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The effects of synchronous text-based computer-mediated communication tasks on the development of L2 and academic literacy: A mixed methods study

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The effects of synchronous text-based computer-mediated communication tasks on the development of L2 and academic literacy: A mixed methods study

by

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Iowa State University
Ames, Iowa
2012

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DEDICATION

I dedicate this dissertation to my family, particularly to my parents, Su Li and Chuanshu Chen, who have inspired me to study languages and language learning, and have always had confidence in me. I must also thank Marc, who has been a terrific listener and has given me his fullest support. There is no doubt that without their continued encouragement and support, I could not have completed this project.
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ABSTRACT

The dissertation examines how synchronous text-based computer-mediated communication (SCMC) tasks may affect English as a Second Language (ESL) learners’ development of second language (L2) and academic literacy. The study is motivated by two issues concerning the use of SCMC tasks in L2 writing classes. First, although some of the alleged benefits of SCMC, including its visual saliency and the possibility of slower processing speed, have been supported by theories of Second Language Acquisition (SLA), more evidence is still needed since empirical studies have not yet produced enough consistent findings. Second, most studies on SCMC have focused on its influence on learners' development of basic communicative competence while it has been suggested that SCMC may hold great potential for the development of advanced academic literacy (Luo, 2005; Mohan & Luo, 2005) that is considered as an essential goal for L2 writing classes.

Therefore, the dissertation addresses these issues using mixed methods research completed in two phases. A quasi-experiment was conducted in the first phase among forty-four international students enrolled in two sections of an ESL academic writing course to examine the differential effects of SCMC and face-to-face tasks. The differential effects were assessed by comparing the students' improvement on measures of L2 grammatical and lexical complexity, accuracy, and fluency (Wolfe-Quintero, Inagaki, & Kim, 1998) from a pre-test to a post-test. The results of the quasi-experiment were also used to help select representative focal students for the multiple case studies in the second phase where the SCMC discourse of the focal students was examined for the details of L2 learning and the development of academic literacy. In analyzing the SCMC
discourse of different triads, instances of L2 learning opportunities based on the Interaction approach and sociocultural theory of L2 learning were identified and classified, and the patterns of learning for each triad and between triads were discussed. The SCMC discourse was then re-analyzed to examine how the focal students developed their ability to construct effective arguments by participating in the back-and-forth rhetoric and by learning to use meta-discourse devices appropriately. The patterns of learning observed in the SCMC discourse of the focal students were also compared with the patterns observed from their writing samples.

The quasi-experiment and the multiple case studies were connected by a mixed methods research design (Creswell & Plano Clark, 2007, p. 73) whose aim was to understand how SCMC tasks might affect both the outcome and the processes of the development of L2 and academic literacy. The results largely confirmed the benefits of SCMC tasks on L2 written accuracy and fluency, and suggested that SCMC tasks had great positive potential in engaging students in the processes of arguments to help them learn to incorporate discussions of opposing views in building effective arguments. Future research may further examine the differences of learning between pairs, triads, or small groups working on the same SCMC task. Research on the use of SCMC tasks and the learning of meta-discourse devices can also inform pedagogical decisions.
CHAPTER ONE. INTRODUCTION

1.1 Background

Synchronous text-based computer-mediated communication (SCMC) tools, or text-based chat programs, have been widely employed to facilitate second language (L2) teaching and learning. SCMC was first used to help hearing-impaired students learn English at Gallaudet University (Baston, 1988) and was tested later, as a new platform for classroom discussions in composition and literature classes for native speakers of English (Bump, 1990). The open-ended whole-class discussion organized through computer networks was referred to as computer-assisted classroom discussions, or CACD (Bump, 1990, p. 51). CACDs were soon introduced into English as a Second Language (ESL) classes to help organize whole-class or group discussions, and were shown to have great potential to increase the quantity of interactions and to equalize learners’ participation (Beauvois, 1992; Kelm, 1992; Kern, 1995; Warschauer, 1996).

Thereafter, empirical studies based on the Interaction approach to second language acquisition (SLA) have continued to demonstrate the potential of SCMC for L2 development. First, different types of communication tasks conducted in SCMC are shown to be, at least, as effective as the same tasks conducted face-to-face in terms of facilitating negotiation of meaning (Blake, 2000; Pellettieri, 2000; Salaberry, 2000) and noticing of L2 form (Fiori, 2005; Lai & Zhao, 2006). Moreover, studies have found the unique environment of SCMC may provide learners with more opportunities for L2 development, such as interactive competence (Chun, 1994) and L2 complexity (Kern,
Most of the benefits may be attributable to the visual saliency and the possibility of self-paced language processing enabled by SCMC, as compared to face-to-face discussions (Chapelle, 2003; Warschauer, 1997). Along the same line of research, studies have revealed that other factors, such as the types of tasks (Blake, 2000; Bower & Kawaguchi, 2011), interlocutor-related factors (Liang, 2010; Sotillo, 2005), and technical difficulties associated with the use of SCMC (Hamano-Bunce, 2010) may affect the way the new mode of communication influences L2 development.

Meanwhile, research based on sociocultural theory of L2 learning has examined the nature of SCMC discourse mostly from a complementary perspective, and has enriched the understanding of the role of SCMC in L2 learning. Some studies examined the co-construction of linguistic knowledge by the participants during their interactions in SCMC, and found SCMC to be a advantageous platform, where learners can effectively assist each other linguistically and cognitively during the process of feedback negotiation (Lee, 2008; Peterson, 2009). Others have focused on examining features of SCMC discourse, and are divided with regard to the effects of these features. On one hand, research has identified unique interactive features of SCMC and found them to be facilitative for developing learners’ linguistic and pragmatic competence (Darhower, 2002). On the other hand, however, studies have pinpointed the concern over the possible negative impact of SCMC on L2 learning. In particular, SCMC discourse may be restricted to a limited range of language moves such as assertion (Collentine, 2009). Meanwhile, a larger proportion of content discussion as opposed to meaning negotiation (Liang, 2010) and frequent use of informal expressions were observed in SCMC
(Collentine, 2009; Kern, 1995). Moreover, SCMC was perceived by some learners as primarily an informal way of communication (Collentine, 2009; Kern, 1995).

