students improve their core literacy skills as readers and writers. For example, practices such as feedback exchange and communicating with a larger public are relevant to traditional literacy practices. In this sense, in-class literacy practices should incorporate and expand these

competencies, rather than 'push[ing] aside old skills to make room for the new.' (Jenkins et al., 2009, p.19).

Social and communication skills. In post-study interviews, students also reflected that their gains from year-long collaboration experiences included not only writing skills, but also strong communication and social skills. In the next interview excerpt (9.14), the teacher explained that it was part of the instructional goal to enhance students' social skills through collaborative teamwork.

> Excerpt 9.14
> My goal was to have the students go through the writing process with the support of a team and the opportunity to help and contribute to a team product as a way of trying something different because for so many years it was always like "Okay everybody let's write up this essay" and I would teach it and they would write by themselves. It was a very isolated experience so I just thought if they can work as a team they could build a greater product and I think I've seen that. At least a greater comfort level, more engagement, better commitment.

The social aspect of literacy has been emphasized in the new literacies movement. Jenkins et al. (2009) defined social skills as one of the major component of new literacies, suggesting that literacy skills should involve skills to interact within a larger community, and not simply an individualized skill for personal expression. One student raised a similar point (Excerpt 9.15), identifying social skills as the core skill for effective collaborative writing:

> Excerpt 9.15
> I think social skills are important because you need them to share your ideas, but I also think that—I feel like not everyone has all of the skills, but there's different skills in each person so they all come together.

As the above excerpt illustrated, social skills include ability to communicate effectively, to pool knowledge within a collective intelligence, and to reconcile conflicting perspectives (Jenkins et al., 2009). My earlier discussion on students' communities of practices (Ch. 8),

particularly on the intimacy and work stage, illustrated many examples of the process and the perceived outcomes of students' abilities to negotiate and reconcile conflicts and successfully establish their membership within a community.

As discussed earlier, student survey results also revealed that students' perception of benefits in social skills was stronger than those in writing skills (Figure 9.2). A majority of students also perceived that collaboration skills would be useful in their future. In the following excerpt (9.16), one student discussed that her group's collaborative writing strategy (i.e., separate writing) did not help him with improving writing skills so much as collaborative skills.

> Excerpt 9.16
> I don't really think collaborative writing helps that much because usually you're writing an essay by yourself, but for collaborative writing, it's specifically writing one paragraph, and your team covers for you, so it's not exactly teaching you, but it teaches you collaborative skill.

Similarly, another student perceived little benefit in writing and, rather, identified the development of leadership skills as the major outcome of the collaboration experience: "It takes more leadership. It's good for leadership skills but in terms of writing like skills, it doesn't really help it's just the same thing."

College and career readiness. Besides the benefits in the cognitive and social aspects, collaborative writing was also perceived to be effective for equipping students with college and career readiness skills. The focus on teamwork and collaboration is also relevant to the structure and needs of the modern workplace (Jenkins, 2009). Both the teacher and students realized the critical role that collaborative group works play in higher education and career settings, particularly those practices involving technology. In the following interview excerpt (9.17), the teacher illustrated how the in-class collaborative writing opportunities ultimately apprenticed students into practical competencies required in workforce.

Excerpt 9.17

And I would imagine in schools that don't have the one to one at hand, they'd probably use Google Docs even more because the whole point of that is you can collaborate wherever you are, you don't have to sit next to each other. I think there are still people that think they need books in their hands, but when they get into the workforce they will be using technology.

Students also recognized the necessity of building collaboration skills to be college and career ready. For example, in the following excerpt, one student discussed the critical role of communication skill in career settings, and the necessity to be aware of that as they engage in collaborative writing.

Excerpt 9.18

I think you have to collaborate with others in real jobs. Like your communication with others has to be on point and I think your group members also have to be aware that. They need to also communicate with you to create a whole writing. If they don't understand or they don't do the right topic, you'll fail in real jobs, too.

Students also discussed the role of collaboration practices in their specific future careers. They recognized how different careers would require diverse skills and knowledge to confront common challenges. For example, students discussed how collaboration practices related to academic research (Excerpt 9.19) and graphic design (Excerpt 9.20).

Excerpt 9.19

I want to be a marine biologist...like work with animals. It sounds pretty fun. I know it's kind of random, but it's something I want to do. Maybe collaborating with others like to write research papers or do research.

Excerpt 9.20

I have vague plans, but I really like graphic design because I really like art in general. I think this collaborative writing assignment really helped us because for graphic design there's a writing element involved and there's also collaboration with other people. So this entire experience was just really helpful.

As discussed in the following excerpt (9.21), students appreciated the apprenticeship opportunities that they gained from year-long collaborative projects, describing the benefits of 'getting an early experience' of future career skills.

> Excerpt 9.21
> I do believe it now that technology is taking over, and in the future, there will be a lot more jobs involved with technology. I kind of feel that we are getting an early experience into using technology and doing collaborations. It really affects how you work when you get older.

Support systems for struggling writers. Lastly, interviews and observation data revealed a particular affordance of synchronous collaborative writing for struggling writers, including English language learners (ELLs). Given the complex cognitive and cultural constraints faced by learners when engaging in second language writing (Olson, Scarcella, & Matuchiniak, 2013), collaborative writing poses even more complicated challenges on second language learners. Second language socialization studies describe this as 'added complexity' since second language learners "already possess a repertoire of linguistic, discursive and cultural traditions and community affiliations when encountering new ones" (Duff, 2007, p. 310). Therefore, the cultural differences pose an additional layer of constraint that comes from having different cultural writing conventions and expectations for group work and writing practices (Olson et al., 2013). Recognizing the multiple challenges faced by the ELLs, the teacher explained in the following excerpt (9.22) how synchronous collaboration may provide them with a peer support system and learning opportunities.

> Excerpt 9.22
> The level of proficiency is a big factor. Where they come from, how they feel about being here. I think some kids come in 7th grade and the expectation is—you will learn English right now. That's so difficult for them. They are falling behind because they're trying to learn all this curriculum and a whole new language. I don't think collaborative writing can be intimidating or difficult for some writers, because if I say, "Go write an essay," if this person is all by

> themselves trying to write, they're not going to get it done or they're going to get a tutor to get it done for them. For the people struggling with language at least they feel like they're on the same boat with their peers, as opposed to being by themselves under the weight of having to write the entire essay and not knowing where to begin.

Peer modeling. During interviews, struggling writers identified their major benefits from collaborative writing as learning from observations and gaining peer tutoring. As discussed earlier, struggling writers often hesitate to participate in group writing due to their lack of confidence in their writing skills, particularly during the initial stage (see discussion in Ch.8, phases of CoP). They typically display initial confusion and anxiety over sharing their apparently imperfect text in synchronous environment, and they remain rather silent while observing others' progress. Non-participants' peripheral and lurking behaviors have often been criticized as a negative and destructive action. However, as Nonnecke and Preece (2000) noted, lurking is a frequent and important part of online communication. Recent CoP approaches legitimized lurking through the concept of peripheral participation (e.g., St. Clair, 2008), and acknowledged the value of learning from observations that occurs during this silent phase.

Student interviews revealed how they learned from modeling and observations, and gradually moved out of lurking and started to participate. For example, one student discussed how she initially noticed the vocabulary gap between her own and her advanced peers', but was able to narrow it with the help of the peer.

> Excerpt 9.23
> At the beginning when we were doing the narrative, I was reading Elena's writing and I thought to myself "I should write more like Elena". Then I would look over my own paragraphs and I thought I should find something like in the thesaurus … Elena really helped me with that. I'll go look in the thesaurus and look for another word to replace that word.

Group planning and revision. The synchronous writing and editing features available in Google Docs were particularly helpful for strengthening planning and revision processes. Previous studies have emphasized that the greatest challenge for struggling writers comes from their weak self-regulatory processes involved in composing, particularly in planning and revising (Graham & Harris, 2000). For struggling writers, managing and coordinating the elements underlying the process of planning and revising can be a daunting task. In the next excerpt (9.24), one struggling writer discussed how collaborative group work in synchronous settings forced her to plan more thoroughly.

> Excerpt 9.24
> We're forced to plan more because there are so many different ideas, and we can't have the same ones and not others. If you plan it wrong, you could be doing the same exact thing, so we were very cautious. For myself, I don't do as much planning, but maybe with others. Now I think I have better ideas about how to plan my writing.

Another student described her group's collaborative work on revising grammar and vocabulary, which illustrates the benefit of regulatory support through peer modeling. In the next excerpt (9.25), she explained her experiment with learning past tense with the support of other members, which exemplifies the contextualized, inductive approach to language learning.

> Excerpt 9.25
> After we would write, they would look over it and using that we would learn new words. In particular for our story, we had different past tense and present and so that was a little bit confusing, but then after working together, we corrected it because we had a lot of flash backs… Using tenses was very difficult for me, and I always had a hard time understanding the vague explanations in the grammar book. But this time, I understood better, because I could see how the ideas are put into the sentence and my group members helped me.

This illustration is echoed in Wheeler et al.'s (2008) study on wiki-based collaboration, which suggested that the increased discussion and peer feedback occurs in wiki allowed students to

gain skills in critical analysis and, in turn, improve their own writing by observing others (p. 993).

Multidirectional process of peer scaffolding. Other ELL students reflected that the use of technology provided them opportunities to contribute and participate despite their limited language proficiencies. For these students, technology served as a universal language that they are conversant with. For example, one ELL student discussed below (Excerpt 9.26) how he was able to contribute to the team by using his web search skills and tapping into his local resources.

> Excerpt 9.26
> A lot of Korean websites are really good. Those websites I also use like a dictionary to translate from Korean to English or from English to Korean. For one time, I didn't understand the Amendments, so I searched up in Korean, the United States amendments and to translate it into Korean. Then I shared the information with my group, which they found helpful.

Several researchers (de Guerrero & Villamil, 2000; Storch, 2002, 2005) have maintained a similar point, stressing that scaffolding is not just a unidirectional support from an expert to novice, but can occur between novices with both learners acting as expert and supporting each other mutually and concurrently through dialogic interaction (Hanjani & Li, 2014). Kasper (2009) underscored the *reciprocity* of L2 socialization: "Socialization processes are multidirectional, encompassing not only efforts by experts to induct novices to community membership but also mutual ways of shaping social roles, relationships, and identities through interaction" (p.274). In a similar vein, Kilmanova (2013) argued that the reciprocity is an important premise of language socialization theory. She re-conceptualized language learner as language *user* or *communicator*—a perspective grounded in the asset-based approach to bilingualism. Instead of focusing on L2 learners' limitation in linguistic competence, this perspective values bilingual students' funds of knowledge and unique capacities other than

language (Valencia, 1999). In the following excerpt (9.27), an ELL student further discussed how he felt empowered about his unique contribution, particularly his advanced technology skills. He stressed that his technological competency compensated for his limited language skills.

> Excerpt 9.27
> I was able to help the group by doing more research, help with formatting, or answering questions in pre-writing summary tasks. There are still many things that I can help out the group. Because I am good with troubleshooting, some students asked me to look into some formatting problems in Google Docs or log-in problems… I was able to help that out and I felt they needed me. I felt good. Not everyone in our group is a writer anyways.

His positive experience resonated with what Kramsh (2002) defined as the outcome of successful language learning. She underscored the ultimate outcome is not full mastery of linguistic structures, but "the ability to communicate in the language of a particular community and act according to its norms," which is "defined not only by external measures of individual achievement but also according to subjective and relational criteria" (Kramsch, 2002, p. 24). From the perspective of CoP, the ELL students' increased contribution—their moving forward from legitimate to full participation—implies opening up of a diversity of relationships (Lave & Wenger, 1991).

Perceived Challenges of Synchronous Collaborative Writing

A post-study survey queried students about their perceived challenges of writing collaboratively with Google Docs, particularly with regards to challenges coming from (a) instruction, (b) group factors, (c) and individual factors. As shown in Figure 9.2, challenges coming from individual factors (e.g., writing ability, social skills, technology skills, prior experiences) were not perceived as strongly as instructional factors (i.e., assessment, instruction) or group factors (e.g., member familiarity, ability gaps). Students were most

concerned about accountability: challenges coming from members who were not accountable (3.96) were most strongly perceived, followed by a relevant factor—lack of division of roles and tasks (3.68).

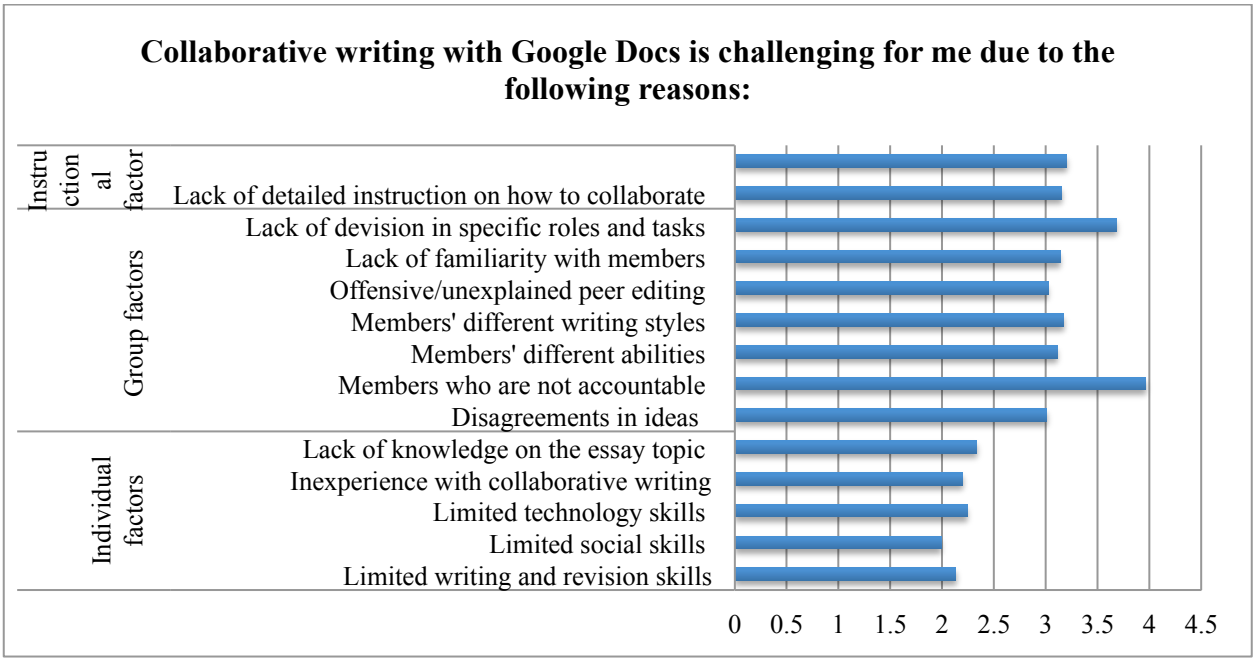

Figure 9.2. Post-survey Results: Challenges of Collaborative Writing with Google Docs

In addition to the survey results, qualitative analysis of student interviews, open-ended surveys, and observations revealed several challenges of synchronous collaboration. While specific challenges of ill-functioning groups have been discussed in earlier chapters (Ch. 6: Patterns of interaction, Ch. 8: Phases of Building CoP), the challenges that I discuss in this section do not only come from the unsuccessful focal group, but also from groups and individual students who positively evaluated their collaboration experiences at the end. The challenges include (a) undue focus on efficiency over quality, (b) tension between collective vs. individual ownership, and (c) time constraints.

Efficiency over quality. Some students placed undue focus on efficiency over quality, defining successful collaboration as merely an effective alternative to finish the work by

division of labors. These students often showed a pattern of separate writing, which can be characterized by cooperation. In the next excerpt (9.28), one student discussed the benefits of synchronous collaborative writing lie in making the job 'easier' by 'killing two birds with one stone.'

> Excerpt 9.28
> You're all editing while you're writing so it's kind of like killing two birds with one stone. In collaborative writing we all follow the same pattern like the intro, body paragraphs, and then conclusion, but with collaborative essay, you are writing the whole thing and it's kind of easier. You wouldn't have to write the intro all by yourself. You would only have to focus on one body paragraph, which you help you put better content into that paragraph.

The student simply perceived that synchronous collaboration (e.g., simultaneous branching) would reduce the amount of work, rather than producing a better work through negotiation and co-construction of knowledge. When asked if he had carefully read and provided feedback to other members' portions of the text, he said that he only did when time permitted, and his group usually ran out of time. Trentin (2009) raised a similar concern that members tend to concentrate on one branch of knowledge covered in the final collaborative work. It may also pose a challenge to teachers, as it is difficult to gauge the extent to which each group member critically engages with the overall work, besides performing his or her individual portion of a group task. In the next interview excerpt (9.29), another student discussed that he ended up writing a 'quick efficient' sentence, but the product did not translate into quality.

> Excerpt 9.29
> It encourages me to write fast-- a quick efficient sentence as others are doing. Maybe it was good that we were able to do efficient work but the bad thing was we weren't able to actually do some of the things.

Tension between collective vs. individual ownership. Another challenge perceived by students was the necessity to maintain a balance between collective and individual ownership.

Caspi and Blau (2011) identified this tension as a critical issue in group work, suggesting that collaboration and ownership have trade-off relationships, despite their distinctive advantages for learning. For example, enhanced individual ownership in group texts (e.g., assigned and individually graded paragraph) might reduce students' sense of accountability for the group text. In contrast, a stronger sense of collective ownership may lead to students' over-reliance on peer support.