Despite the alleged drawbacks of SCMC, findings of its negative impact on L2 development are arguably inconclusive, due to three main reasons. First, the mixed results on the influence of SCMC in the empirical studies can be caused by variations in the definitions and operationalizations of the construct of L2 development, or more fundamentally in the understanding of the nature of language and language development. With regard to the nature of language, while the structural linguistic view describes it essentially as discrete building blocks, such as phonetics, morphology, syntax, semantics, and pragmatics (Bloomfield, 1966), functional approaches emphasize the mappings between language forms and functions, and thus view language as composed of linguistic resources at multiple levels unified under meanings or functional concepts (Cooreman & Kilborn, 1991). In the field of SLA and computer-assisted language learning (CALL), researchers, who focus on explaining the acquisition and representation of knowledge of the linguistic system, tend to take the structural linguistic approach (Blake, 2009; Coniam & Wong, 2004; de la Fuente, 2003; Ellis, 2005; Sauro & Smith, 2010), while those focusing on learners’ ability of language use generally take a functional approach (Bardovi-Harlig, 1994; Belz, 2003; Luo, 2005). As a result, it can be difficult to make sense of the large body of research on the effects of SCMC on L2 development.

Second, some observed features of SCMC discourse, or learners’ language use in SCMC, may be attributable to the broader contexts of learning, including instructors’ pedagogy (Beauvois, 1992), task types (Yilmaz & Granena, 2010), and more importantly, the dynamics of the interactions within each pair, triad, or small group. For example,
studies have shown that specific instructions of focus-on-form in SCMC may lead to significant improvement of linguistic accuracy in terms of the language production online and more desirable behavior such as negotiation of meaning and collaboration (Beauvois, 1992; Fiori, 2005). Meanwhile, an increasing number of studies have observed the influence of several group-related factors, including language proficiency, or more precisely interlocutors’ perception of each other’s language proficiency level relative to one’s own (Lee, 2004), the perceived purpose of language use (Khamis, 2010; Liang, 2010; Peterson, 2009; Warner, 2004), the degree of engagement of group members (Oskoz, 2009; Storch, 2002), and the perceived relationships between interlocutors (Darhower, 2007). Although some of these factors were characterized as isolated attributes of individuals in some studies, it is how they play out in the formation of pairs or small groups that would ultimately affect the quality of interactions and subsequent learning outcomes. Therefore, conflicting results on interaction patterns or characteristics of SCMC discourse could be caused by the dynamics of pairs, triads, or small groups in different contexts. If these micro learning units may exhibit different dynamics in different contexts, it may be misleading to generalize typical moves or characteristics of SCMC discourse based only on observations of learners’ language use in one or two tasks or SCMC sessions (Collentine, 2009; Kern, 1995; Liang, 2010; Vandergriff & Fuchs, 2009). Thus, the researcher believes learners' perceptions of language use in SCMC and their language behavior in SCMC may be shaped by instructions and other factors, instead of the assumption that learners' perceptions of SCMC, which affects their language behavior in SCMC, do not change or cannot be changed.
Third, it is doubtful to make inference of learners’ linguistic competence based only on their language use observed in SCMC. Since no one talks the same way all the time (Hymes, 1984), it is reasonable to expect variations in learner language across different contexts as well. In fact, studies on the variability in learner language have provided ample evidence of systematic variation (Ellis & Yuan, 2005; Tarone & Liu, 1995), and have attempted to account for the variation from different theoretical perspectives. Sociolinguistic models believe that both linguistic environment and social contexts may influence speakers’ choices of language (Bailey, 1973; Bickerton, 1975; Labov, 1973). Social-psychological models focus on how speakers’ views of their own and their interlocutors’ social, institutional, and ethnic status may affect their decisions of language use (Giles, Coupland, & Coupland, 1991). Psycholinguistic models, on the other hand, are concerned with the effects of planning and monitoring on the systematic variation in language production (Levelt, 1989). Since SCMC entails the co-construction of a new context of interaction, which depends on, among others, the interlocutors’ perceptions of the topics of discussion, their interpersonal relationships, and the role of the language in the discussion, it is questionable to assume that learners’ linguistic behavior in SCMC may represent their linguistic performance in other similar or dissimilar contexts.

Therefore, it is necessary to further examine the impact of SCMC on L2 development taking into account the above-mentioned three main issues. The first issue of construct definition posed some challenge with regard to the selection of theoretical lenses and approaches to the analysis of learner language. The researcher decided to take a pragmatic approach, where the decision of the theoretical framework and analytical
approach was driven by the need to address the research problem. To start with, my
objective in conducting this current study was to examine the extent to which SCMC
tasks can facilitate the development of L2 and academic literacy. Since the planned
intervention would involve the use of discussion and role-play discussion tasks in SCMC,
I situated the study within both the framework of the Interaction approach and that of
sociocultural theory of L2 learning.

Some may question the soundness of drawing on different theoretical perspectives
in a single study. However, my goal was not to merge the two SLA perspectives or to
resolve their controversies. Instead, I saw the similarities and complementarities between
the two perspectives that would help generate a more insightful picture of the
development of L2 and academic literacy both through and in interactions. Specifically,
both the Interaction approach and sociocultural theory of L2 learning emphasize the role
of interaction in L2 learning, and characterize the learning process, to some extent, as
cognitive (Ellis, 2008). The Interaction approach focuses on learners’ mental processes
during interactions and draws upon constructs such as comprehensible input, noticing,
negotiation of meaning, intake, integration, and output to identify and examine optimum
conditions in interactions that can facilitate L2 acquisition (Chapelle, 2005; Gass, 1997;
at the role of the mental processes in L2 learning by examining mediation and
internalization (Lantolf & Thorne, 2007). The difference is that sociocultural theory of L2
learning also stresses the value of the social experiences of language use in helping
learners internalize L2 knowledge, and how learning can happen during interactions.
Therefore, my goal was to bring the two perspectives to the same interaction data (Foster
& Ohta, 2005) to obtain a better understanding of the opportunities for L2 learning that SCMC can afford.

The decision of analytical approaches was also based on a pragmatic stance. Since my goal was to assess the development of L2 and academic literacy to show the effects of SCMC, and that I was interested in both generalizable results of the learning outcomes and details of the learning processes emerged in the SCMC discourse, both structural linguistic concepts and functional concepts were used. Traditionally, L2 development was conceptualized as the acquisition of the knowledge of the L2 system such as vocabulary and grammar. Increasingly, more studies are now concerned about L2 use in different contexts. However, more researchers recognize that the interaction between linguistic knowledge and contexts of language use would be more helpful for the understanding of language development and language use. For example, Chapelle (1998) have discussed an interactionist view in assessing L2 development where performance consistency is attributed to both learner characteristics and contextual variables. The researcher also believes that it is difficult to distinguish the learner's linguistic knowledge completely from his or her ability to use the knowledge in different contexts, and thus the most reliable evidence of L2 development would be generated from analysis of samples of the learner's language use in similar target contexts.