The following student comments illustrated the examples of students' over-relying attitudes: "if there's like not a good word in my text, someone can correct it and put a better word for me," and "I hardly have anything to edit [because of other members' help]. Such problems have been pointed out by earlier studies (Myhill & Jones, 2007; Yim et al., 2015). These concerns mainly correspond to low-proficient students who has difficulty "self-monitoring just what their writing problems are," and lack "access to techniques and methods for overcoming them" (Pea & Kurland, 1987, p. 295). This complication suggests the need to train students with specific feedback strategies to help overcome an over-reliant tendency on technology.

Students also felt disturbed about the lack of control over the group text, suggesting the presence of strong individual ownership. For example, in the following excerpt (9.30), one student discussed her frustration with lacking control over document access and editing behaviors in Google Docs.

> Excerpt 9.30
> Some suggestions that I would make is about the powers that people in the document have. If a certain person isn't the owner of the document, then they shouldn't have the power to change the accessibility of other members. This caused great disruption in the group writing. And sometimes someone deletes what I wrote on accident. So it would be helpful if there's an option to select certain test, and click a button so someone can't delete it. Not so like someone

> can't erase anything you've written, but you can select certain text not to be deleted.

Students also expressed concerns over unsolicited peer feedback (Excerpt 9.31), which suggests the importance of raising awareness and discussing openly about changes that are made. Kraut et al. (1992) suggested earlier that joint revision of global aspects of text (e.g., structure, thesis) are generally more open to alternative solutions and, therefore, need more reciprocal discussion than micro-level feedback (e.g., error correction). Given that simultaneous editing and writing can potentially go unnoticed, groups working in synchronous environment may need even more explicit discussion about the degree to which they want each other to provide explanations and how.

> Excerpt 9.31
> Creating more limitations for others is a good improvement, by this I mean the authority over letting someone edit or view. It would be better to have people ask for permission on Google Doc to edit other people's work.

Time constraints. Time constraints in completing the group task seemed to pose multiple challenges to group members, including the over emphasis on efficiency (discussed above), and weak quality of writing, particularly in organization. Several students complained that the group coordinating processes took most of their time, leaving little time for actual writing and discussion. For example, one student discussed how time pressure often stifled collaboration, commenting that "I kind of like that we could bounce off ideas from each other, but then sometimes the thing that lacks with collaborative writing is that you could spend too much time bouncing off each other and then it could eventually outcome in not writing at all." Similarly, one student discussed the difficulty in managing time for discussion and actual

writing, commenting that "We don't really discuss what the subject is but if we do discuss too long it might take us behind on our writing. Spending too much time."

Previous studies have emphasized the necessity and importance of group processing to improve teamwork coordination and group productivity (Johnson & Johnson, 1987; Chiu & Hsiao, 2010), which ultimately affects the writing quality. Students may need specific training on effective time management for group coordination or explicit discussion about the definition and goal of collaboration as well as the group strategies before they engage in synchronous collaboration. In the following excerpt (9.32), one student suggested the need to have scheduled reflections to facilitate the group coordination processes.

> Excerpt 9.32
> We need scheduled reflections, where people can report how they think what they're doing, what they feel about the project so far, if they have any issues with work distribution.

Students also discussed that the lack of reflection at the final review stage leads to weak quality of text, particularly in the organizational aspect. Most of the students interviewed reflected that they felt rushed after they completed the first group draft, and did not spend sufficient time for reviewing for organization and coherence. In the next excerpt (9.33), one student discussed the challenge of building a coherent group text, particularly with synchronous technology that allows 'everyone [to] write everywhere at the same time.'

> Excerpt 9.33
> In terms of writing, I don't think it will [improve] just because you are writing such a small part that you don't get that much experience and if anything your organization will get worse because everyone is writing everywhere at the same time.

As discussed below (Excerpt 9.34), the teacher expressed a similar concern, suggesting the need to enhance the organizational aspect of group text, since students do not usually spend sufficient time on rearranging and reorganizing the final text due to a time crunch.

Excerpt 9.34

> That [weak area of group text] would be an area in organization, it's another area that I would need to build in more accountability for the revision process. It was my idea that it gave some kind of a scaffold and that you would revise, rearrange, delete, and reorganize. Some did it to a certain degree, but I didn't see it as much and I think part of it was that by the time we got to it, it was a bit of a time crunch and it was a little rushed.

These concerns over weak coherence in group texts were echoed in my previous study on undergraduates' synchronous, collocated writing using Google Docs (Yim et al., 2017). The results suggested that balanced pooling of ideas from multiple authors in synchronous contexts may strengthen the content. However, the positive effects of peer editing and participation evenness were not evident in the aspect of organization. Therefore, careful attention is needed to polish the organizational structure of text. The presence of peer-readers in synchronous collaborative context does not necessarily enhance the organization, which contradicts findings from previous studies on asynchronous feedback practices including those on wikis. This study re-confirms the previous finding that careful efforts are necessary to tie together different ideas pooled from members.

Given that most of the previous findings examined asynchronous collaboration, it is also possible that writers may tend to become careless or over-dependent on peer support in synchronous mode of collaboration, or have little ownership of the whole. Therefore, they may not pay sufficient attention to the organizational or mechanical aspect during the final polishing/revision stage. Palloff and Pratt (2005) suggested that the time factor for allowing groups to move through phases should be an important consideration in course design. When pressured for time, groups may focus on completing the assignment at hand, which is likely to cause frustration on members who find it difficult to keep the pace of group process and potentially feel left behind, as illustrated in the cases of Group 4 (see Ch.8 for details).

Contextual Factors Shaping the Implementation

Based on the bottom-up analysis of interviews, surveys, and observations, I identified salient contextual factors that shaped students' synchronous collaboration experiences: (a) technology-supportive context, (b) school's emphasis on collaboration and diversity, (c) and curriculum integration and teacher's role.

Technology-supportive context. Studies have suggested that suitable multimedia equipment and communication tools are basic pre-requisites for collaborative online learning (Hron & Friedrich, 2003). In this study, the participating classes were situated in a technology-supportive context. The district was moving forward to implementing one-to-one laptop programs in all schools, and the school examined in this study was one of the leading schools with a strong technology initiative. In the following excerpt (9.35), the teacher discussed the sufficient training and support she has received from the district, evaluating the district's one-to-one laptop program initiative as successful.

> Excerpt 9.35
> There is a ton of training on that so that is where the focus is right now. I don't feel like I'm lacking in training. We do have TOSA (Teachers on Special Assignments); they're tech specialists. They are always sending out messages saying they are here to help and they are from the district. I can say, "I'm teaching language arts and I'm not feeling very innovative these days, come and show me something." I think this is why our district has had such a successful program.

The teacher herself actively engaged with experimenting with technology in her class, and showed confidence and enthusiasm toward integrating technology in her classes, as discussed in the following excerpt.

> Excerpt 9.36
> I really like learning how to-- I think where my strength is that if I learn how to use a certain program, I can do that. I think sometimes some people don't see the great benefit and there's such great benefit. I don't really seek it out, but I

> have other colleagues that are really good at finding things to use and I would just benefit from that. I think you [as teachers] need to diligently work to make a program that incorporates technology.

In her ELA classes, she integrated Google Docs as core writing platforms, and has used a variety of other technology programs that also involve collaborative nature (Excerpt 9.37). Using these multiple programs in conjunction with the group writing projects appeared to be helpful for students, as they got used to the concept of collaborative learning in various components of literacy (e.g., vocabulary, reading, writing).

> Excerpt 9.37
> I've used vocab.com, study sync, moby max a little bit. We used to use these active expressions, which were these little devices where kids could text their answers and it would show up on the screen, only it was like a phone. A lot of that peripheral technology equipment has fallen to the side because there's so much that is web based now. There's this program called Socrative that does just what the active expressions did. I pose a question, they submit their answers and it's anonymous. That's kind of a collaborative element too.

She further discussed that her experiments with these technology tools in her classes were well-received by the students, who also have high levels of technology proficiency. In the following excerpt (9.38), one student who transferred from another school appreciated the technology-supportive learning environment that the school provided.

> Excerpt 9.38
> The other school I went to, we didn't use any technology, so it was mostly just pen and paper. In [this school], I think we learn what we are supposed to learn and above that. Our school focuses on technology, especially with Google Docs. I think they use Google Docs since the second grade. We don't necessarily write a lot, but we have so much available writing and resources to use such as going online and practicing.

As discussed below (Excerpt 9.39), the teacher expressed high expectations toward her students' capacities to utilize technology themselves, and discussed how she learned from students in navigating different technologies.

> Excerpt 9.39
> I think the biggest thing I like about technology in the classroom is that the students teach me. Last year we did this video project and I told them I wanted them to use green screen technology and then there was this style where they just swept and text appears and then they pushed the texts out of the way in this movie we watched. I said, "I want you to do that, but I have no idea how to do it." I don't even know what I'm asking you to do, but I want you to do it and they said, "Okay, we can do that." I've had some kids come up and ask me how to do green screen and I said, "I don't know." So they would just look it up and I like that a lot.

Teachers' feelings of empowerment and diminished need for support are important indicators in determining the degree of effectiveness in the integration of instructional technology, as suggested in previous research (e.g., Zhao et al., 2002).

School's emphasis on collaboration and diversity. The school's emphasis on collaboration, real world application, and diversity also facilitated students' collaboration practices in ELA classes. In the following excerpt (9.40), the teacher discussed the school's overall instructional goal was not on knowledge transmission, but rather on knowledge creation and on raising students' 21st century competencies required in real workforce.

> Excerpt 9.40
> Well, I think it [the school] definitely emphasizes collaboration and real world application. I love this idea that we talked about a lot, the classroom walls are kind of torn down because it's 24/7 learning. It's not this do this assignment, turn it in, then I'm done. It's kind of this ongoing build up of skills, connections, and applications. We ask, "What are they going to bring to this community as a learner?"

Interdisciplinary learning was also emphasized and widely adopted at this school. During the collaborative writing projects, students were allowed to use textual evidence that they learned

from other subjects, such as in history. One student discussed the benefit of using evidence he learned from his history class in informative writing, commenting that; "there was a lot of background info that our history teacher talked about and I could incorporate a lot of that. It was a paragraph and that could make it much more valid."

Students were also used to creating collaborative products using multimedia, such as digital storytelling projects. During interviews, one student reflected on the similarities and differences between the collaborative academic essays and the digital storytelling projects. In the following excerpt (9.41), he specifically discussed his distinct roles in each project and how the writing component of video making process related to the collaborative academic essay. Such close connections and rich experiences with group work would have positively influenced students' collaborative academic writing.

> Excerpt 9.41
> I think the group put me to my best abilities— scriptwriter, cameraman, and editing. So I'm pretty good with editing and I can write decently. So I wrote the script and edited because the actors were a little bit heavier. But I can't just sit there, write and edit. So I was a little bit of a camera man. I guess you can say I kind of led there. That's just because that person didn't want to be an actor and he didn't have a lot of experience. So I was more like his tutor than a leader. In a sense, it was similar to the collaborative essays, in that I sometimes edit, write, tutor, and lead.. working with others.. In the end they both just came down to be editing and we finish it off and add final touches.

The school's multicultural student population also contributed to forming the collaborative and diverse school culture. In the following excerpt (9.42), one student appreciated working with peers from diverse backgrounds, which made her more open to collaboration.

> Excerpt 9.42
> I have friends from different parts of the world. It's kind of cool because you get to learn their culture and foods like at lunch and when they talk to their parents they can also teach you. I guess it's an eye-opener that there are so many places in the world. In terms of writing, I think everyone has their own strong suit,

> whether it's writing its self or creating ideas, or it's just grammar… you need all of those things to write a good essay so I think by having a diverse group with different skills as well as different ethnicities kind of makes it more open to collaboration.

Observations of student interactions and analysis of class materials further revealed that students shared strong bonds with peers from similar cultural backgrounds (Figure 9.3). During interviews, ELL students also discussed how they gained support from peers using the same home language (Excerpt 9.43). This suggests the potential benefits of sharing multiple CoPs. Individuals are likely to participate in multiple communities, each with distinct practices and identity structures. These involve exploring senses of belonging and identities as individuals negotiate their membership within those communities. As Mutch (2003) argued, individuals develop a sense of agency and identity through *the adoption and adaptation* of different forms of participation within different communities. In this sense, students develop their identities and practices not solely *within* a community of practice but in the spaces *between* communities (Handley et al., 2006). In my study site, the bilingual culture and strong sense of belonging to one's own ethnic group could have provided an additional layer of support systems for language minority learners as they engaged in multiple communities of practice.

> Excerpt 9.43
> We have a lot of Asians too. It's easier to understand because I have some peers that speak Korean and in English at the same time so if I don't understand they can translate for me. I'm comfortable with everyone, but if they are Korean it's easier to communicate and I feel closer to them. I can rely on them when I need help.

Curriculum integration and teacher's role. Research suggests that the curricular integration of the collaborative learning unit is essential to support learner motivation and participation (Hron & Friedrich, 2003). Hutchison and Reinking's (2011) national survey of literacy teachers similarly pointed out that lack of curricular integration is one of the strongest

obstacles to technology integration. The authors underscored the need to differentiate shallow technological integration that conceptualized the integration of technology as independent from the curriculum, from curricular integration that views ICTs as integral to the curriculum. They concluded that authentic and effective technology integration is only possible with the latter type, for which this school strived.

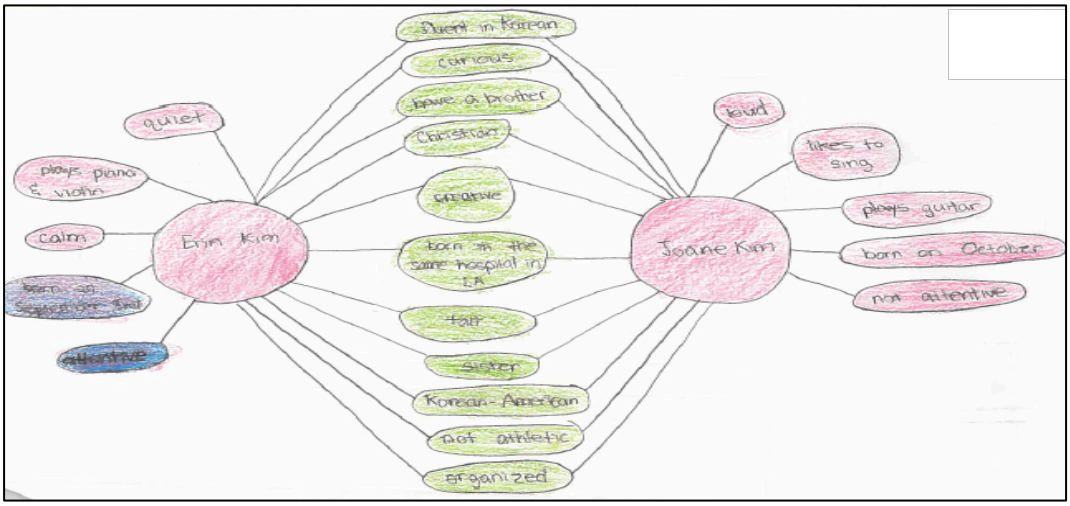

Figure 9.3. Students' mind map illustrating a sense of bonding among bilingual peers. The two peers identified their fluent Korean speaking abilities and Korean ethnicity as the common characteristics between them.

In the ELA classes that I observed, three collaborative writing tasks were integrated as part of the teacher's year-long instructional plan. The teacher deliberately integrated the collaborative writing projects as post-reading activities that followed intensive reading and discussion activities. She also designed the projects in a way that students get to work with multiple tasks across genres, and provided opportunities for subsequent individual revisions, and for being assessed on both group and the individual product. This careful instructional planning matched with her belief in the social aspects of literacy, as well as her goal of fostering a strong teamwork and a sense of accomplishment as the instructional outcome. She discussed this point in the following excerpt:

Excerpt 9.44

> What I saw was a greater sense of their own recognition of how far they've come. I saw teams reminiscing about "Remember when we wrote the narrative and we were trying to come up with the characters' names?" I think there was this body of work that these teams got to create and there was a sense of accomplishment for that.

Instead of implementing the collaborative task as a single exploratory activity, she provided students with ample opportunities to engage in collaboration processes as they worked on different tasks with unique genre demands. In the following excerpt (9.45), one student explained how her group increasingly felt more comfortable with each other as they engaged with multiple tasks. Earlier discussion on collaborative writing strategies (Chapter 6) displayed how groups experimented with different writing strategies that suit their group's diverse goal and dynamics.

Excerpt 9.45

> I really think it was a smart idea to start with the narrative because that is the one that is more open to opinions and different ideas, so because of that we were able to outwardly say this is what I want and we all worked together and eventually as we got into other things like argumentative and informative, we're already kind of used to being criticized about our ideas. And we're more aware of each other's personal side.

The teacher also ensured that students were prepared sufficiently for the group writing tasks. Prior to the collaborative writing projects that served as the wrap-up task of each unit, students read nine to twelve reading texts centered around the theme of the unit. This intensive reading activity was followed by a series of pre-writing tasks, such as answering comprehension questions, modeling and analyzing exemplary texts. Students were required to use these texts as textual evidence in their collaborative writing. In the following excerpt, the teacher stressed the

importance of building background schema for effective collaborative writing, yet explained that it was up to the groups to decide how they would go about planning and writing.

> Excerpt 9.46
> I would say enough background knowledge that they can use to bring to something to the project. The pre-writing was to look at a mentor's text and to analyze the introduction, body. So I made them do the prewriting on Google Docs so everybody can see everybody's analysis of the type of writing that we were going to be doing. There was a model text for that. It was an example of the type of story they were supposed to write.

The teacher also identified time planning and clarity of directions as important conditions for successful collaboration. However, she also made it clear that students needed to be given room for creative construction of their own group processes, as discussed in the following excerpt:

> Excerpt 9.47
> As far as how they planned their writing, that's part of what I like about this whole Google Doc thing is they all bring a different approach. I'm sure there is a leader in the group who says, "let's organize it this way." It was fun to see the different ways they organized their thoughts.

Along the same line, one student discussed the positive aspect of experimenting with a free structure in promoting creativity and in-depth collaboration throughout the process (Excerpt 9.48). Previous studies on collaborative writing also suggested that collaborative projects are suitable for diversifying instructional approaches and for appealing to the differing cognitive strengths and backgrounds of group members (Meyers, 2010).

> Excerpt 9.48
> In terms of collaboration I liked how it was really free because we have more creative input into it and I didn't feel so rushed or so restricted. It was like, "Oh, can you please have this done at this time," and do it however way you want it done. I just like the whole open idea of it because of the creative aspect. It really makes for it to be really collaborative because you all have to work together.

Next, the teacher underscored the need to balance collaborative and individual aspects of writing. Following the group work, she had students revise their group product on their own and evaluated the refined individual essay for grades. In the following excerpt, one student discussed her positive perception of the teacher's assessment structure.

> Excerpt 9.49
> I think collaborative writing really helps, but then I also think that there should be an independent factor of it as well. So I like what the teacher did after we all wrote the story together, that we do it independently because that's what makes it the better story for yourself personally.

This point was also discussed among Meyers's (2010) study participants, who argued that some stages of writing (e.g., information search), were best performed alone, and others (e.g., planning) in a group. This point concurred with Elola and Oskoz (2010)—how collaborative writing should not supplant individual writing in class, as it is supported by the individual writing gains of both groups in this study. Rather, in-class web-based collaborative writing allowed students to further develop their own individual writing.

During the collaboration projects, the teacher assumed a role of facilitator. She circled the room and checked student writing in Google Docs, providing writing support and answering questions when needed. In the following excerpt (9.50), she described her own role as *a guide on the side*, but not in a passive sense, but with a strong mission of facilitating students' problem-solving skills and agency.

> Excerpt 9.50
> I kind of feel like I don't have to [get involved in their group work] maybe because they come with so much experience with that, but also I think they just need to learn how to do it. If they come to me saying their group is having problems then I'll get the whole team together and we'll try to sort it out. My role was giving them instructions and monitoring the Google Docs as they worked. [Students did] a lot of reading while they wrote and commenting on it. I

> think really being the guide on the side. They were writing on their own and not doing what I told them to do.

Teachers' central role in successful technology-based learning has long been emphasized in previous literature (e.g., Fischer & Dillenbourg, 2006). Squire and Johnson (2000) maintained that the facilitator role of an instructor can be more valued and effective than his or her role as a content provider or information source. However, these researchers warned against a misleading interpretation of student agency as minimizing teacher's role. Instead, successful technology integration recognizes the role of the teacher even more, as teachers are expected to coordinate complex multi-layered activities in real time (Warschauer, 2011). Particularly regarding the context of collaborative learning, Palloff and Pratt (1999) recommended that an instructor or a group leader should act as a facilitator, who fine-tunes and leads verbal and written discussion in the right direction. Similarly, Bax (2011) argued that teachers should instead be "difficultators" that stir up student thinking to create the need for transforming perspectives. In addition, he suggested that an effective classroom should aim to be "learning-centered" rather than "learner-centered" (p. 254).

Classroom observations, as well as student and teacher interviews, revealed that the teacher in the current study made efforts to provide appropriate level of support and facilitation for student groups through multiple ways: (a) by providing groups with sufficient pre-writing tasks so that the members could establish group cohesion—an essential component in successful collaborative work, (b) by integrating the multiple collaboration tasks within the year-long curriculum and supporting the processes with guided instruction at the beginning of each task, (c) by having students stay with the same group for a year so they are given sufficient time for building CoPs, and lastly, (d) by using collaborative writing as a preparatory step for the subsequent individual writing, which is an effective example of a *gradual release of*

responsibility model (Pearson & Gallagher, 1983). As revealed in student interviews, collaborative practices gave students an opportunity for peer teaching and scaffolding, which lay the ground for the subsequent individual work. Responsibility of the task was gradually released from the teacher and the peers until the writer took its own textual ownership, moving from a state of interdependence to independence. It provided opportunities for them to explore both the social and independent aspects of writing. Moreover, it helped reduce students' concerns about member accountability and fair assessment of their writing. However, it should be noted that the teacher's goal was to provide an overall guiding structure for the groups and let them figure out the specifics of their group dynamics, rules, and processes. The findings of this study, particularly the challenges and conflicts identified in the non-collaborative groups, point to the need for integrating explicit training and instruction on collaboration strategies and processes. I elaborated this point further in the pedagogical implications in the subsequent chapter.

CHAPTER 10

Discussion and Conclusion

Given the increasingly widespread use of digital media technology in literacy education, it is critical to understand how students' new literacies practices may shape their learning outcomes and perceptions. This longitudinal case study examined 8th graders' year-long engagement with synchronous collaborative writing with Google Docs using a mixed-method design that combines qualitative, quantitative, and text-mining approaches. Specifically, this study explored the characteristics and patterns of students' collaborative interactions, their subsequent writing outcomes and perceptions, and how these may be influenced by critical contextual factors such as task type or language proficiency. In addition, triangulation of multiple sources of data collected over a year (e.g., interviews, group discussion, text visualizations, reflection essays, observations) helped elucidate the processes of building communities of practice (CoP) during collaborative academic writing, which have yet been reported in the literature. Below I highlight the results of this longitudinal case study and discussed their theoretical, pedagogical, and methodological implications.

Theoretical Implications

Collaborative writing as new literacies practice. This study examined the under-explored area of digital literacy practices—synchronous collaborative writing in academic settings, and how these in-school practices may shape students' learning outcomes and perceptions. In contrast to the large volume of research on asynchronous collaborative writing with peer review practices and research on outside-of-school literacy practices, there are few studies about K-12 students' synchronous group writing practices in ELA classes. The synchronous features (i.e., simultaneous access, writing, and editing) of cloud-based technology have expanded the scope,

pattern, and educational potential of group writing even more dramatically. Unlike traditional word processing programs where the writer must wait for group members to complete their turns before gaining access to each other's text, the synchronous writing and reviewing functionalities in cloud-based environments are intertwined in a recursive writing process (Kessler et al., 2010).

However, this complex and new digital writing practice may add significant challenges to students who already face cognitive constraints that stem from task equivocality of group writing (see discussion in Ch.8). The challenge is even greater for second language writers who cope with linguistic and cultural constraints as well (Olson, Scarcella, & Matuchiniak, 2015). As such, many scholars (e.g. Lowry, Curtis, & Lowry, 2004; Yeh, 2014) have addressed the compelling need for researching the synchronous group writing practices among second language writers in networked environments.

The qualitative examinations of students' year-long engagement with synchronous collaborative writing revealed how the newly emerging writing practices using Google Docs shape perceived learning (Ch. 9) and textual outcomes (Ch. 7). Analysis of observations, interviews, and group discussion data revealed that the new digital literacy practices enabled distributed control over group composition and allowed multiple entry points for participation. In the modes of simultaneous many-to-many writing, groups explored the fluidity of texts that "function as resources for expansion, reconfiguration, and new synthesis" (Lund, 2008, p.50). As discussed in Chapter 9, simultaneous access, writing and editing features of Google Docs provided students with distributed control and enhanced participation opportunities, which enabled them to expand students' knowledge through what they called a 'simultaneous branching' of ideas.

Text analysis and visualizations using DocuViz and AuthorViz further revealed that synchronous technology afforded new styles of group writing—for example, synchronous hands-on style (e.g., simultaneous building of sentences by multiple writers). Student interviews indicated that these writing practices supported the continual revision and expansion of ideas such as adding contextual evidence by multiple authors. These practices represent the characteristics of new literacies, which are more participatory, collaborative, and distributed than print-based literacy (Leu et al., 2004). Qualitative analysis of the four focal groups' interaction patterns (Ch. 6) and phases (Ch. 8) illustrated how members were able to take advantage of synchronous technology as they mutually scaffolded and expanded on each other's thoughts. Within the one-to-one laptop environment, students engaged with both verbal and textual collaboration, demonstrating the processes of cognitive elaboration. Simultaneous access and writing features of Google Docs enabled members to provide each other just-in-time feedback, which enhanced intersubjectivity (i.e., seeking a shared understanding of the situation, Rommetveit, 1985) and contingent responsivity (i.e., interpreting group partner's behavior and responding appropriately, Lidz, 1991). Research underlines the importance of just-in-time feedback provided in the intermediate stages of drafting for developing writing skills (Ferris, 2006).

As discussed in Chapter 6, the functionalities of synchronous technology facilitated collaboration throughout the writing process (i.e., *sustained collaboration,* Bikowski & Vithanage, 2016), which is a desirable form of collaboration, yet rarely occurs in face-to-face collaboration (Storch, 2012). As Storch cautioned, students tend to collaborate within a limited range of composition process, such as planning or reviewing, and write independently in face-to-face settings due to the difficulty in sharing single document among multiple authors. The

simultaneous access and writing in Google Docs enhanced the opportunities for easy participation and contribution, and facilitated the reorganization and integration of ideas throughout the writing processes.

Despite the observed benefits, however, the qualitative examination of the four cases (Ch. 6) underscores that the mere use of synchronous technology did not guarantee the realization of these affordances, as seen in the contrasting patterns of interaction between collaborative (Groups 1 and 2) and non-collaborative groups (Groups 3 and 4). The four focal groups' cases demonstrate that despite the increased opportunities for participation and interaction in synchronous environments, the level and degree of collaboration depended on each group's efforts and capacity for negotiating the differences and conflicts that arise during group work. Qualitative analysis of collaboration phases (Ch. 8) also demonstrated how multiple factors such as mutual trust, level of awareness, and symmetry of benefits (Shah, 2010) influenced the degree to which groups realized the learning affordances of collaborative writing. The results underscored the need for both cognitive scaffolding and social-affective support in the development of students' collaborative writing skills (Xu & Carless, 2016). This point reiterates Warschauer and Meskill's (2000) earlier conclusion that the key to effective integration of technology in language teaching lies in the human factor and the affordances of technology cannot be fully understood without considering the sociocultural contexts.

Next, student perceptions also revealed that synchronous collaborative writing practices were relevant and responsive to the cultural practices of students. The in-class collaborative writing practices overlapped with out-of-school literacy practices around social media (e.g., feedback exchange, strong reader presence, collaborative creation of content) and, thus, were perceived as culturally relevant. Students also perceived the practices as beneficial for

improving their social and communication skills, and for their college and career competencies. By incorporating students' repertoires of literacy practice—culturally relevant practices in which students are fluent and effective out-of-school (Ladson-Billings, 1995), the teacher in this study was able to enhance students' engagement and help them improve their core literacy skills as readers and writers. Research has suggested that out-of-school literacy practices such as exchanging feedback and comments have the potential to strengthen the iterative processes of revision in academic writing (Black, 2005; Jenkins et al., 2009), yet there has been little empirical evidence—understandably, due to the difficulty in analyzing data collected from uncontrolled, naturalistic settings. The lack of research, in turn, has made it difficult for teachers to make informed decisions about integrating new literacy practices into their instruction, despite the suggested benefits. Both qualitative and quantitative results from this study suggest that synchronous collaborative writing practices can serve as a bridge to connect print-based literacy skills with the emerging outside school literacies, which typically characterized as more fluid and communicative.

In this current study, analysis of students' group texts, interviews, and survey results imply how synchronous group writing that are relevant to out-of-school literacy practices may impact academic writing development. In Chapter 9, analysis of student interviews and observations revealed how synchronous group writing facilitated the fluidity in writing and revision, students' reflective and critical thinking skills, reader awareness, and shared responsibility, all of which were perceived as contributing to developing academic writing skills. In addition, quantitative analysis of group text outcomes revealed how collaborative writing practices (e.g., participation evenness, editing amount) may be associated with the textual quality of academic texts produced by group (see Ch.7 or details). Of particular importance was

the influence of contextual factors (i.e., task types, ability grouping status) on this association. For example, the evenness of participation and editing amount generated different textual outcomes depending on the genre characteristics. Whereas the evenness of participation predicted stronger content in the information genre, it predicted weaker organization in the narrative genre. Analysis of surveys and interviews further revealed that the synchronous group writing can be confusing and distracting without agreed-upon group norms and rules, and this challenge may result in weak organization and mechanics.

The results demonstrating the link between collaboration practices and textual outcomes underscore the importance of key social and contextual factors that need to be carefully considered in integrating new literacy practices in ELA instruction. For example, analysis of collaboration phases (Ch.8) and student perceptions (Ch.9) revealed several challenges of integrating synchronous technology into group writing. Students' limited technology proficiencies can be a stumbling block for fluid collaboration and text construction, particularly during the initial phase of collaboration. In addition, analysis showed that students tended to misuse the functionalities of simultaneous editing and writing (e.g., simultaneous branching in parallel writing mode) as they focus on task efficiency over quality. Given these challenges, it is important to ensure that both teachers and students fully understand the purpose and strategies of synchronous collaborative writing in order to realize the benefits of integrating digital literacy practice for improving both academic writing and broader 21st literacy skills.

Collaborative writing as a community practice. This longitudinal case study investigated the group processes of building CoPs (Ch.9), which have been rarely examined in previous literature, particularly in academic settings. Understanding collaboration processes using the theory of CoP was relevant given that the important ingredients of learning, such as group

practices, norms, and membership, develop over time (Squire & Johnson, 2000). Qualitative analysis of group discussion, interviews, open-ended survey responses, and observations collected over a year provided a thick description of various factors that are critical to understanding the gradual development of learning communities (Chapters 8 & 9).

Analysis of group collaboration processes was informed by Palloff and Pratt's (2001) four phases of building online communities: (1) the initial phase, (2) the conflict phase, (3) the intimacy and work phase, and (4) the termination phase. Qualitative discussion of the phases and sub-themes within each phase indicated that there are unique group tasks that need to be accomplished in each phase, and the degree to which members accomplish these tasks ultimately determine the level of collaboration and perceived learning. Particularly, analysis revealed that students deal with critical group tasks during the intimacy and work phase, which include building trust and safety, negotiating differences, establishing norms and membership, and pooling resources and expertise. Successful completion of these tasks supported novice members' move from legitimate peripheral participation to full participation as seen in the cases of Groups 1 and 2. Furthermore, analysis of group interactions (Ch.6) and perceptions (Ch.9) underscored the critical role of mutuality and group cohesion in successful accomplishment of sub-tasks during the intimacy and work phase.

Groups that failed to establish a collegial learning community during the preceding phases rarely reached the termination stage, which is a true performing stage of CoP (Palloff & Pratt, 2001). The contrasting cases of groups with high mutuality (Groups 1 and 2) and low mutuality (Groups 3 and 4) illustrated the different paths leading to the termination phase: peripheral participation remains stagnated whereas the other moves forward to full participation. Of particular importance was the presence and type of leadership in building communities of

practice. Analysis of group interactions (Ch. 6) revealed that groups with a collaborative stance had an expert mentor who scaffolded for the apprentice members (Group 2) or had a shared and distributed leadership (Group 1), whereas groups with non-collaborative orientations had either authoritarian (Group 3) or reluctant leader (Group 4) who were not responsive to other members' participation efforts. In the non-collaborative groups, the participation of peripheral members remained stagnant, and there was no negotiation or change in membership.

In addition, I examined the group experiences during the termination stage using Shah's (2010) nested model of collaboration, which illustrates the differing levels of collaboration (i.e., communication, contribution, coordination, cooperation, collaboration). Unlike previous case studies that typically observed group collaboration over the short term (Storch, 2005; Li & Zhu, 2013; Kost, 2011), this longitudinal study examined students' changing experiences during the different phases of CoP, and more importantly, how different factors (mutuality, equality, group rapport, etc.) may affect the processes and subsequent levels of collaboration. The results strongly indicated that participation does not necessarily lead to collaboration. As discussed in-depth earlier, the use of synchronous technology provided multiple entry points for participation, as well as multiple channels of language socialization and affiliation opportunities (Thorne & Black, 2007). However, it should be noted that the enhanced opportunities for participation in synchronous environments do not guarantee effective collaboration. For example, one member's efforts to engage in meaningful participation (e.g., making suggestions, request for help) may not elicit responses from members, as seen in the cases of Group 3 or 4. In this sense, participation best functions as a pre-condition for mutual engagement and collaboration.

This point underscores the social embeddedness of technology, which captures the ecological intertwining of technology and its users (Warschauer, 2003). The social and

interactional processes of meaning-making during group work ultimately determines how the technological affordances of Google Docs can be realized and ultimately lead to meaningful collaboration and learning. This view contradicts two commonly accepted approaches to technology integration—the technology deterministic view, which considers educational impact as inherent in technology, and the instrumentalist view, which sees technology as a neutral tool devoid of particular content or values (see discussion in Feenberg 1991; Warschauer, 2003).