Analyzing learner language used to be purely based on the structural linguistic view (Corder, 1967), but some linguistic analysis has successfully incorporated functional concepts. For example, analyses of form-function mappings have taken into account both learners’ use of language form and their intended meanings or functions, and have revealed great insights into interlanguage development in longitudinal studies.
(e.g., Ellis & Barkhuizen, 2005). Therefore, the structural linguistic analysis of learner language and the functional approach may be used to unveil different aspects of L2 use.

More specifically, some structural linguistic concepts, such as L2 grammatical and lexical complexity, accuracy, and fluency (CAF), have been considered as different aspects of L2 development, and different CAF measures have been widely used as indices of L2 development. Researchers have considered CAF measures as more objective measures in comparison with holistic measures based on experts' impression and judgment, and have provided evidence showing that some CAF measures strongly correlate with L2 writing proficiency (e.g., Wolfe-Quintero, Inagaki, & Kim, 1998). Therefore, CAF measures can offer an efficient method to measure the effects of SCMC on the overall development of L2 use in academic writing.

At the same time, functional approaches provide important analytical tools that can reveal how learners learn to expand their linguistic resources to express certain meaning or to perform certain function. In writing academic essays, for example, an important aspect is to be able to construct effective arguments using argumentative moves to incorporate discussions of opposing views, and to project credible authorial identity by using meta-discourse devices appropriately. Based on systemic functional linguistics (SFL), functional approaches focus on how learners expand their linguistic repertoire and develop their ability to use the linguistic resources to make meaning (Halliday, 1978). Moreover, functional approaches emphasize that texts are contextualized within social practices. Therefore, language learning is viewed as language socialization through which learners are socialized into certain conventions of language use of a specific social group (Schieffelin & Ochs, 1986).
The functional perspective lends support to the current study in two main ways. First, it provides a framework to examine the learning of both language and content. Specifically, in an ESL academic writing course, learners need to acquire advanced academic literacy skills in addition to L2, such as using rhetorical strategies and linguistic devices to construct effective arguments (Hinkel, 1999) and using meta-discourse devices to project credible authorial identity (Hyland, 2002, 2005; Hyland & Milton, 1997). These aspects of learning may not be captured by the structural linguistic concepts of CAF and their measures. Functional approaches, however, would provide a framework to analyze and reveal the processes where learners develop their ability to use the linguistic devices to construct effective arguments and to project credible authorial identity.

Second, functional approaches would provide tools to help examine learners’ experiences and perceptions of possible factors that may affect their language use in SCMC, and thus would help contribute to the ongoing dialogue about learners’ perceptions of the nature and characteristics of SCMC discourse.

Although certain SLA theoretical perspectives may favor certain orientations towards the understanding of language and language learning, functional approaches seem to be compatible with both the Interaction approach and sociocultural theory of L2 learning. Both theories focus on the learner's communicative use of language and the necessity to understand not only what the learner knows about L2, but also how such knowledge can be put to use (Cooreman & Kilborn, 1991; Ellis, 2008). Additionally, sociocultural theory of L2 learning and functional approaches share the fundamental view of language as a semiotic tool to facilitate interaction and social action (Wells, 1994), and, thus, a strong focus on the semantic properties of language (Ellis, 2008). Therefore,
it would be possible and beneficial to situate the study within both the framework of the Interaction approach and that of sociocultural theory of L2 learning, and to incorporate linguistic and functional analyses to examine the effects of SCMC on the development of L2 and academic literacy.

The second issue concerning the influence of possible confounding factors related to some characteristics of pairs, triads, or small groups can be addressed by using statistical methods informed by multi-level analysis that take into account of the fact that the data set used in the current study may have violated the assumption of independence of observation, or that learners within the same micro learning unit may share more similarities than they do with learners from other micro units. Traditional hypothesis tests and the calculation of confidence intervals for the linear contrasts of means assume independence of observation (Howell, 2010; Maxwell & Delaney, 2004). However, in interaction studies, individuals of a pair, a triad, or a small group are not simply independent individuals. Instead, they share the pair, triad, or small group membership, and therefore their performance on the dependent variable may not be completely independent of each other. More specifically, the issue of non-independence in studies of SCMC refers to the possibility that the members of the same pair, triad, small group, or micro learning unit demonstrate more similar behavior (e.g., characteristics of SCMC discourse or scores on the subsequent learning outcome tests) than they do in comparison with the behavior of individuals from a different pair, triad, small group, or micro learning unit. In other words, learners in different pairs, triads, small groups, or micro learning units may differ significantly in terms of their perceptions of SCMC tasks, their roles in the tasks, and their relationships with their group members, and the approaches
they take to complete the tasks. These differences, or dynamics in different micro learning units, may, in turn, generate impacts on the way SCMC tasks affect learning outcomes. Therefore, it is likely that the performance of the learners from the same micro learning unit on the dependent variable is, too, more similar to each other than they are to the performance of learners from other micro learning units. Therefore, traditional hypothesis tests based on the assumption of independence of observations may not be adequate in treating interaction data. At the same time, multi-level analysis, with the help of systemic functional linguistics, provides a way to explore how to operationalize the influence of the frequently observed confounding factors on the effects of SCMC tasks on L2 development.

Specifically, systemic functional linguistics, focusing on the analysis of language as it relates to social structure and contexts, provides a framework to conceptualize and model several key small group characteristics that may affect the quality of interactions in SCMC. According to SFL, linguistic choices in interactions depend on the context of situation that is described in terms of three situational variables of field, mode, and tenor (Halliday & Martin, 1993, p. 32). Field refers to the social activity that is taking place, or learners’ perceptions of tasks and their goals. Tenor refers to the role structure, or learners’ perceptions of their roles in a group and their relationships with group members. Mode refers to the symbolic organization, or learners’ perceptions of the purpose of language in tasks. In the current study, the participants were invited to rate these aspects of their small group characteristics. Questionnaire items were developed that describe sample behavior and perspectives in these three aspects, and the students were then invited to indicate their agreement or disagreement for each of the items or statements.
Therefore, based on the framework of multi-level analysis and SFL, the measures of the four important small group characteristics – group effectiveness, group language use, group social distance, and perceptions of relative language proficiency were developed, and the four characteristics were modeled as variables at the small group level in a re-analysis of the differential effects of SCMC and face-to-face tasks on CAF. In analyzing the data set from the quasi-experiment for the second time, the dependence of the values for each of the four dependent variables of CAF was first evaluated, and two alternative approaches informed by multi-level analysis were carried out in analyzing the data with a high level of dependence.