Lastly, the collaboration experiences of struggling writers during the processes of CoP lead to several implications. The use of synchronous technology provided multiple ways for students to contribute their expertise and resources to the group task. For example, ELL students were able to use their advanced technology proficiency (e.g., troubleshooting, information literacy skills using local language) to compensate for limited English language skills during group composition (Ch.8). Such illustration helps expand our understanding of CoP—moving beyond a unidirectional process (i.e., novice learners being apprenticed into expert practices), but toward a multidirectional process that entails "not only efforts by experts to induct novices to community membership but also mutual ways of shaping social roles, relationships, and identities through interaction" (Kasper, 2009, p.274). Providing students with opportunities to engage with multiple group tasks appeared to be particularly meaningful for low-proficient writers as they learned to reposition themselves and to negotiate their membership within the communities of practice.

Pedagogical Implications

Pedagogically, the results help us identify appropriate instructional strategies or scaffolding support necessary for accommodating students of diverse ability levels and backgrounds. Specifically, I discuss the potential impacts of task types, ability grouping status, and interaction

patterns on collaboration, and how the results may inform the task design and classroom implementation. The findings will be particularly helpful for supporting struggling bilingual writers and their group members who may need collaborative efforts to negotiate their linguistic and cultural differences for mutual understanding and learning.

Variations across task types. One of the key results from this study that provides strong pedagogical implications is the result indicating the impacts of task type on collaborative writing practices (Ch.5) and text outcomes (Ch.7). Previous studies on collaborative writing typically examined a single genre and, therefore, their results have been mixed and inconclusive. In this sense, the findings of this study underline the importance of taking into consideration the different genre characteristics in designing and implementing collaborative group tasks. First, this study found that collaborative writing behaviors—evenness of participation, editing amount, use of collaboration strategy—may differ across task types. Specifically, a contrasting pattern of participation evenness and editing amount was noted between the narrative task and the other two tasks (i.e., argumentative, informative task). Member participation was more unbalanced in the narrative genre than in the argumentative or informative genre. Analysis of collaborative writing strategies used in the three tasks revealed a similar point: during argumentative and informative tasks, groups employed a more cooperative strategy that involved balanced participation (e.g., divide and conquer), such as the parallel writing or the cooperative revision strategy. During the narrative task, however, groups tended to use the main writer strategy or synchronous writing strategy, which can be effective for generating the story as a group rather than writing pre-assigned sections independently. Analysis of textual outcomes further revealed that the impacts of collaboration practices on textual quality also tend to differ by task type. For

example, unbalanced participation was associated with strengthened organization in the narrative text, but no such association was found in the other two genres.

The result on participation evenness also added new insight into the task type variations that were observed in previous studies. Research indicated that open-ended tasks in which learners co-construct knowledge—such as narratives—tend to encourage peer interactions and sustained collaboration compared to simple, closed tasks or information-sharing tasks (Storch, 2005; Storch & Wigglesworth, 2007). In the current study, qualitative analysis of student interviews and reflection essays echoed this point. The results suggested that narrative writing, despite the imbalance in written participation, tended to facilitate more discussion and sustained interaction, unlike argumentative and informative writing. Division of labor was more even in the argumentative and informative genres, yet there was less discussion and peer interaction.

Several researchers underscored the different linguistic and cognitive demands posed by each task type. Compared to the typically open structure of the narrative genre that focuses on intertwined actions and events, argumentative and informative writing demands a logical structure that builds self-explanatory, yet inter-related chunks of ideas in a hierarchical format (Grabe, 2002). Such differences in genre characteristics may cause groups to employ different collaborative writing strategies (Ch.5 & 7). For example, the cooperative strategy, which is characterized by a strong division of labor (e.g., parallel writing) was used frequently and proven effective in argumentative and informative tasks. In contrast, the main writer or synchronous hands-on strategy was used frequently and proven effective in the narrative genre. The results are useful for understanding the general patterns of collaboration that differ across genre, yet also reveal some challenges: main writers' potential dominance in the narrative genre, and an independent mode of writing that lacks interaction in the argumentative and informative

genres. In order to facilitate collaboration that leads to mutual learning benefits, these challenges have to be carefully considered in implementing collaborative group work.

Next, integrating a series of collaborative writing tasks as part of a year-long curriculum rather than as a separate activity proved noteworthy as well. Implementing multiple tasks across a longer period of time can be more efficient than assigning singular writing tasks as members need to explore different strategies and styles that work best for their groups. In terms of task order, several students discussed the benefits of introducing the narrative task first during an interview since its creative aspect motivated them and facilitated more active group discussion (Ch. 8). Researchers argued for the existence of a developmental sequence in mastering genres, in which students move progressively across three categories: personal genres, factual genres, and analytic genres (Schleppegrell, 2004). The authors maintain that the narrative genre is typically mastered during the early years of schooling, whereas the skills for effective argumentative writing develop later (Berman & Nir-Sagiv, 2007). The findings in our study and the existing theory on developmental sequence of genre mastery suggest that task type is a critical consideration in instructional designs for collaborative writing. However, more empirical research is needed to confirm the effects of task order on collaborative interaction, and also the effects of other task-related factors (e.g., prompts, task completion time, task structure—open vs. closed).

Students' positive reactions to the instructional structure also indicate that it can be effective for students to engage in collaborative writing as a post-reading activity and to use theme-based reading texts as evidence for their group writing. Assessment is also an important consideration since there are issues of accountability and concerns about free-riders. Teachers

may grade students on their individual contribution, by monitoring their participation or having them evaluate their own group or peers.

Ability grouping and collaboration patterns. In Chapters 5 and 7, I examined whether students' collaborative writing practices may differ across ability group status (mixed vs. same ability groups), and whether the grouping status may relate to the quality of group texts. Specifically, quantitative analysis supported by text mining and computational text analysis methods revealed how editing behaviors and collaborative writing strategies might be associated with ability-group status, which has not been informed by previous qualitative studies (e.g., Storch, 2002; Li & Zhu, 2013). The results indicate that mixed-ability groups tend to engage in imbalanced participation patterns, yet are generally more active in editing behaviors than same ability groups, particularly in self-edits. Regarding the evenness of participation, it can be assumed that the same-ability groups may involve more balanced patterns of collaboration (e.g., cooperative pattern with equal division of labor) compared to mixed-ability groups that may encounter difficulty in dividing work equally due to the writing proficiency gaps among members. The results may imply that mixed-ability groupings provide more opportunities for editing as students of heterogeneous ability levels work to negotiate their differences. Yet, the use of dominant, unbalanced collaboration strategies may push a few members in a group to take over most of the writing.

Several studies have warned against the negative impacts of unbalanced division of work among mixed-ability groups. These studies cautioned that low proficient learners tend to assume minimal or mechanical roles in mixed-ability groups (e.g., Kost, 2011). The more proficient partner, in contrast, may feel disappointed by or ignore the less able partner's input or feedback (Hedge, 2000) and prefer working on his or her own (Bahar, 2003) due to concerns

about unequal distribution of work. Zhu's (2001) study of mixed-proficiency groups revealed that low-proficient writers tend to be withdrawn and produce fewer language functions during oral discussions about writing. Similar concerns were raised in this study. Qualitative analysis of group interactions revealed (Chapters 6 & 8) that high-proficient writers, especially those in non-collaborative, mixed-ability groups, perceived asymmetric benefits of learning: they did not perceive collaborative writing as mutually beneficial. This suggests the need to structure the group task so that all members understand the purpose and mutual benefits of collaborative interaction. For example, groups can engage with structured planning sessions, during which members discuss each other's strengths and potential contributions, and establish explicit group norms and rules. This will help groups to successfully perform critical group tasks such as negotiating differences and pooling different resources, which will ultimately enable the smooth transition from the *conflict* stage to the subsequent *intimacy and work* stage.

Several studies discussed how certain instructional strategies may encourage meaningful involvement of lower-ability peers, as well as assuring higher-ability peers about the benefits of peer interaction. For example, Yarrow & Topping (2001) examined how the use of structured interaction may facilitate symmetric benefits of learning among mixed-ability groups. In this study, the authors divided the students into two groups: a control group with no assigned roles, and an experimental group with assigned roles of tutor and tutee. In the experimental group, peers engaged with structured interaction, where one higher-ability peer was assigned as a helper and the lower-ability peer was assigned as a tutee. In both conditions, students were instructed how to praise, provide feedback, and monitor each other's progress in collaborative writing tasks. The pre and post-test results indicated that the interactive group produced higher quality writing. The results suggest that guided writing practice and structured student

interactions (e.g., tutor-tutee relationship) can be more beneficial than the groups that function without specific roles. Saddler et al.' (2008) study on peer-assisted sentence-combining intervention also highlighted this point. The authors found that in the absence of more able peers who can assist them, low-level writers in the intervention group efficiently interacted and scaffolded each other during the structured and guided sentence combining tasks.

Qualitative analysis of group work also revealed that member roles are important in group dynamics, particularly the leadership roles. For example, the results cautioned against the negative impacts of authoritarian leadership on group dynamics (Ch. 6, 8, 9). The contrasting cases of Group 3 (dominant/passive pattern) and Group 1 (collectively contributing/mutually responsive pattern) particularly illustrated this point (Ch. 6). As noted in previous studies, the authoritarian leadership in Group 3 tended to harm group morale and undermined the goal of mutual contribution by the group (Arnold et al., 2009, Wang, 2010). Therefore, groups are encouraged to reach for distributed and fluid leadership characterized by shared understanding and combining different expertise. As illustrated in Chapter 6, group dynamics with decentralized leadership (Group 1) and tutor-tutee relationships (Group 2) may support novice participants in re-negotiating the relations of power (Lave & Wenger, 1991) and facilitate their transition to full participants of the writing task.

Overall, the results point to the critical role of group dynamics, which carry more weight than a mere proficiency gap in generating the benefits of collaborative interaction. A mere proficiency gap is not the defining factor in collaborative writing, even though a general tendency exists regarding distinct collaborative behaviors across ability groups (mixed vs. same). Qualitative analysis of building CoPs (Ch.8) specifically revealed that the ability gap among members merely indicates one source of multiple conflicts that a group needs to deal

with. What matters more than the ability gap appears to be the capacity of a group as a whole to negotiate differences and establish positive group cohesion.

Task design and instructional context. Results from Chapters 6, 8, and 9 indicated the need for providing sufficient guidelines and training for students before they engage with synchronous collaborative writing. As noted in the illustrations of the focal groups' interaction patterns (Ch.6), writing in shared spaces can be intimidating and overwhelming for students, particularly during the initial phase of CoP (Ch.8) since they do not have sufficient member familiarity, group work experience, and technology proficiency. The results point to several important considerations in designing and implementing collaborative writing tasks.

First, it is important to grant students sufficient time for group planning, during which they build member familiarity and establish an agreed-upon group norms. Results from Chapter 6 illustrated that building positive group rapport and mutuality may facilitate increased student participation and lead students to achieve higher levels of collaboration. As illustrated in Chapter 6, when members feel safe and comfortable with each other, they are more likely to provide constructive criticism rather than superficial comments, and are more likely to be more responsive and willing to negotiate different perspectives. One way to help groups build a collegial environment with high levels of mutuality is to provide students with sufficient planning time and encourage them to openly discuss their group goals and rules. The importance of group planning was also highlighted in the quantitative analysis of group texts (Ch. 7). The quality of group planning predicted higher scores in textual outcome, specifically in the area of content (in the case of narrative genre) and organization (in the case of argumentative genre).

There can be diverse ways to facilitate group planning. For example, groups may engage with prewriting activities such as reading relevant texts that can be used as textual evidence for subsequent collaborative writing, as in the current study. Given the importance of member familiarity in the initial stage of collaboration (Ch. 6), it will also be helpful to integrate simple ice-breaking activities that can help members get to know each other. As discussed in earlier chapters, explicit group planning is particularly important given the high equivocality of collaborative group task (Kraut et al., 1992).

Establishing member familiarity and mutuality through group planning can be particularly vital for low-proficient writers. Writing in networked environments can facilitate member participation, but may also lead to lurking behaviors because it is easier not to be noticed in online settings than in face-to-face communication (Hale, 2003). As illustrated in qualitative analysis of group interactions (Ch. 6, Ch. 8), members who are less motivated or confident about their writing skills tend to fade into the background. As seen in the cases of Groups 3 and 4, this may result in the dominant and unbalanced pattern of collaborative writing, in which the more vocal students take over the task while (e.g. Groups 3 and 4).

This calls for instructional arrangements where students are provided with specific training or strategies to encourage participation from less interactive group members, for example, by assigning roles and responsibilities to different members during the initial stage. In this sense, teacher involvement is highly recommended in collaborative group work. Students, especially those with shy personalities or low-proficient writing skills, need appropriate support from teachers and peers throughout the learning process. Students may need step-by-step instructions and micro-scripts that guide their interactions, especially if they are not used to writing in groups. Before putting students into group work, teachers may walk them through the

specific stages of collaborative writing or share an exemplary group process with the entire class to demonstrate how writers negotiate, establish membership, and engage with joint construction of knowledge. Previous studies that utilized the PALS model (peer-assisted learning strategies) has proven the effectiveness of paring a stronger and weaker student and having them alternate their roles in improving target skills, such as reading, math, and sentence combining (see Saddler & Graham, 2005 for more details). In the PALS model, a stronger and weaker student alternatively acts as the tutor for the other, so it ensures mutual scaffolding. Such research-based instructional arrangement can help empower less competent learners and facilitate their meaningful participation.

Feedback and revision training. In order to facilitate effective collaboration, students may also need explicit training on peer feedback and revision strategies, which are foundational for effective group writing. In Chapter 6, constant comparative analysis between groups with a collaborative stance (Groups 1 and 2) and those without (Groups 3 and 4) revealed that effective use of feedback and revision (e.g., politeness strategy, provision of explanation, group revision accompanied by verbal discussion) was crucial in forging group cohesion and mutuality. Research has suggested that feedback on micro-level features (e.g., grammar, mechanics), specifically those provided without explanations (i.e., direct edits), do not lead to improvement in writing (Cho & MacArthur, 2010). Given this fact, it is critical to train students to provide detailed and constructive feedback that focus on macro-level features (e.g., content, organization). The role of carefully structured training is particularly noteworthy given the technology-supportive context of this study. In this one-to-one laptop school, students were generally proficient in technology use and familiar with technology-integrated writing practices, including peer commenting and feedback. However, synchronous group writing appeared to

present new challenges as revealed in qualitative findings of study (see Ch.8 and 9 for more details), which may require additional arrangement and support for effective feedback exchange and group revision practices. This point echoes my earlier study on feedback and revision practices in Google Docs (Yim, Zheng, & Warschauer, in press). Content analysis of middle school students' feedback and revision patterns revealed that students tend to focus on micro-level features or affective feedback (e.g., compliments) and do not effectively incorporate the feedback in subsequent revisions. The findings suggest that mere familiarity with the technology tool or frequent peer feedback practices in the absence of explicit instruction may not necessarily result in gaining useful feedback skills.

Research has suggested the importance of a balanced approach to writing instruction, in which a process-oriented instruction integrates a strong *skills* instruction where teachers explicitly and systematically deal with key foundational skills (Olinghouse, 2008). Therefore, it is desired that collaborative writing instruction, which is grounded in a process-based approach, integrate evidence-based, explicit instruction on feedback and revision skills. For example, the characteristics of constructive feedback can be explicitly discussed and taught in classes. According to research, effective feedback that leads to writing improvement entails the following components: appropriateness, specificity, justification, and thought-provoking questions (Gielen et al., 2010). The use of constructive critical feedback, which refers to the "expressions of opposition to a proposal with evidence or arguments" (Valacich, Dennis, & Nunamaker, 1992, p. 59) was found to predict subsequent writing improvement. Similarly, Cho et al.'s (2006) study reported that undergraduate writers perceived it most useful when the peer provided *directive* feedback that suggests a specific solution for revision.

It is also vital to make sure that students are given sufficient instructional time on revisions and reflection. Qualitative analysis of student perceptions (Ch.9) revealed that time constraints proved to be challenging in synchronous collaborative writing. When students feel rushed and do not fully explore the benefits of peer interaction, they prioritize productivity over quality and as such, they tend to view collaborative writing as an easy way to get the job done. Therefore, teachers should make sure that groups clearly understand the expectations and anticipated outcomes at each stage of collaborative writing (e.g., initial stage, conflict stage, intimacy and work stage, termination stage), and should offer sufficient time for group revision and reflection.

The different characteristics of feedback mode (i.e., asynchronous vs. synchronous) can also be an important consideration in designing collaborative writing tasks. Research suggests that synchronous functionality of feedback may change communication dynamics (Kern et al., 2008; Shultz, 2000). While asynchronous feedback can reduce interactivity due to the lack of nonverbal cues and delays of interaction (Braine, 2001; Tuzi, 2004), they are likely to promote sustained interactions and greater syntactic complexity in written communication (Sotillo, 2000). In contrast with the *textuality* in asynchronous feedback, synchronous collaboration is characterized by *orality* (Guardado & Shi, 2007). The trait of orality in synchronous mode tends to facilitate real-time discussions between the reader and the writer—particularly in collocated settings (Kern et al., 2008). Studies have shown that synchronous peer commenting enhances prompt idea exchanges and interpersonal engagement (Honeycutt, 2001); and also involves discourse functions that resemble face-to-face communication (e.g., requests, apologies, complaints; Sotillo, 2000). Synchronous communication (e.g., online chatting), therefore, can

be effective for tasks that demand higher levels of meaning negotiation and metalinguistic awareness (see studies by Kern et al, 2008).