The third issue of variability in learner language can be addressed by examining longitudinal data collected from a naturalistic environment. Although SCMC is not a new technological tool, its regular use in an ESL academic writing class is probably still rare. Therefore, the integration of SCMC with curriculum objectives would give learners a more meaningful context and allow them the necessary time to form and adjust their perception of the use of SCMC in a classroom setting regularly. Meanwhile, longitudinal data would also allow the researcher to sample the interaction data systematically to separate idiosyncratic instances from interaction patterns. Moreover, the researcher also documented the development of L2 and academic literacy in samples of language use in the SCMC discourse, in addition to samples of their language use in academic writing.

In addition to the three main issues discussed above, studies on the effects of SCMC may have been held back because they rely either on the interaction data in SCMC (Hamano-Bunce, 2010; Lee, 2008) or some pre-study and post-study measures (Coniam & Wong, 2004) to make inferences about how SCMC affects L2 learning. The
interaction data may reveal details of the learning processes as they emerge in SCMC, and the test measures may provide evidence of learners’ language use in target contexts. However, either one alone may not seem to be adequate in addressing the effect of SCMC on L2 learning. Therefore, it would help advance the understanding of the role of SCMC by connecting evidence from the learning processes to that shown in the learning outcomes (Ortega, 1997). Since the goal of the study was to examine the effects of SCMC tasks on the development of L2 and academic literacy, or more specifically an essential aspect of academic writing, samples of academic writing could be regarded as a basis for obtaining outcome measures that evaluate the development of L2 and the use of argumentative moves in academic writing. To identify possible links between the evidence from the learning processes and that from the learning outcomes, the interaction patterns in SCMC discourse and the patterns of development shown in the parallel samples of academic writing were first identified separately, and then the patterns observed in the SCMC discourse and the patterns observed in the writing samples were compared, and the similarities and differences concerning the patterns were discussed.

1.2 Research Questions

This study aims to examine the use of SCMC tasks in an ESL academic writing course, and how these tasks can facilitate the development of L2 and academic literacy. The purpose of this study is two-fold: 1) to improve the understanding of how the Interaction approach to SLA and sociocultural theory of L2 learning can be brought together to reveal and examine the potential opportunities of L2 learning in SCMC, and 2) to take a functional approach to examine how SCMC tasks can also help L2 learners
develop their academic literacy, or more specifically, their ability to construct effective arguments by incorporating discussions of opposing views and by projecting credible authorial identity using meta-discourse devices appropriately. Specifically, the study addresses the following five research questions.

1. How do average scores of grammatical and lexical complexity, accuracy, and fluency change from a pre-test to a post-test, respectively, and compare for treatment and control groups?

2. What interactional processes occur in the SCMC discourse of the focal students in the selected triads that may be considered beneficial for L2 learning?

3. How does the SCMC discourse of the focal students reflect their development in using argumentative moves to construct effective arguments? What patterns of change can be observed concerning the use of argumentative moves in the timed writing samples of the same students? What connections, if any, are there between the characteristics of the use of argumentative moves in the SCMC discourse and the patterns of change in using argumentative moves in the writing samples?

4. How do the focal students learn to use meta-discourse devices in the SCMC discourse? What patterns of change can be observed concerning the use of meta-discourse devices in the timed writing samples? What connections, if any, are there between the use of meta-discourse devices in the SCMC discourse and the patterns of change in using meta-discourse devices in the writing samples?
5. What are the focal students' perceptions of the SCMC tasks, their triads, and their learning in the SCMC tasks?

The first question is addressed mainly through a quasi-experiment that was designed to test the differential effects of SCMC and face-to-face tasks on learners' development of L2 in academic writing as assessed by measures of L2 grammatical and lexical complexity, accuracy, and fluency. The second, third, fourth, and fifth questions are answered through multiple case studies that aimed to focus on different aspects of the learning processes of some focal students selected based on the results of the quasi-experiment. Specifically, the second, third, and fourth research questions aimed to analyze the focal students' language use and development in both the SCMC discourse and the parallel samples of academic writing to make possible connections between the patterns of change observed in the SCMC discourse and the patterns of development shown in the samples of academic writing. The fifth question aimed to examine the participants' experiences in and perspectives of the SCMC tasks, the dynamics in their triads, and their learning in the SCMC tasks. The findings for the five research questions are presented and discussed in Chapter 4.

1.3 Significance of the Study

Most studies on SCMC have been framed either from the framework of the Interaction approach or that of sociocultural theory of L2 learning. While they have produced considerable advancement of the understandings of the influence of SCMC on language learning and teaching, they also posed challenges for comparing results and interpreting findings. A few studies on the effects of face-to-face interactions on L2
learning have incorporated both perspectives in analyzing learners’ interactions, and have found that combining the two perspectives in examining learners’ interactions resulted in a more complete understanding of the potential of interactions for L2 learning. To illustrate, in their analysis of their learners’ interactions, Foster and Ohta (2005) first identified occurrences of negotiation for meaning, and then coded the rest of the data for processes that are believed to benefit L2 learning from the perspective of sociocultural theory of L2 learning. They found that even in the absence of instances of negotiation for meaning, there were plenty of other processes where learners were co-constructing linguistic knowledge and thus learning. However, few studies on SCMC, to the best of my knowledge, have attempted to bring multiple theoretical perspectives to the investigation of the SCMC discourse. Therefore, this study provides a broader view of the opportunities for L2 learning that SCMC may afford.

Moreover, this study draws upon concepts and constructs from the structural linguistic and functional linguistic traditions to advance understandings of the impacts of SCMC on the development of both L2 and academic literacy. Previous studies have suggested that SCMC may be beneficial for the development of L2 complexity, because learners may be able to use the extra processing time allowed by SCMC to plan and monitor their language production and to use lexically and syntactically more formal and complex language in SCMC, as compared with their language use in face-to-face discussions (Warschauer, 1996). SCMC has also been shown to have positive impacts on L2 fluency (Blake, 2009; Lee, 2002). There have been some disagreement with regard to the effects of SCMC on the development of L2 complexity and fluency (Hamano-Bunce, 2010; Sauro & Smith, 2010), but the most controversial issue is probably about the effect
of SCMC on the development of L2 accuracy. Supporting arguments are generally based on the additional visual saliency and the slower processing speed afforded by SCMC, and counter arguments are largely sustained by inferences from analyses of SCMC discourse or learners’ perceptions of conventions of language use in SCMC. Only a few studies have used outcome measures to trace the effects of SCMC tasks on accuracy systematically (Coniam & Wong, 2004). Therefore, this study contributes to the understanding of the differential effects of SCMC and face-to-face tasks on the development of L2 grammatical and lexical complexity, accuracy, and fluency in academic writing, and to a more comprehensive understanding of the L2 learning opportunities emerged in SCMC discourse based on the Interaction approach and sociocultural theory of L2 learning.

At the same time, functional approaches are essential because they address two significant issues associated with research on the use of SCMC. First, observations of some features of SCMC discourse seemed to have been taken as norms of communications in the new medium and, thus, give rise to a negative sense that such norms, if not beneficial, may not be changed. However, SFL recognizes variations in interaction styles as a result of the three register variables of field, tenor, and mode, and therefore opens up the possibilities of reconstructing a new register that may be more conducive for learning. It is important to note that the construction or reconstruction of the new register is at the hands of the learners and the extent to which the newly constructed register may benefit L2 learning varies from one group to another, and from one context to the next. Indeed, SCMC is still a relatively new medium of communication in a classroom setting, and the effective use of it for various learning purposes can very
possibly be shaped by topics of discussion (field), learners’ perceptions of the interpersonal relationships in groups (tenor), and learners’ views of the purpose of language (mode)—all can be influenced to a great extent by the instructors and may change over time. Therefore, this study attempts to advance the understanding of how the use of SCMC can be shaped for the development of L2 and academic literacy in an ESL academic writing course by documenting the design of the SCMC tasks and the processes of how the tasks were carried out in SCMC and face-to-face, comparing the learning processes in SCMC, the learning outcomes in parallel samples of academic writing, and examining the learners’ experiences and perceptions of the SCMC tasks and their learning in the SCMC tasks.

A second significant issue of research on SCMC is the lack of attention to its potential in facilitating the development of academic literacy, despite some positive findings on its role in assisting learners’ development in using academic discourse (Luo, 2005). This is probably a more urgent issue considering L2 writing research has shown that ESL writers are not only challenged by languages issues but also issues involving the use of sophisticated lexis and grammatical structures, and advanced textual patterns conventional to academic writing. For example, some thorny issues confronting ESL writers in their academic writing tasks are quite often caused by the inadequacy of “balanced argumentation” (Hinkel, 1999, p. 1). If such difficulties are truly caused by different perceptions of argumentation in different cultural traditions (Hwang, 1987; Scollon, 1994) and have not been quite successfully addressed by explicit instruction or increased quantities of individual writing practice, they may be expected to be resolved more effectively through an alternative approach of language socialization. Specifically,
learners can be given more opportunities to be engaged in academic discussions in which they would be able to observe and learn from others’ language use and make adjustments. Since SCMC shares some features of both written and oral communications, it is reasonable to believe it can offer some unique assistance in raising learners’ awareness of features of academic discourse and rhetorical conventions of academic English. In particular, SCMC allows only text-based exchanges and enlarges social distance between the interlocutors, which, together with course-related topics of discussion, may help orient the learners in the SCMC tasks to the use of academic discourse, and promote serious engagement in the processes of discussion where learners can practice constructing effective arguments. At the same time, the sense of an immediate audience enabled in the SCMC tasks may motivate learners to contribute their ideas, and thus also provide opportunities for the learners to be exposed to different perspectives and help them learn to anticipate responses from a potential audience and incorporate discussions of opposing views to effectively strengthen their own arguments. Therefore, by following functional views of language and language learning, the study draws attention to the potential that SCMC holds for not only L2 development but also the development of academic literacy.

This study also contributes to the field of CALL by using mixed research methodology. Most studies in the field of CALL adopt quantitative methods (Kern & Warschauer, 2000; Saurao, 2009; Warschauer, 1996; Vinagre & Muñoz, 2011), and an increasing number of studies have begun to use qualitative methods along with discourse analysis of interactions in SCMC (Belén Díez-Bedmar & Pérez-Paredes, 2012; Bower & Kawaguchi, 2011; Collentine, 2009; Liang, 2010; Sun & Chang, 2012). This study
employed mixed research methodology to first evaluate the students' performance on a pre-study and a post-study writing test to obtain generalizable results concerning the differential effects of SCMC and face-to-face tasks on the development of L2 grammatical and lexical complexity, accuracy, and fluency in academic writing. Then the results were used to identify focal students representing different levels of performance on one of the key dependent variables on the post-test. The SCMC discourse of the focal students was then examined to better understand the learning processes shown in SCMC and to make the connections between the learning processes and the learning outcomes. Specifically, the current study adopted the participant selection model within the two-phase explanatory mixed methods research design that includes two main components (Creswell & Plano Clark, 2007, p. 59). The first phase involved a quasi-experiment, where the effects of SCMC tasks on the development of L2 grammatical and lexical complexity, accuracy, and fluency were examined using both the traditional hypothesis tests and confidence intervals for linear contrasts of means (Bonett, 2008, 2010; Howell, 2010; Shannon & Davenport, 2001), and statistical methods informed by approaches of multi-level analysis (Maxwell & Delaney, 2004; McCoach & Adelson, 2010; Snijders & Bosker, 2012). The second phase involved multiple case studies of the learning processes shown in the SCMC discourse. The case studies examined the SCMC discourse of the selected triads from three perspectives: 1) the opportunities for L2 learning emerged in the SCMC discourse, 2) the development in using increasingly sophisticated argumentative moves in responding to and incorporating opposing views in building one's own arguments, and 3) the development in using meta-discourse devices appropriately. In the second phase, the focal students' perceptions of the SCMC tasks,
their language use and learning in the SCMC tasks were also examined. Mixed research methodology made it possible to examine systematically the outcomes and the processes of learning that were affected by the use of SCMC tasks, where the multiple case studies were situated within a more transparent context set up by the quasi-experiment and the results of the quasi-experiment were substantiated by the findings from the multiple case studies. Thus, mixed research methodology adopted in the study allowed the researcher to look at different aspects of learning that was affected by the use of SCMC to better understand its role in the development of L2 and academic literacy.