While the orality in synchronous communication can be beneficial for idea generation, brainstorming during the planning stage of writing, it should be used with caution in drafting and revising. Schultz (2000) discussed that synchronous written communication can carry the fluid and recursive nature of speech over into text, which can be effective for idea generation. However, he cautioned against students' tendency to digress more frequently in synchronous settings compared to face-to-face discussions. A similar point was captured in my earlier study on undergraduates' simultaneous, collocated group writing (Yim et al., 2017). Using text mining approach that analyzed collaboration characteristics (e.g., participation balance, editing amount, number of coauthors, etc.), we found that while synchronous interactions may enhance content and evidence use in textual quality, the benefits were not evident in areas of organization and mechanics (Yim et al., 2017). In the current study, analysis of student surveys and interviews similarly revealed that polishing the organizational and mechanical aspect of a group text can be a challenge in synchronous group writing. Given the different characteristics of feedback modes and their suggested outcomes, combining synchronous, collocated peer feedback practices with asynchronous, independent activities in collaborative writing tasks. For example, synchronous peer feedback and writing can be most effective in planning or joint drafting, as the synchronous mode of communication facilitates interactive discussion and just-in-time support for writing. However, an asynchronous or independent mode of writing can be most beneficial during the review and revision stage so that students have opportunities to reflect on and polish the overall structure, cohesion, and mechanics. Future studies may empirically examine whether this combined approach (i.e., the selective use of synchronous and

asynchronous modes of group writing) is more effective than either synchronous or asynchronous group writing.

Methodological Implications.

Integration of text mining approach. Methodologically, my dissertation contributed to the field by actively exploring the potential of technology both as an instructional tool and a research tool. Previous computer mediated communication (CMC) studies documented strong evidence on how pair or small group interactions may facilitate L2 learning, yet there is a lack of empirical data on how much, and in what ways, diverse students collaboratively write and revise their work. Thus, we understand little about how these collaborative behaviors may contribute to students' writing development and learning outcomes (Wang et al., 2015). To address this challenge, this study provided in-depth text analysis by integrating text mining (i.e., DocuViz, AuthorViz, SCAPES) and computational textual analysis tools (Coh-Metrix, VocabProfile). Access to additional sources of data on learners' technology use may not only enhance pedagogy, but will also contribute to language learning theories (Garrett, 1991).

Text-mining provides fine-grain analysis of collaborative writing practices that were once hidden in previous studies that relied mainly on traditional methods of observation, surveys, or qualitative document analysis. Using the additional layer of information available from text-mining, this study examined how students' synchronous collaborative writing practices may differ across key contextual factors, such as ability grouping status and task types (Ch. 5), and how collaboration characteristics (e.g., participation evenness, editing amount) may relate to textual outcomes (Ch. 7). In addition, textual visualizations helped with identifying different strategies of collaborative writing (Ch. 6).

The sociocultural theories of literacy underscore the importance of contextual factors since they influence the affordances and constraints of mediating technologies (Chapelle, 2009; Warschauer, 1997). Although previous research suggested that factors such as members' collective language proficiency (Wigglesworth & Storch, 2012) or task type (Aydin & Yildiz, 2014) may impact the degree and level of collaboration, few studies have examined this empirically, mainly due to the methodological challenges. The multiple findings of my dissertation demonstrated that the impacts of contextual factors on social interaction processes or outcomes are better understood when in-depth qualitative analyses are supported by quantification and visualization of collaboration using text-mining techniques.

Longitudinal mixed-method case study. This study adopted a longitudinal multi-method design for several reasons. First, researchers have warned that carefully controlled studies of language learning driven by quantitative analysis do not align with the ecological approach of computer-assisted language learning (CALL, see van Lier, 2000 for more discussion). The ecological view of technology integration underscores the social embeddedness of technology—the intertwining of people and organizations in shaping the use of technology (Warschaer, 2003).

Therefore, CALL researchers encourage the balanced use of qualitative as well as quantitative evidence drawn from contextually rich and naturalistic environments (Warschauer, 1997). Careful triangulation of multiple sources is desired in using text-mining, as its current form provides insight to only one of the dimensions of collaboration: usage statistics based on the amount of written interaction. Acknowledging this concern, my dissertation attempted to examine diverse channels of student collaboration (e.g., verbal discussion, textual interaction) and the context-specific factors (e.g., participant background, curriculum context, teacher role) through triangulation of qualitative, quantitative, and text-mining analysis.

Studying collaborative writing longitudinally enabled the collection and triangulation of multiple data sources. Longitudinal research involves the repeated collection of data sources at multiple time points and, therefore, is well-suited for investigating phenomena that change over time (Van Ness et al., 2011). Despite the gradual nature of community-building processes, few studies on online learning communities are longitudinal. This is particularly true for studies on in-class digital literacy practices. A longitudinal approach is effective in understanding the interaction patterns of collaborative writing (Ch. 6) and the phases of establishing communities of practice (Ch.8) that develop gradually. The development of patterns and phases of collaboration is difficult to understand without a thick description of diverse contextual factors examined across multiple time points.

By triangulating multiple data sources collected for one academic year, this study revealed how student groups develop their interaction patterns, membership, and resources over time. Particularly, analyzing interviews, observations, group discussions, and text visualizations helped identify the phases and sub-phases of building CoP. The results underscored the central role of the intimacy and work phase (i.e., building trust/safety, establishing norms/ membership, pooling of resources/expertise) in members' transition from peripheral participation to full participation. The degree to which members successfully negotiate their differences and mutually scaffold the writing tasks ultimately determines the collaborative stance of each group and its perception of learning.

Limitations and Directions for Future Studies

As with most case studies, the findings from my dissertation may not be generalized to the overall population. For example, the school's exemplary history of technology use, as well as its socioeconomic context, implies that the results can be difficult to generalize to other

educational settings. In particular, the school is located in a well-to-do, technology-supportive community with an extraordinarily high population of language minority students. As such, integrating the tool in low-income school contexts or in other language learning environments (English as a second or foreign language context) may lead to different results. Though specificities of context would pose issues of generalizability, I want to note that the primary purpose of the study is to provide an in-depth illustration and discussion of how specific contextual factors may shape the integration of cloud-based technology, which is driven by the social informatics approach—a perspective that emphasizes the intertwined relationships among technologies, people, and organizations within a heterogeneous sociotechnical network (Kling, 2000; Warschauer, 2003). Future research investigating how the tool can be embedded in different social and educational contexts—with different levels of student competency, ethnic/linguistic composition, economic backgrounds, and district/school cultures—will provide multifaceted information that are necessary to help advance students' learning through the use of collaborative technology.

In addition, this study examined naturalistic classroom environments since non-experimental, less contrived situations are regarded as ideal for the analysis and interpretation of participation interactions in computer-supported collaborative environments (Schrire, 2006, Zhu, 2001), particularly in studies on reiterative writing processes (Faigley and Witte, 1981). Therefore, I do not have a comparison or control group to make causal inferences about the impact of integrating the technology as opposed to another, but I examined the cases in their naturalistic settings. While this will enhance the ecological validity of the study, it involves several factors that were left uncontrolled, which may have influenced the quantitative analysis of student outcomes.

Future studies may employ a different methodological approach that warrants the use of more robust measures and control of extraneous variables. For example, future studies can test the effects of different prompt or task types (e.g., degree of open structure, task completion time) and sub-categories of ability grouping status (e.g., mixed with high ability peers vs. mixed with lower ability peers) on collaborative writing practices and outcomes. In our current study, the prompt for the narrative task was much more open-ended compared to the other genres, so this variability might have influenced the results. Other task-related variables task time and duration (e.g., short-term, long-term engagement with collaborative writing), or implementation orders (e.g., narrative-argumentative-informative) can also be considered in future studies. Given that the groups in the current study were randomly assigned by the teacher in naturalistic settings, future investigations may target more controlled grouping arrangements and also use more robust criteria for categorizing grouping other than the district benchmark tests. These studies may employ quasi/experimental designs so that they can examine the causal effects of collaborative writing processes and products, and expand our understanding of how technology-based collaborative writing practices influence learning of writing. Particularly, it will be worth investigating the degree to which students' positive collaborative learning experiences or specific behaviors (e.g., peer edits) transfer into individual writing skills, using a pre and post-test experimental design.

Understanding the specific mechanisms through which members communicate and collaborate during group writing will also be helpful for designing and implementing collaborative writing tasks. Particularly, follow-up investigations into the mediating or moderating role of socio-emotional factors, such as group cohesion and mutuality, in collaboration processes and products are highly desired. According to the qualitative analysis of

my dissertation, both individual-level (e.g., writing efficacy) and group-level socio-emotional factors (group cohesion, mutuality) are critical in forging group dynamics and subsequently affect the collaboration processes and products. Studies that employ quantitative measures of writing efficacy or group cohesion (e.g., Wang & Lin, 2007) can integrate the text mining approach and examine more closely how those socio-emotional factors may affect students' collaboration behaviors and the subsequent writing outcomes. Future studies are also desired to look more closely at the different processing conditions of group interactions (e.g., written vs. spoken, synchronous vs. asynchronous), and whether these conditions may lead to different linguistic input differently. This investigation will be important from the second language acquisition (SLA) perspective, given the critical role of interaction in language development (Chapelle, 2009).

Lastly, it may also worth investigating the potential of text mining tools as an instructional or assessment tool. Research suggests that text mining can help increase students' collaboration awareness—that is, the awareness of what each group member is doing or has done so they can better coordinate (see Wang et al., 2015). The use of text mining tools, such as DocuViz, in writing classes has the potential to help students aware of one's own and peers' level of written participation and collaboration. Earlier studies pointed out that heightened collaboration awareness alleviates members' frustrations and confusion over group writing, and may thus enhance writing efficiency and quality (e.g., Olson & Olson, 1995). Particularly, my dissertation and previous study (Yim et al., 2017) suggested that participation evenness is strongly related to textual quality, particularly in the aspects of content and organization. Integrating the text mining tools and textual analysis tools into an online writing or evaluation

platforms may help group members hold each other accountable and also monitor how their written participation may affect different linguistic aspects of their group texts.

By attempting to laying the foundational work for future research, my dissertation aims to further advance the theory, research, and practice related to bilingual students' digital literacy, particularly the development of collaborative writing skills. In-depth analysis of students' collaborative writing—using both qualitative, quantitative, and text mining methods—have revealed the affordances as well as the challenges of integrating synchronous technology in group writing. Understanding students' in-class digital literacy practices, learning outcomes, and perceptions will help us design and implement collaborative writing tasks in K-12 instruction to equip students' with core competencies for 21st century, and promote collaborative interaction among students from linguistically and culturally diverse backgrounds.

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Appendix A

Individual Student Interview Protocols

Thank you very much for taking some time out of your day to talk to me. I think our conversation will last about 30 to 45 minutes. Basically, I'm doing interviews to get a better understanding of your experience with using Google Docs for collaborative writing.

If it's okay with you, I'm going to record our interview so that I can refer back to it later. Our conversation will be completely confidential. I want to know what you think and what your experience has been in class. Please feel free to share your honest thoughts and opinions.

I will not be using these interviews for any other reason than for my own learning as an educational researcher. I am curious about your thoughts and perspectives. There are no right or wrong answers. Please feel free to skip any questions that I ask you.

- Please describe any collaborative writing experiences you have had so far (what was the purpose, who participated, whether you used technology or not).
- What do you think is the benefit of using Google Docs in collaborative writing? Do you think the use of Google Docs was effective, and if so, why?
- What expectations did you have about collaborative writing in this course? Did you like using Google Docs in the class? Why/ why not?
- In your opinion, how does it differ to write individually and collaboratively? (e.g., writing process, writing strategy, writing product, ownership, etc.)
- Which do you prefer? Do you think collaborative writing with Google Docs has special advantage over individual writing, or vise versa? Why?
- Could you explain your overall experience collaborating with your group members?
- How did you feel about writing and editing simultaneously on Google Docs?
- What did you like most and least about your collaborative writing experience today?
- In what ways did you feel that your group members are different from each other? What efforts did you make to overcome the differences?
- Do you think collaborative writing practices help you become a better writer?
- Is there anything you would have liked to do to make the collaborating experience more engaging or effective?
- Do you think collaborative writing makes you more motivated to write?
- How has your participation in online collaboration changed the way you view writing?

Appendix B

Focus group Interview Protocols

Thank you very much for taking some time out of your day to talk to me. I think our conversation will last about 30 to 45 minutes. Basically, I'm doing interviews to get a better understanding of your experience with using Google Docs for collaborative writing.

If it's okay with you, I'm going to record our interview so that I can refer back to it later. Our conversation will be completely confidential. I want to know what you think and what your experience has been in class. Please feel free to share your honest thoughts and opinions.

I will not be using these interviews for any other reason than for my own learning as an educational researcher. I am curious about your thoughts and perspectives. There are no right or wrong answers. Please feel free to skip any questions that I ask you.

- What was the most interesting aspect of working with your group members on Google Docs?
- As a group, do you feel you have a certain way of doing the collaborative task?
- Could you identify any specific stage or part of writing that your group struggled or enjoyed?
- Do your group members take certain roles?
- How did you like writing collaboratively for this particular task?
- How does it differ to learn about the topic with and without collaborating with peers?
- Do you think collaborative writing helps you learn the content knowledge better? If so, why and in what ways?
- Do you think collaborative writing helps you more motivated and engaged in the topic?
- How does the collaboration help you express and expand your thoughts on the subject?