To sum up, this study aimed to advance the understandings of how SCMC can be effectively integrated in ESL academic writing instruction to facilitate the development of both L2 and academic literacy by analyzing learners’ language use in SCMC discourse and parallel samples of academic writing, and learners' perceptions of SCMC tasks and their language use and learning in the SCMC tasks using mixed research methodology.

1.4 Organization of the Dissertation

Chapter 2 is a review of selected literature on CALL, computer-mediated communication (CMC), and SCMC situated within different perspectives of SLA and orientations towards language and language learning. Through comparisons and contrasts of findings from studies framed by the Interaction approach and those from studies framed by sociocultural theory of L2 learning, Chapter 2 expects to reveal issues raised within each theoretical framework, as well as those raised by the division between the two, thereby introducing the advantages of incorporating multiple theoretical perspectives in the investigation of the role of SCMC in L2 learning. Meanwhile, Chapter 2 argues for
the integration of functional approaches to the re-conceptualization of the role of SCMC in ESL academic writing instruction by introducing the systemic functional linguistic view of language and language development, and identifying the need for better understandings of the influence of the sociocultural context of SCMC use. Moreover, Chapter 2 also argues for the need to understand how SCMC can be used to facilitate the development of both L2 and academic literacy, and by reviewing literature on academic literacy and challenges in teaching ESL academic writing, Chapter 2 narrows the concept of academic literacy down to a key aspect of academic writing: to construct effective arguments by incorporating discussions of opposing views using argumentative moves and to project credible authorial identity using meta-discourse devices appropriately.

Following the review of the theoretical foundations, Chapter 2 explains the analytical framework adopted for the analysis of learners' use of argumentative moves and meta-discourse devices in SCMC and academic writing.

Chapter 3 presents the rationale and a detailed description of the mixed research methodology adopted for this study. The first part of the chapter is a review of the theoretical assumptions and framework behind the mixed research methodology. This chapter then provides descriptions and justifications for the mixed research design, followed by explanations of the research context, the participants, the data collection procedure, and the data analysis methods used in both the quasi-experiment in the first phase and the multiple case studies in the second phase. Chapter 3 concludes with a discussion of the legitimation of the study.

Chapter 4 presents the results and discussion of the study. The five research questions presented earlier in Chapter 1 and Chapter 2 are addressed in different sections
in Chapter 4. Following a brief introduction, Section 4.2 looks at the differential effects of SCMC and face-to-face tasks on the development of L2 grammatical and lexical complexity, accuracy, and fluency in academic writing. By examining changes on the measures of CAF, this section aims to demonstrate how SCMC may affect the development of learners' L2 use in academic writing, and to identify some focal students to represent different levels of achievement on one of the four aspects on the post-study writing test. Section 4.3 investigates the SCMC discourse of the focal students based on the framework of both the Interaction approach and sociocultural theory of L2 learning. The purpose is to examine the various L2 learning opportunities emerged in the SCMC discourse of selected focal students. Interaction patterns and L2 learning opportunities are identified and summarized for different triads and were compared between triads. Section 4.4 continues with a re-analysis of the same SCMC discourse from a functional perspective, and aims to examine how the focal students in different triads take the opportunities of interactions in SCMC to practice constructing arguments and using meta-discourse devices. Interaction patterns in constructing and responding to arguments, and the use of meta-discourse devices are identified and summarized for each focal student and compared between the focal students. The patterns of the use of argumentative moves and the use of meta-discourse devices are then compared with the patterns of development in the same two aspects shown in parallel samples of academic writing. Possible connections between the interaction patterns and the use of meta-discourse devices in SCMC, and the development patterns identified in the writing samples are discussed for each focal student. Section 4.5 explores the participants’
experiences in the SCMC tasks, and their perceptions of language use and learning in the SCMC tasks. Chapter 4 concludes with a summary of findings and discussion.

Chapter 5 summarizes the major findings of the study, and explains the theoretical and pedagogical implications. In the discussion of theoretical implications, the researcher revisits the issue of using multiple theoretical perspectives in the examination of the potential of SCMC for L2 learning discussed in Chapter 2, and the use of mixed research methodology described in Chapter 3. Moreover, the researcher suggests pedagogical implications based on the findings reported and discussed in Chapter 4. As a conclusion, Chapter 5 discusses the limitations of the study and future directions for research on the use of SCMC tasks in L2 teaching and learning.
CHAPTER TWO. SYNCHRONOUS TEXT-BASED COMPUTER-MEDIATED COMMUNICATION, L2 LEARNING, AND THE DEVELOPMENT OF ACADEMIC LITERACY: A REVIEW OF LITERATURE

2.1 Overview

Chapter 1 has briefly discussed four potential issues in previous studies on the role of SCMC in L2 learning. First, variations in the definition and operationalization of the construct of L2 development make it difficult to interpret and understand the effects of SCMC tasks on L2 learning. Second, contextual factors tend to be overlooked in interpreting the characteristics of SCMC discourse or learners’ perceptions of language use in SCMC. Third, the possibility of variation in learner language between different contexts casts doubt on inferences about learners’ linguistic competence or their L2 development as affected by the use of SCMC based solely on the analysis of characteristics of L2 use in the interactions in SCMC. Fourth, studies of the effects of SCMC on L2 learning usually rely either on evidence from data showing the learning processes in the interactions in SCMC, or evidence from outcome measures on L2 performance. In addressing these issues, Chapter 1 argues for the integration of multiple theoretical perspectives in studies of SCMC and L2 learning, the use of functional views of language and language learning to examine not only L2 development but also the development of academic literacy and to re-interpret characteristics of SCMC discourse and their effects on language learning, and the use of longitudinal data involving both the interactions in SCMC and the parallel samples of academic writing. This chapter will
follow this line of argument by introducing relevant concepts in details and synthesizing and analyzing findings from empirical studies.