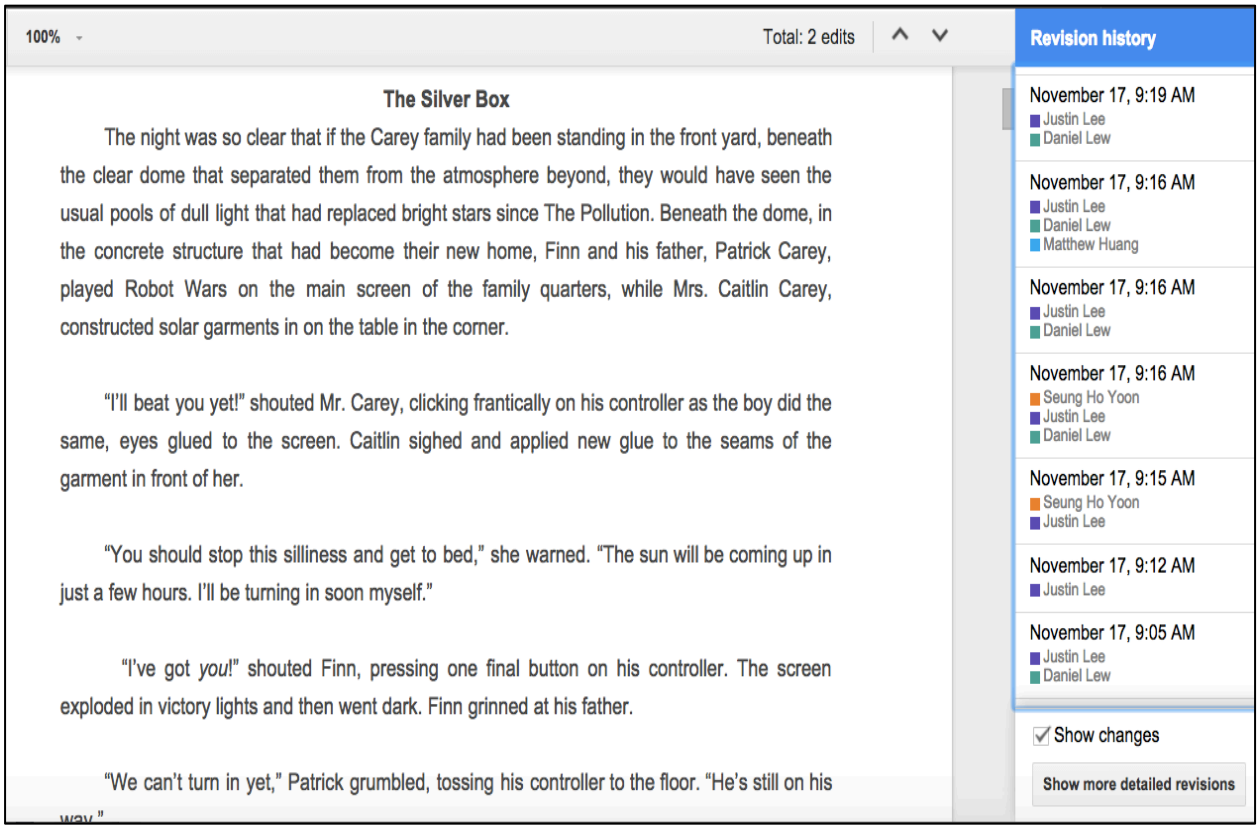
Appendix C

Teacher interview Protocols

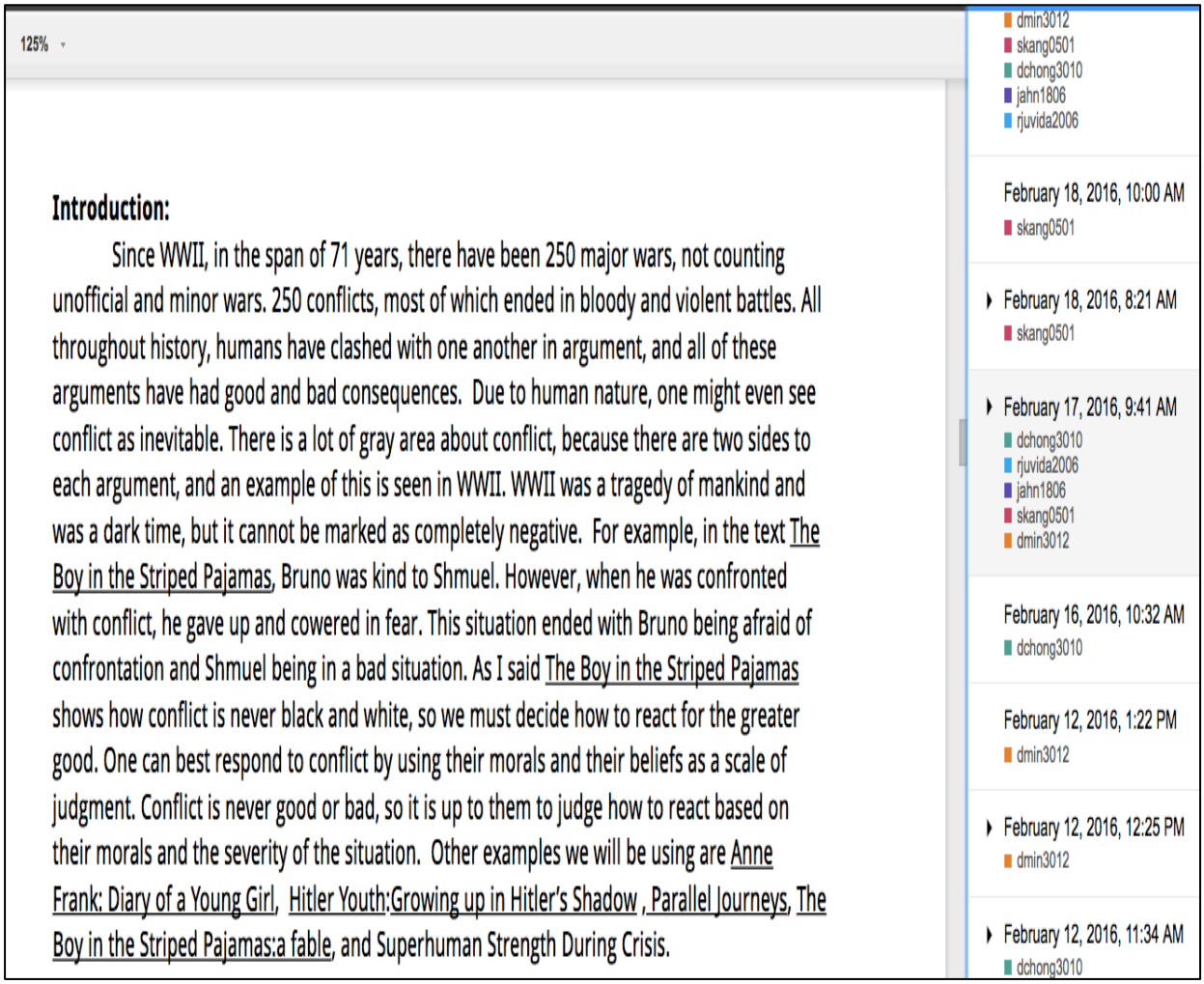
- Could you please tell me your experience integrating technology in your ELA classes?
- What is your pedagogical belief about integrating technology in your ELA classes?
- How did you like integrating Google Docs in your classes? What are the benefits and challenges that you experience, as a teacher? What about your students?
- What is your goal of implementing collaborative writing assignments using Google Docs? Particularly across three different genres?
- Do you provide a separate instruction on collaborative writing strategies or methods? Do you think it's necessary to provide instruction or training on collaborative writing? If so, what are the necessary components of such instruction?
- Do you think collaborative writing practices help students write better? And learn better?
- Do you think collaborative writing with Google Docs facilitate students' level of participation and collaboration? Have you perceived any changes over a year?
- What do you think are the necessary conditions for effective collaborative writing?
- What changes do you think need to be implemented in your future collaborative assignments, if any?

Appendix D. Samples of Collaborative Group Essays

Narrative



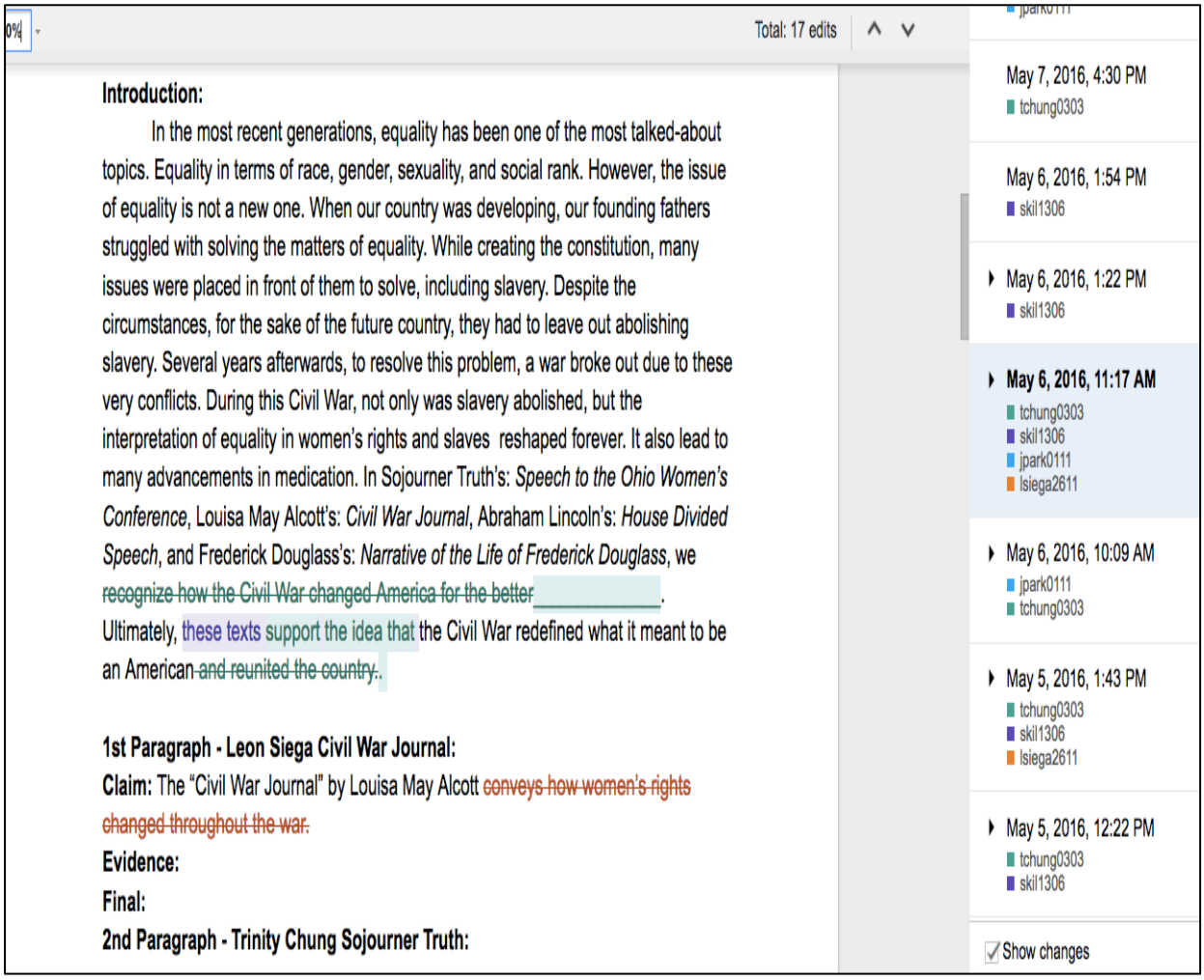
Argumentative



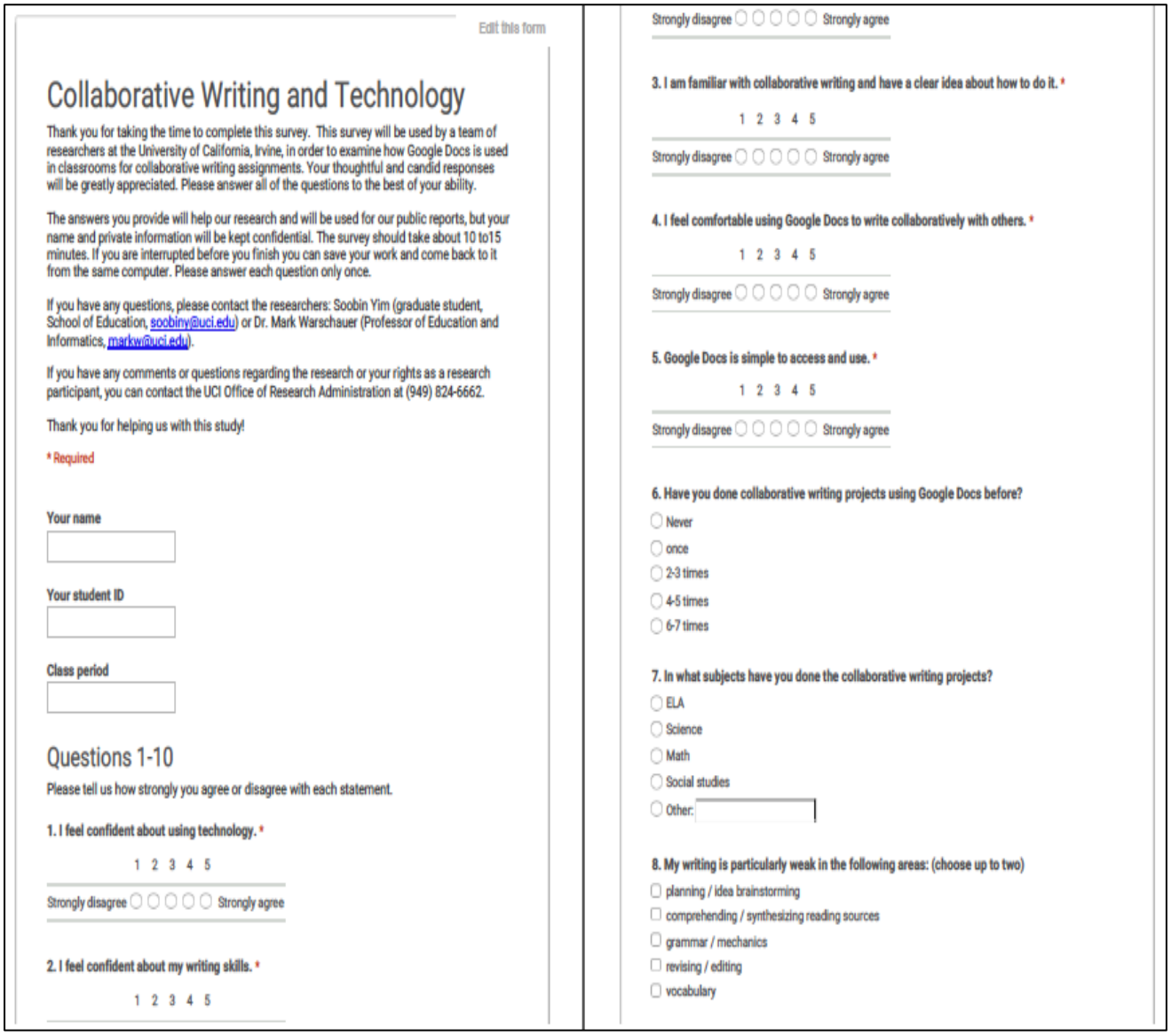
Introduction:

Since WWII, in the span of 71 years, there have been 250 major wars, not counting unofficial and minor wars. 250 conflicts, most of which ended in bloody and violent battles. All throughout history, humans have clashed with one another in argument, and all of these arguments have had good and bad consequences. Due to human nature, one might even see conflict as inevitable. There is a lot of gray area about conflict, because there are two sides to each argument, and an example of this is seen in WWII. WWII was a tragedy of mankind and was a dark time, but it cannot be marked as completely negative. For example, in the text The Boy in the Striped Pajamas, Bruno was kind to Shmuel. However, when he was confronted with conflict, he gave up and cowered in fear. This situation ended with Bruno being afraid of confrontation and Shmuel being in a bad situation. As I said The Boy in the Striped Pajamas shows how conflict is never black and white, so we must decide how to react for the greater good. One can best respond to conflict by using their morals and their beliefs as a scale of judgment. Conflict is never good or bad, so it is up to them to judge how to react based on their morals and the severity of the situation. Other examples we will be using are Anne Frank: Diary of a Young Girl, Hitler Youth:Growing up in Hitler's Shadow , Parallel Journeys, The Boy in the Striped Pajamas:a fable, and Superhuman Strength During Crisis.

Informative



Appendix E: Pre-study Background Survey



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Collaborative Writing and Technology

Thank you for taking the time to complete this survey. This survey will be used by a team of researchers at the University of California, Irvine, in order to examine how Google Docs is used in classrooms for collaborative writing assignments. Your thoughtful and candid responses will be greatly appreciated. Please answer all of the questions to the best of your ability.

The answers you provide will help our research and will be used for our public reports, but your name and private information will be kept confidential. The survey should take about 10 to15 minutes. If you are interrupted before you finish you can save your work and come back to it from the same computer. Please answer each question only once.

If you have any questions, please contact the researchers: Soobin Yim (graduate student, School of Education, soobiny@uci.edu) or Dr. Mark Warschauer (Professor of Education and Informatics, markw@uci.edu).

If you have any comments or questions regarding the research or your rights as a research participant, you can contact the UCI Office of Research Administration at (949) 824-6662.

Thank you for helping us with this study!

* Required

Your name

Your student ID

Class period

Questions 1-10

Please tell us how strongly you agree or disagree with each statement.

1. I feel confident about using technology. *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

2. I feel confident about my writing skills. *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

3. I am familiar with collaborative writing and have a clear idea about how to do it. *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

4. I feel comfortable using Google Docs to write collaboratively with others. *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

5. Google Docs is simple to access and use. *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

6. Have you done collaborative writing projects using Google Docs before?

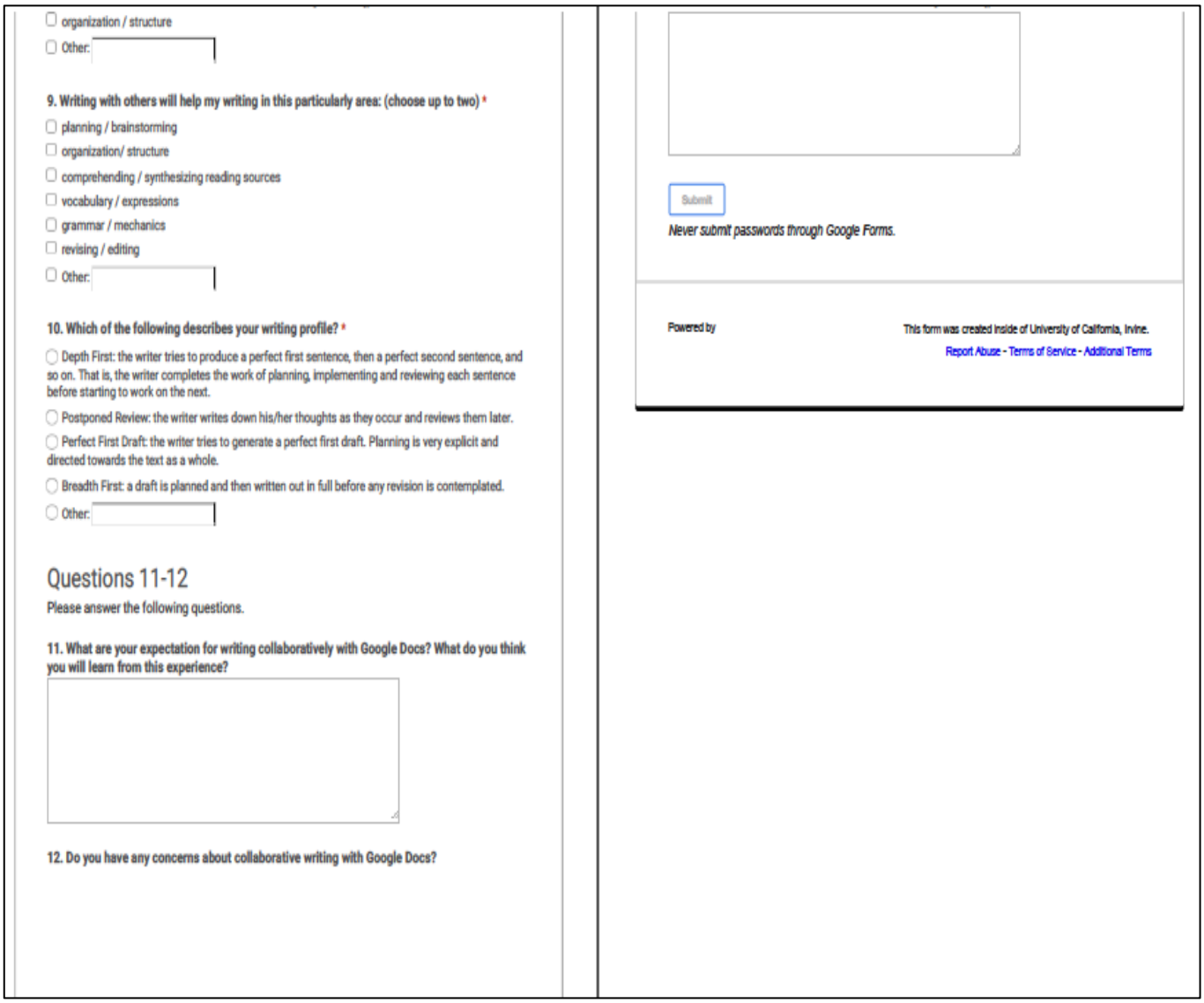
- ○ Never
- ○ once
- ○ 2-3 times
- ○ 4-5 times
- ○ 6-7 times

7. In what subjects have you done the collaborative writing projects?

- ○ ELA
- ○ Science
- ○ Math
- ○ Social studies
- ○ Other:

8. My writing is particularly weak in the following areas: (choose up to two)

- ☐ planning / idea brainstorming
- ☐ comprehending / synthesizing reading sources
- ☐ grammar / mechanics
- ☐ revising / editing
- ☐ vocabulary



☐ organization / structure

☐ Other:

9. Writing with others will help my writing in this particularly area: (choose up to two) *

☐ planning / brainstorming

☐ organization/ structure

☐ comprehending / synthesizing reading sources

☐ vocabulary / expressions

☐ grammar / mechanics

☐ revising / editing

☐ Other:

10. Which of the following describes your writing profile? *

○ Depth First: the writer tries to produce a perfect first sentence, then a perfect second sentence, and so on. That is, the writer completes the work of planning, implementing and reviewing each sentence before starting to work on the next.