Specifically, Section 2.2 focuses on the Interaction approach to SLA, examining its underlying views of language and language learning and key constructs reflecting L2 development and its operationalization. This section also describes and analyzes issues emerged in empirical studies on the use of SCMC informed by the Interaction approach. Section 2.3 focused on sociocultural theory of L2 learning, examining its underlying views of language and language learning and key constructs reflecting L2 development and its operationalization. This section also describes and analyzes empirical studies on the use of SCMC informed by sociocultural theory of L2 learning. Section 2.3 concludes with a comparison of the Interaction approach to SLA and sociocultural theory of L2 learning, and suggests that these two theoretical perspectives on L2 learning can be regarded as complementary to each other and thus both theoretical lenses can be used to examine the same interaction data to generate more insights on the processes of L2 learning in SCMC. Section 2.4 explores functional views of language and language learning, functional approaches in analyzing learner language, and the implications of functional perspectives for understanding characteristics or features of SCMC discourse. This section then expands on the functional view of the development of academic literacy, and narrows the focus of academic literacy down to learners’ ability to construct effective arguments and to project credible authorial identity in academic writing. Section 2.5 explains the potential problem of using traditional hypothesis tests and calculations of linear contrasts of means in analyzing interaction data. Following the explanation, this section introduces two alternative approaches that can be used to obtain more accurate
results in analyzing interaction data. The first approach involves the calculation of Intraclass correlation coefficient (ICC) to evaluate the degree of dependency between data points and to assess the appropriateness of using traditional hypothesis tests, and to calculate corrected results in the tests of the difference between the means. The second approach follows the framework of model comparison in modeling and testing variables at both the level of the individual and that of the micro learning unit in a series of general linear models. Section 2.5 concludes with a suggestion for the use of the statistic methods informed by multi-level analysis in analyzing interaction data. Section 2.6 summarizes the main theoretical perspectives and constructs underlying the study and the research gaps in previous studies on the use of SCMC tasks and L2 learning, and states the purpose and research questions of the current study.

2.2 SCMC and The Interaction Approach to SLA

2.2.1 Background

Computer-assisted language learning (CALL) develops based on the idea that computer technologies can facilitate interactions between a human and a computer as well as those between humans through computers (Chapelle, 2003). Defined as “communication that takes place between human beings via the instrumentality of computers” (Herring, 1996, p. 1), computer-mediated communication (CMC) has become an important strand of research in CALL, and has been further divided into synchronous CMC such as text-based synchronous CMC, or chat, and audio- or video- based chat, or conferencing (Levy & Stockwell, 2006), and asynchronous CMC such as emails and discussion boards, depending on whether communications happen in real time or not.
Although the introduction of multimodality has opened up more possibilities of CMC applications in L2 teaching and learning, synchronous text-based computer-mediated communication (SCMC) still holds, arguably, huge potential for L2 learning.

Early research focused on comparing SCMC to face-to-face interactions and examined whether or not SCMC would lead to increasing quantities of interactions (Böhlke, 2003; Kern, 1995) or a more equal level of participation from all the learners engaged in a conversation (Warschauer, 1996). The idea was that more interactions meant more L2 learning opportunities because interactions would provide learners with exposure to language input and opportunities to use the language. The primary focus on how learners may develop L2 through interactions in SCMC, and CMC in general, has given rise to the adoption of the Interaction approach to SLA in empirical studies of SCMC. Therefore, I will briefly review some important concepts and constructs related to L2 development from the perspective of the Interaction approach before analyzing some of the issues emerged in empirical studies of SCMC framed by the Interaction approach.

The Interaction approach is informed by the interaction model of SLA that focuses on explaining how L2 acquisition happens through “exposure to language, production of language, and feedback on that production” (Gass & Mackey, 2007, p. 176). The interaction model has developed from Long’s (1996) updated Interaction Hypothesis that is believed to have integrated some aspects of the Input Hypothesis (Krashen, 1982, 1985) and the Output Hypothesis (Swain, 1985, 1995). Specifically, the Interaction Hypothesis (Long, 1996) was proposed based on a comparative analysis of conversations in native speaker (NS) – non-native speaker (NNS) dyads and conversations in NS – NS dyads. Long found that the NS – NNS dyads generated more interactions and concluded
that the increased interaction may be a result of the need to negotiate the meaning of certain linguistic items and to make modifications to certain expressions to clarify misunderstandings in the communications in the NS - NNS dyads. Long (1996) then proposed the following hypothesis based on the findings:

I would like to suggest that negotiation for meaning, and especially negotiation work that triggers interactional adjustments by the NS or more competent interlocutor, facilitates acquisition because it connects input, internal learner capacities, particularly selective attention, and output in productive ways. (Long, 1996, pp. 451-452, original emphasis)

Empirical studies have further examined the role of negotiation in comprehension and learning in both NS – NNS and NNS – NNS conversations, and have provided favorable evidence to support the connection between negotiated interaction and second language learning (Gass, 2003; Mackey, 1999; Swain & Lapkin, 1998). Specifically, the model of the negotiation of meaning proposed by Varonis and Gass (1985) based on a study of the conversational interactions between NNS and NNS and Long’s (1996) Interaction Hypothesis have become the basis for many studies focusing on examining how learners develop L2 through interactions. In Varonis and Gass (1985), negotiation episodes are side sequences where learners stop the main line of communication and focus instead on clarifying understandings of each other, and are defined as the “exchanges in which there is some overt indication that understanding between participants has not been complete” (p. 73). Varonis and Gass (1985) further suggest that a negotiation sequence may contain four parts: a trigger, an indicator, a response, and a reaction to the response. The trigger is the utterance or part of the utterance on the part of the speaker that causes some misunderstandings or non-understandings on the part of the hearer. Then if the hearer decides to act upon the trigger and to point out the problem that
has caused the misunderstanding or non-understanding, the main line of the conversation will be stopped by an indicator that some comprehension problems need to be dealt with first before further progression of the conversation. The speaker usually gives a response to the indicator to acknowledge and to help resolve the misunderstanding or non-understanding. As suggested by Varonis and Gass (1985), the speaker may respond by giving a repetition, an expansion, a rephrase, a confirmation, or a reduction (p. 77). The function of such sequences is to negotiate non-understandings and to go back to the main line of communication. But before going back, there is an optional reaction to the response. A reaction to the response is believed to be used to end the negotiation sequence and to indicate that the speakers are ready to go back to the main line of conversations, but it is optional. The model of negotiation of meaning (Varonis & Gass, 1985) has become widely used in studies examining the potential of SCMC for L2 acquisition.