○ Postponed Review: the writer writes down his/her thoughts as they occur and reviews them later.

○ Perfect First Draft: the writer tries to generate a perfect first draft. Planning is very explicit and directed towards the text as a whole.

○ Breadth First: a draft is planned and then written out in full before any revision is contemplated.

○ Other:

Questions 11-12

Please answer the following questions.

11. What are your expectation for writing collaboratively with Google Docs? What do you think you will learn from this experience?

12. Do you have any concerns about collaborative writing with Google Docs?

Submit

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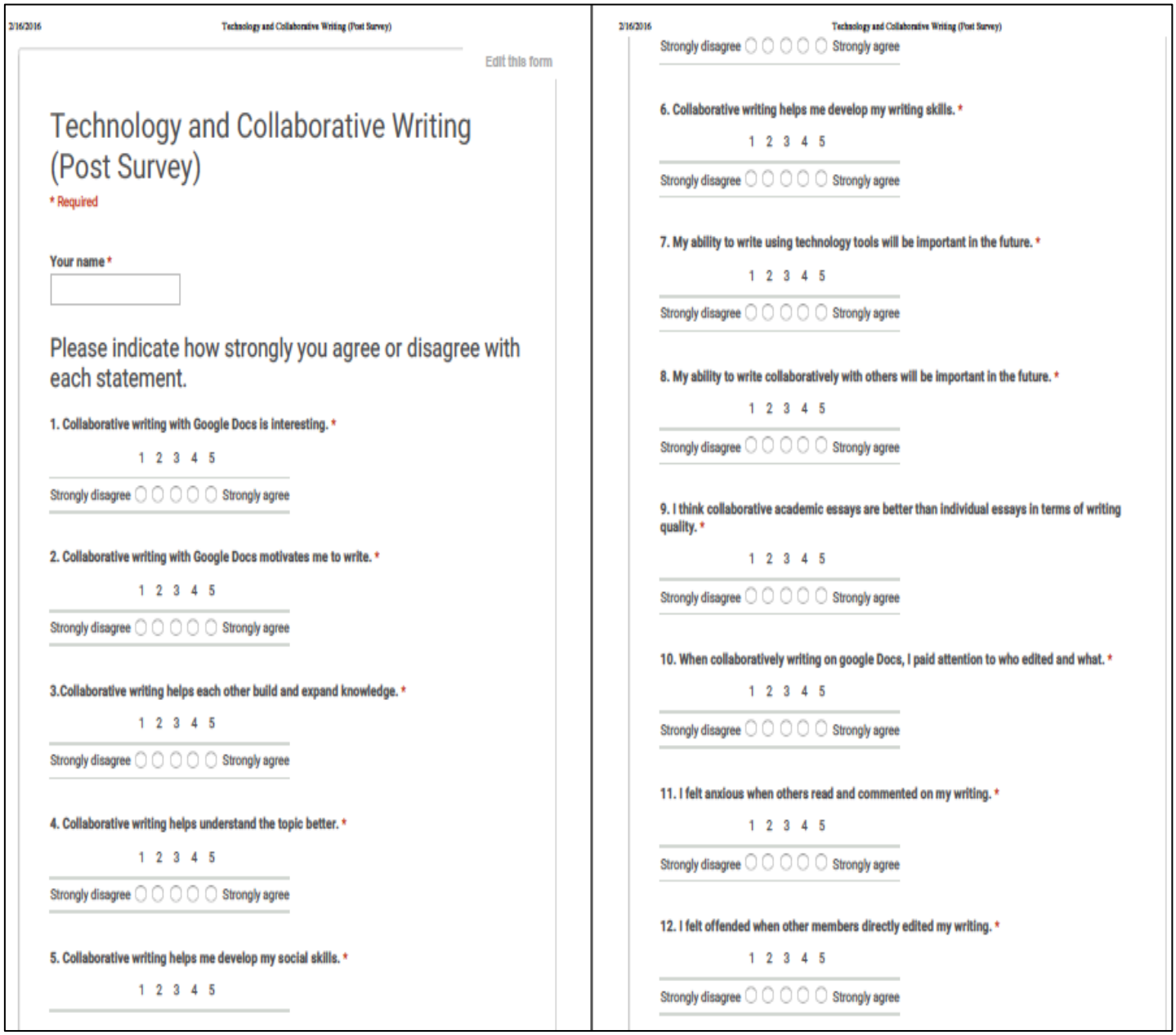
Appendix G: Post-study Survey



2/16/2016 Technology and Collaborative Writing (Post Survey)

Edit this form

Technology and Collaborative Writing (Post Survey)

* Required

Your name *

Please indicate how strongly you agree or disagree with each statement.

1. Collaborative writing with Google Docs is interesting. *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

2. Collaborative writing with Google Docs motivates me to write. *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

3.Collaborative writing helps each other build and expand knowledge. *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

4. Collaborative writing helps understand the topic better. *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

5. Collaborative writing helps me develop my social skills. *

1 2 3 4 5

2/16/2016 Technology and Collaborative Writing (Post Survey)

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

6. Collaborative writing helps me develop my writing skills. *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

7. My ability to write using technology tools will be important in the future. *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

8. My ability to write collaboratively with others will be important in the future. *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

9. I think collaborative academic essays are better than individual essays in terms of writing quality. *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

10. When collaboratively writing on google Docs, I paid attention to who edited and what. *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

11. I felt anxious when others read and commented on my writing. *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

12. I felt offended when other members directly edited my writing. *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

13. Now I have a clear idea about how to write collaboratively. *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

14. I prefer to work with students whose writing and academic abilities are similar to mine. *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

15. Collaborative writing with Google Docs is particularly helpful in this area: *
(a) planning

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

(b) idea brainstorming *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

(c) organization/ structure *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

(d) expression *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

(f) grammar/ spelling *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

(g) revising/ editing *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

16. Google Docs is effective for collaborative writing because *
(a) it saves time (i.e., no need to meet face to face)

1 2 3 4 5

Strongly disgree ○ ○ ○ ○ ○ Strongly agree

(b) I can use revision histories to track changes. *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

(c) I can exchange feedback and comments with my peer writers *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

(d) I can write and revise with others at the same time. *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

(e) I can monitor others' writing and editing. *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

(f) I can share the same document with my peer writers. *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

(g) I can easily organize and share the documents in Google Drive. *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

(h) it saves the documents automatically. *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

17. Collaborative writing with Google Docs was challenging for me due to the following reason: *

(a) inexperience with the technology.

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

(b) inexperience with collaborative writing. *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

(c) lack of knowledge on the topic *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

(d) limited writing and revision skills *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

(e) limited social skills *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

(f) when I disagree with my peers' ideas. *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

(g) when my peers' writing styles are different from mine. *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

(h) when members do not participate equally. *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

(i) when group members' abilities differ from my own. *

1 2 3 4 5

Strongly disagree ○ ○ ○ ○ ○ Strongly agree

18. How was writing collaboratively different from writing individually (e.g., in terms of writing process, strategy)? Which do you prefer and why? *

19. How was it different to collaboratively write the narrative, argumentative, and informative essay assignment? Which did you like the most and least, and why? *

20. What suggestions do you have for making collaborative writing more effective? *

Appendix G: Observation Protocols

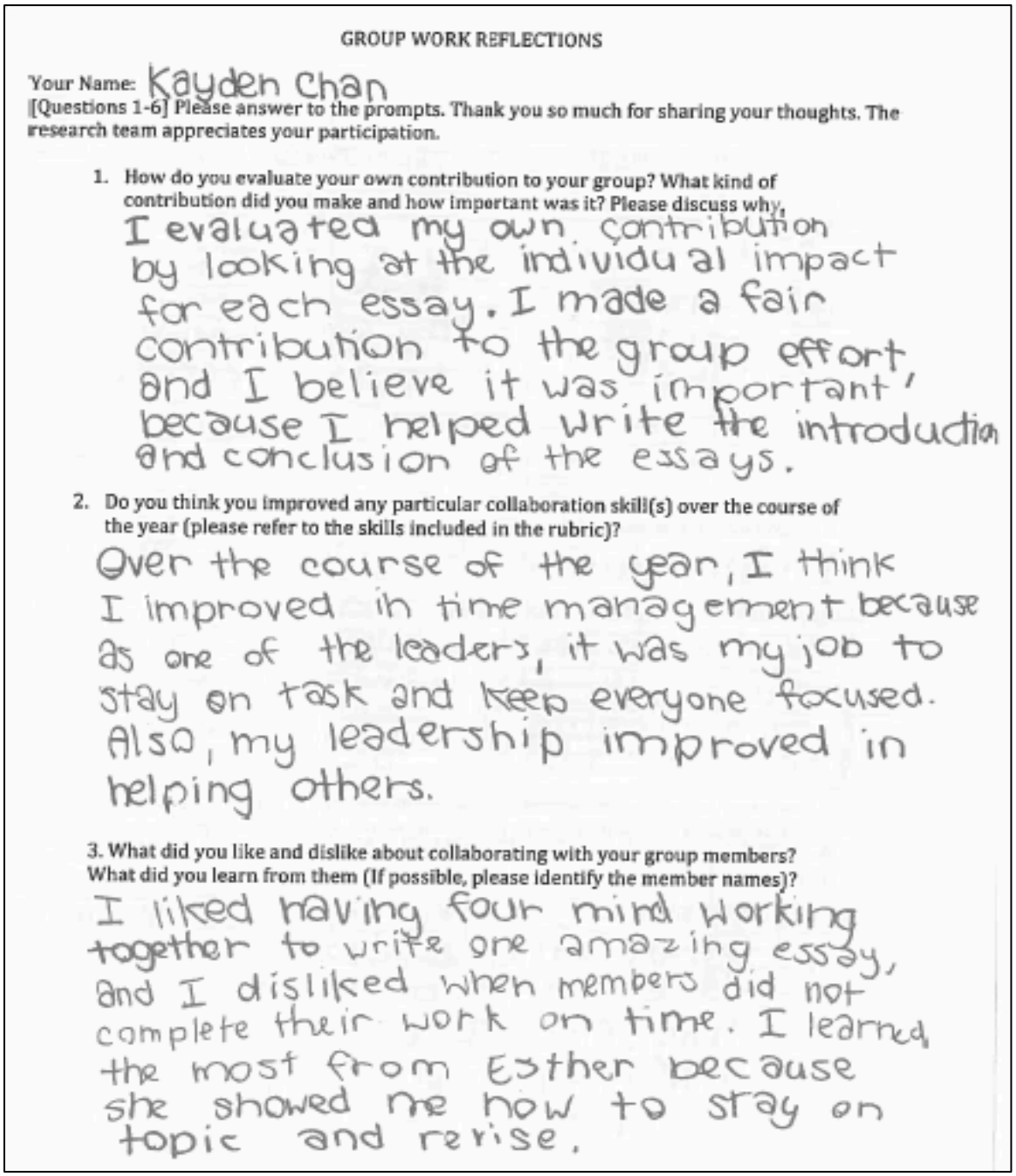
Teacher/ Class Period: _____ Date: _____ Time: _____
Project name: _____ Target group: _____

Key Questions	
• How do the students approach the collaborative task? Are there any identifiable strategies, patterns or phases? • What characterizes students' interactions? Any division of roles? Is someone in a dominant or marginalized position? • Are there any changes in the way students participate or collaborate, compared to the last observation?	
Notes on Classroom Environment	
• Student seating arrangement: • Class atmosphere: • Students' laptop use: • Student-student interaction: • Teacher-student interaction: • Student on-screen behavior:	
Key Summary	Connection to Other data (Interviews, Surveys, Student documents)

APPENDIX H

Sample of Students' Post-study Reflection

Reflection A



GROUP WORK REFLECTIONS

Your Name: Kayden Chan

[Questions 1-6] Please answer to the prompts. Thank you so much for sharing your thoughts. The research team appreciates your participation.

1. How do you evaluate your own contribution to your group? What kind of contribution did you make and how important was it? Please discuss why.

I evaluated my own contribution by looking at the individual impact for each essay. I made a fair contribution to the group effort, and I believe it was important, because I helped write the introduction and conclusion of the essays.

2. Do you think you improved any particular collaboration skill(s) over the course of the year (please refer to the skills included in the rubric)?

Over the course of the year, I think I improved in time management because as one of the leaders, it was my job to stay on task and keep everyone focused. Also, my leadership improved in helping others.

3. What did you like and dislike about collaborating with your group members? What did you learn from them (If possible, please identify the member names)?

I liked having four mind working together to write one amazing essay, and I disliked when members did not complete their work on time. I learned the most from Esther because she showed me how to stay on topic and revise.

4. How did the way you participate in the group work change over the course of the year (i.e., participation in three different projects: narrative, argumentative, informative)? Did you participate increasingly more (or less) as time goes by, and if so, why?

As time went by, I participated more because I felt more comfortable in my environment, and was closer to my peers.

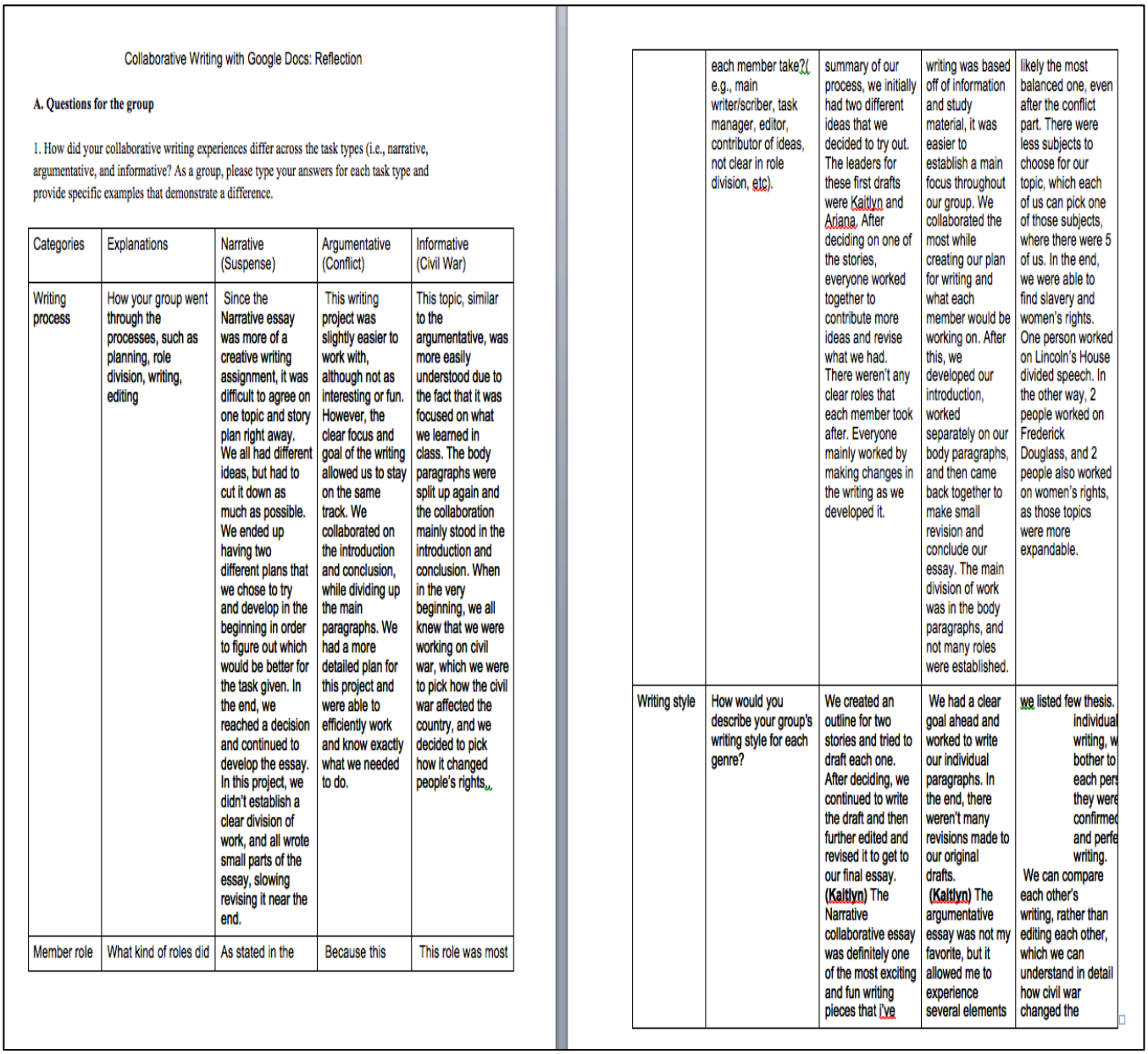
5. In your opinion, how does the use of an online collaborative writing tool changes a group's interaction and collaboration? Any advantages or disadvantages?

In my opinion, an online collaborative writing tool was an advantage because we could work together from home. One of the disadvantages was communicating less in person because we were always on our computers.

6. Compared to non-technology settings, which skills listed in the rubric can be better developed in collaborative writing using technology tools such as Google Docs? Among the collaborative work skills listed in the rubric, which skill(s) do you think can get enhanced by using technology, such as Google Docs?

By using Google Docs, I improved in providing feedback because I could easily comment on someone's writing. Also, I was able to complete a full workload because working on the computer is faster and more efficient.

Reflection B



Collaborative Writing with Google Docs: Reflection

A. Questions for the group

1. How did your collaborative writing experiences differ across the task types (i.e., narrative, argumentative, and informative? As a group, please type your answers for each task type and provide specific examples that demonstrate a difference.

Categories	Explanations	Narrative (Suspense)	Argumentative (Conflict)	Informative (Civil War)
Writing process	How your group went through the processes, such as planning, role division, writing, editing	Since the Narrative essay was more of a creative writing assignment, it was difficult to agree on one topic and story plan right away. We all had different ideas, but had to cut it down as much as possible. We ended up having two different plans that we chose to try and develop in the beginning in order to figure out which would be better for the task given. In the end, we reached a decision and continued to develop the essay. In this project, we didn't establish a clear division of work, and all wrote small parts of the essay, slowing revising it near the end.	This writing project was slightly easier to work with, although not as interesting or fun. However, the clear focus and goal of the writing allowed us to stay on the same track. We collaborated on the introduction and conclusion, while dividing up the main paragraphs. We had a more detailed plan for this project and were able to efficiently work and know exactly what we needed to do.	This topic, similar to the argumentative, was more easily understood due to the fact that it was focused on what we learned in class. The body paragraphs were split up again and the collaboration mainly stood in the introduction and conclusion. When in the very beginning, we all knew that we were working on civil war, which we were to pick how the civil war affected the country, and we decided to pick how it changed people's rights,,
Member role	What kind of roles did each member take?(e.g., main writer/scriber, task manager, editor, contributor of ideas, not clear in role division, etc).	As stated in the summary of our process, we initially had two different ideas that we decided to try out. The leaders for these first drafts were Kaitlyn and Ariana. After deciding on one of the stories, everyone worked together to contribute more ideas and revise what we had. There weren't any clear roles that each member took after. Everyone mainly worked by making changes in the writing as we developed it.	Because this writing was based off of information and study material, it was easier to establish a main focus throughout our group. We collaborated the most while creating our plan for writing and what each member would be working on. After this, we developed our introduction, worked separately on our body paragraphs, and then came back together to make small revision and conclude our essay. The main division of work was in the body paragraphs, and not many roles were established.	This role was most likely the most balanced one, even after the conflict part. There were less subjects to choose for our topic, which each of us can pick one of those subjects, where there were 5 of us. In the end, we were able to find slavery and women's rights. One person worked on Lincoln's House divided speech. In the other way, 2 people worked on Frederick Douglass, and 2 people also worked on women's rights, as those topics were more expandable.
Writing style	How would you describe your group's writing style for each genre?	We created an outline for two stories and tried to draft each one. After deciding, we continued to write the draft and then further edited and revised it to get to our final essay. (Kaitlyn) The Narrative collaborative essay was definitely one of the most exciting and fun writing pieces that i've	We had a clear goal ahead and worked to write our individual paragraphs. In the end, there weren't many revisions made to our original drafts. (Kaitlyn) The argumentative essay was not my favorite, but it allowed me to experience several elements	we listed few thesis. individual writing, w bother to each pers they were confirmed and perfe writing. We can compare each other's writing, rather than editing each other, which we can understand in detail how civil war changed the

		ever done out of the three during this year. I was able to collaborate and share my own ideas while making a creative story.	of argumentative essays that i've never heard of before. For example, I was able to learn and create a counter-argument in the essay.	country.

2. As a group, how do you evaluate your own group work? What are the strengths and weaknesses of your group?

Working with the same group this entire year has made writing these essays easier. The main problem that is faced with group writings is disagreement amongst the members. However, working with the same people gave us time to form to each person's style of writing and understand how to work with each other. Starting off with a creative writing showed us how to work with different ideas, while the information-based essays allowed to us incorporate all of our interpretations. Our strength in organization and planning continued to grow as we worked together. Overall, our group has been able to successfully complete each essay.

We evaluate our own group work by commenting and making notes on other's paragraphs or parts of the essay. One of our more distinct strengths is that we are able to agree with one another and give in and make room to other ideas rather than being stubborn and just standing up for our own. We also had no real "leader" so there wasn't any dictatorship in the group, and we weren't being ordered around to do something we wouldn't like. We all had a say and a part in the collaborative essay, and in the end, we were able to complete it successfully.

My group evaluated each other by commenting or directly talk to the people without using computer. Our strengths were that there were many good writers. Since there were a lot of good writers we were able to catch the theme and point fast. Not only because they are good writers, they had terrific ideas that can support everyone's writing. The weakness was that we couldn't agree much to each other's idea. Also we didn't discuss a lot because everyone were focused on their writing.

3. As a group, what did you learn the most and least from collaborative writing?

The main learning point in working with our collaborative writing team was learning how to write with other people. Out of all assignments and subjects that a group project could be given in, writing is considerably one of the more difficult ones, due to the fact that each individual could have a drastically different opinion, style, amount of experience, or overall knowledge. There are a lot of obstacles that groups have to work around in order to develop a clear and thorough essay. Having the opportunity to work on a project like this has allowed all of us to learn about ways in which you could reach the end product that you'd want. While these ideas differ between groups and its members, it is still the area that we've learned the most about.

B. Individual questions

How would you describe your own development as an academic writer over the course of the academic year? How did collaborative writing impact your writing skills?

Name:

Answer: **Personally, I feel that while this project has been challenging, it has still positively impacted me and allowed me to grow as a writer. Before working in the collaborative essay group, I only worked individually and never wanted to have my work be viewed by others and edited. I started out feeling slightly uncomfortable and didn't know where my place was as far as knowledge and experience in writing. However, after spending the year working with this group, I've been able to become more open-minded and considered others' ideas much more than before. Having feedback from others is a big advantage in group writings. I also believe that in the future, I'll be able to apply what I've learned in this project and be able to work well with different collaborative groups.**

APPENDIX I
Sample of Peer Evaluation on Collaboration Skills

Collaboration Evaluation Rubric

COLLABORATIVE WORK SKILLS: RUBRIC

Criteria	Level of Participation			
	4	3	2	1
	Distinguished	Proficient	Basic	Unacceptable
Workload	Did a full share of the work—or more; knows what needs to be done and does it, volunteers to help others.	Did an equal share of the work; does work when asked; works hard most of the time.	Did almost as much work as others; Makes the required effort to patictpate but no more.	Did less work than others; Participates minimally or not at all.
Participation in Discussions	Provided many good ideas for the unit development; inspired others; clearly communicated desires, ideas, personal needs, and feelings.	Participated in discussions; shared feelings and thoughts.	Listened mainly; on some occasions, made suggestions.	Seemed bored with conversations about the unit; rarely spoke up, and ideas were off the mark.
Time Management	Always Completes assignments on time throughout the project. Does not cause the group to change deadlines or reassign work because of lateness.	Usually completes assignments on time throughout the project. Does not cause the group to change deadlines or reassign work because of lateness.	May put things off, but turns assignments in on time. Does not cause the group to change deadlines or reassign work because of lateness.	Needed much reminding; work was late and it did impact quality of work or grade.
Providing Feedback	Habitually provides dignified, clear, and respectful feedback.	Gave feedback that did not offend.	Provided some feedback; sometimes hurt feelings of others with feedback or made irrelevant comments.	Was openly rude when giving feedback.
Receiving Feedback	Graciously accepted feedback.	Accepted feedback.	Reluctantly accepted feedback.	Refused to listen to feedback.
Working with others	Listens well and assists others in their efforts. Facilitates group work.	Usually listens well and assists others in their efforts. Does not facilitate group work, but doesn't hinder it either.	Sometimes listens well and assists others in their efforts but may be difficult to work with.	Does not listen well or assist others; may not participate in group work.
Leadership	Always takes the initiative getting group organized.	Usually takes the initiative getting group organized.	Sometimes takes the initiative getting group organized.	Rarely takes the initiative getting group organized.
Research techniques	Always looks at varied sources and records information in detail.	Usually studies varied sources and records information in some detail.	Often studies varied sources and records information, but sometimes it is sketchy.	Rarely looks at more than one source and barely takes any notes.
Synthesis techniques	Arranges information found by self and others into useful formulations; is able to manage complex ideas.	Usually arranges information found by self and others into useful formulations; may need help in managing complex ideas.	Sometimes arranges information found by self and others into useful formulations. Does not manage complex ideas.	Rarely or never arranges information into useful formulations or manages complex ideas.
Writing techniques	Has an advanced writing skill. Writes at a level far above the group average.	Has a good writing skill. Writes at a level a little above the group average.	Has an average writing skill. Writes at a level of the group average.	Has a limited writing skill. Writes at a level below the group average.
Problem solving	Makes a clear effort to find and share answers to problems.	Does not actively seek answers to problems but helps to improve those found by others.	Passivley accepts solutions found by others without changing them.	Makes no effort to find, share, or try answers to problems. Leaves all work to-others.

Peer Evaluation Sample

COLLABORATIVE WORK SKILLS: PEER EVALUATION

	SCORES (1-4)	Workload	Participation in Discussions	Time Management	Providing Feedback	Receiving Feedback	Working with others	Leadership	Research techniques	Synthesis techniques	Writing techniques	Problem solving
SELF	Score	4	4	4	3	4	4	4	4	3	3	4
Kayden Choh	Comment				Gave feedback once in awhile					Help in complex ideas		
Member Name:	Score	4	4	4	4	4	4	4	4	4	4	4
Esther Park	Comment											
Member Name:	Score	3	4	4	3	4	4	3	4	3	3	4
Damin Kim	Comment	Equal share									Fair writing	
Member Name:	Score	3	4	4	3	4	4	3	4	3	3	4
Kayla Javanillo	Comment	Equal share										
Member	Score											

Appendix J. Genre-specific Rubrics

Narrative

Criterion	9-10 Advanced	7-8 Proficient	5-6 Basic	3-4 Below Basic	1-2 Far Below Basic
Content	The authors skillfully create a strong narrator, point of view, setting, and characters. They use strong narrative techniques, providing details, dialogue, and description that help readers understand the story.	The authors' portrayal of the narrator, point of view, setting, and characters is adequate. They use adequate narrative techniques, providing details, dialogue, and description that help readers understand the story.	The author's portrayal of the narrator, point of view, setting and/or characters is inconsistent. They use narrative techniques inconsistently, using details, dialogue and description unevenly.	The authors' portrayal of the narrator, point of view, setting and/or characters is underdeveloped. They rarely use narrative techniques or uses them ineffectively.	The narrative may be confusing or too short. No attempt identified to use narrative techniques.
Organization	The authors create a strong unified plot that follows a logical sequence of events. They use a variety of transitional strategies.	The authors create a plot which is mostly unified, but sometimes includes events that don't seem to fit. They use some transitional strategies.	The authors create an inconsistent plot that does not follow a logical sequence of events. They use few transitional strategies and uses them inconsistently.	The authors create a plot that is confusing. They use few or no transitional strategies.	They do not attempt to create a plot and/or use transitional strategies.
Language	The authors skillfully use strong sensory, concrete and figurative language that shows purpose and enhances the narrative. They use purposeful and varied sentence structure.	The authors' use of sensory, concrete and figurative language is adequate and shows purpose. They use correct and varied sentence structure.	The authors' use of sensory, concrete and figurative language is inconsistent and at times lacks purpose. They use mostly correct and some varied sentence structure.	The authors' use of sensory, concrete and figurative language is weak, and lacks purpose. They use limited and/or repeated sentence structure.	The authors use limited language that often lacks purpose. They lack sentence mastery (e.g., fragments/ run-ons).
Mechanics	Few, if any, errors are present in usage and sentence formation. Effective and consistent use of punctuation, capitalization, and spelling.	There are some errors in usage and sentence formation, but no pattern of errors. Adequate use of punctuation, capitalization, and spelling.	Frequent errors in usage and sentence formation present. Inconsistent use of punctuation, capitalization and spelling.	Errors in usage and sentence formation, as well as punctuation, capitalization and spelling distract from the meaning.	Errors are frequent, severe and distract from the meaning.

Argumentative

Criterion	9-10 Advanced	7-8 Proficient	5-6 Basic	3-4 Below Basic	1-2 Far Below Basic
Content	The claim is clear, precise, and thoroughly addresses the prompt. The response contains thorough and convincing evidence that is smoothly integrated to support the claim.	The claim addresses the prompt and is clearly stated. The response contains adequate evidence that is for the most part smoothly integrated.	The claim addresses the prompt, but it is unclear or unfocused. The response contains unbalanced evidence that is often poorly integrated.	The claim does not clearly address the prompt. The response contains insufficient evidence to support the claim.	The claim is absent. The response contains no evidence to support the claim.
Organization	The response has a clear progression of ideas from beginning to end. Strong transitions are used between ideas.	The response has an adequate progression of ideas from beginning to end. Adequate transitions are used between ideas.	The response has an unclear progression of ideas from beginning to end. Inconsistent transitions are used, and with very little variety.	The response has little progression of ideas and includes some information that is not relevant to the topic. Minimal transitions are used.	There is no clear progression of ideas; irrelevant and off topic information distracts from the focus. Few or no transitions are used.
Language	The response clearly expresses ideas using strong academic language appropriate for the audience and purpose. Authors use purposeful and varied sentence structure.	The response adequately expresses ideas, uses some academic language, and shows an awareness of the audience and purpose. Authors use correct and varied sentence structure.	The response adequately expresses ideas, academic language is used inconsistently, and/or the author sometimes appears unaware of the audience and purpose. Authors use mostly correct and some varied sentence structure.	The response vaguely expresses ideas, uses limited academic language, and shows little awareness of the audience or purpose. Authors use limited and/or repeated sentence structure.	The response is confusing and/or shows no awareness of audience or purpose. Authors lack sentence mastery (e.g., fragments/ run-ons).
Mechanics	Few, if any, errors are present in usage and sentence formation. Effective and consistent use of punctuation, capitalization, and spelling.	There are some errors in usage and sentence formation, but no pattern of errors. Adequate use of punctuation, capitalization, and spelling.	Frequent errors in usage and sentence formation present. Inconsistent use of punctuation, capitalization and spelling.	Errors in usage and sentence formation, as well as punctuation, capitalization and spelling distract from the meaning.	Errors are frequent, severe and distract from the meaning.

Informative

Criterion	9-10 Advanced	7-8 Proficient	5-6 Basic	3-4 Below Basic	1-2 Far Below Basic
Content	The topic is clear, precise, and thoroughly addresses the prompt. The response thoroughly develops the topic with well chosen, relevant and sufficient concrete details, quotations and/or factual information to develop the topic.	The topic addresses the prompt and is clearly stated. The response develops the topic with relevant and sufficient concrete details, quotations and/or factual information to develop the topic.	The topic addresses the prompt, but it is unclear or unfocused. The response attempts to develop the topic with concrete details, quotations or factual information to develop the topic.	The topic does not clearly address the prompt. The response contains few concrete details, quotations or factual information to develop the topic.	The topic is absent. The response contains no concrete details, quotations or factual information to develop the topic.
Organization	The response has a clear progression of ideas from beginning to end. Strong transitions are used between ideas.	The response has an adequate progression of ideas from beginning to end. Adequate transitions are used between ideas.	The response has an unclear progression of ideas from beginning to end. Inconsistent transitions are used, and with very little variety.	The response has little progression of ideas and includes some information that is not relevant to the topic. Minimal transitions are used.	There is no clear progression of ideas; irrelevant and off topic information distracts from the focus. Few or no transitions are used.
Language	The response clearly expresses ideas using strong academic language appropriate for the audience and purpose. Authors use purposeful and varied sentence structure.	The response adequately expresses ideas, uses some academic language, and shows an awareness of the audience and purpose. Authors use correct and varied sentence structure.	The response adequately expresses ideas, academic language is used inconsistently, and/or the author sometimes appears unaware of the audience and purpose. Authors use mostly correct and some varied sentence structure.	The response vaguely expresses ideas, uses limited academic language, and shows little awareness of the audience or purpose. Authors use limited and/or repeated sentence structure.	The response is confusing and/or shows no awareness of audience or purpose. Authors lack sentence mastery (e.g., fragments/ run-ons).
Mechanics	Few, if any, errors are present in usage and sentence formation. Effective and consistent use of punctuation, capitalization, and spelling.	There are some errors in usage and sentence formation, but no pattern of errors. Adequate use of punctuation, capitalization, and spelling.	Frequent errors in usage and sentence formation present. Inconsistent use of punctuation, capitalization and spelling.	Errors in usage and sentence formation, as well as punctuation, capitalization and spelling distract from the meaning.	Errors are frequent, severe and distract from the meaning.