Moreover, cognitive concepts borrowed from psychology such as noticing, attention, and working memory have been increasingly used to explain the connection between interactions and L2 acquisition (Gass & Mackey, 2007, p. 176). Specifically, noticing and attention are both emphasized by Long’s (1996) Interaction Hypothesis and Swain’s (1985, 1995) Output Hypothesis as important mechanisms that can facilitate L2 acquisition through input, negotiation, and output (Ellis, 2008; Gass & Mackey, 2007). Drawing on Long’s and Swain’s work, Schmidt (1990, 2001) suggest that the emergence of new forms should be preceded by their being noticed in the input. In other words, the conscious noticing of a mismatch between one’s language production and the target form is a necessary and sufficient condition for L2 acquisition. Schmidt (2001) also argues that
noticing requires learners’ conscious apprehension and awareness of input and that "while there is subliminal perception, there is no subliminal learning" (p. 26).

Cognitive SLA further suggests that working memory is "where the key processes of perception, attention, and rehearsal take place", and is thus a very important construct for cognitive SLA (Ellis, 2008, p. 407). Specifically, in VanPatten’s (1996) Input Processing Theory, working memory is a key concept that helps explain learners’ selective allocation of attentional resources to different aspects of language input. In particular, VanPatten (1996) put forward the following important principles to explain learners’ priorities in processing information from input based on the concept of working memory.

P1: Learners process input for meaning before the process it for form.
P1 (a): Learners process content words in the input before anything else.
P1 (b): Learners prefer processing lexical items to grammatical items (for example, morphological markings) for semantic information.
P1 (c): Learners prefer processing ‘more meaningful’ morphology before ‘less or nonmeaningful morphology’.
P2: For learners to process form that is not meaningful, they must be able to process informational or communicative content at no (or little) cost to attention. (pp. 14-15)

The Input Processing Theory has been mostly applied in input processing instruction to help design tasks to draw learners’ attention to target lexical or grammatical features, but it is also useful in explaining learners’ selective allocation of attentional resources to different aspects of language in interactions.

The Interaction approach holds a psychological view of cognition (Ortega, 2007), but it is not specific in definitions of evidence of language acquisition and their views of the nature of language knowledge. Most studies (Mackey, 1999; McDonough & Mackey, 2006) seem to be in line with the structural linguistic view of language focusing on
grammatical categories and syntax, and are mostly concerned about the acquisition of the form and structure of L2. Therefore, such studies usually employ constructs such as grammatical knowledge (Long, Inagaki, & Ortega, 1998), and L2 complexity, accuracy or fluency (Iwashita, 2003; Lightbown, 1983). Some studies are also concerned about the development of learners’ abilities to use language, although the form focus is still clearly more investigated (Mackey & Philp, 1998). Increasingly, studies have incorporated a functional view of language in the analysis because they are not only concerned about the learning of language form but also, and probably more importantly, the learning of using linguistic resources to express certain meaning (Bardovi-Harlig, 1994).

2.2.2 The effects of SCMC on L2 development

Empirical studies on the role of SCMC in L2 development framed by the Interaction approach to SLA have generally followed the essential idea that interactions provide key conditions for L2 acquisition, and that these conditions can be optimized by the design of tasks. Specifically, most of these empirical studies have applied constructs including negotiation of meaning, noticing, feedback, recasts, and modified output in their examination of how SCMC tasks can facilitate L2 acquisition.

Briefly, researchers believe that SCMC provides a unique communication environment that can create favorable conditions for L2 development based on the understanding of the optimal cognitive and social processes of L2 learning (Blake, 2000; 2007; Bower & Kawaguchi, 2011; Chapelle, 2003, 2007; Lee, 2001, 2002; Payne & Whitney, 2002; Shekary & Tahririan, 2006; Vinagre & Muñoz, 2011; Warschauer, 1997;
Yilmaz & Granena, 2010). Specifically, SCMC may benefit L2 acquisition in the following aspects.

To start with, the text-based feature of SCMC can facilitate the comprehension of linguistic input and the noticing of linguistic gaps through the written medium and the opportunities of interactive input modifications (Chapelle, 2003; Smith, 2004, 2009b). In this aspect, task-based SCMC has been suggested to be more beneficial than open-ended discussions (Doughty & Long, 2003) based on the theoretical arguments for principles underlying the use of communicative tasks to encourage interactions in face-to-face discussion (Pica, Kanagy, & Falodun, 1993). Specifically, communicative tasks carried out in SCMC are, at least, as effective as those carried out in face-to-face discussions in terms of facilitating negotiation of meaning (Blake, 2000; Pellettiere, 2000; Salaberry, 2000) and noticing of L2 form (Fiori, 2005; Lai & Zhao, 2006). Empirical studies have also indicated that the visual saliency afforded by SCMC may help learners develop L2 complexity (Warschauer, 1996; Sotillo, 2000) and accuracy (Coniam & Wong, 2004).

A second advantage is that SCMC allows self-paced language processing that may enable learners to pause and “pay closer attention” (Warschauer, 1997, p. 472) to some linguistic features, to reflect during interaction, to notice L2 forms, feedback, and to integrate feedback in modified output. Empirical studies have produced some positive evidence in support of the idea that SCMC facilitates noticing (Lai & Zhao, 2006), that some learners do seem to make use of the extra processing time in SCMC to monitor their language production and to increase L2 complexity (Fitze, 2005; Sauro & Smith, 2010), and that SCMC seems to facilitate some learners’ incorporation of corrective feedback and the production of modified output (Sotillo, 2005; Vinagre & Muñoz, 2011).
2.2.3 Controversies caused by different constructs of L2 development

The above-mentioned findings are far from being consistent. Admittedly, some conflicting results reflect different theoretical perspectives and interpretations. Examples include Fernández-García and Martínez-Arbelaitz (2002) and Darhower (2002), both of which aimed to examine features of SCMC discourse in relation to L2 development among similar student populations, but provided different interpretations of a similar feature of language use in SCMC due to differences in theoretical orientations (Levy, 2010). Participants in both studies were intermediate-advanced University Spanish class students. However, framed by sociocultural theory of L2 learning, Darhower (2002) found that the use of L1, among other identified SCMC discourse features, was conducive for developing linguistic competence; while based on the Interaction approach to SLA, Fernández-García and Martinez-Arbelaitz (2002) found it a concern to use L1 as a means to resolve communication break-down because it may not result in modified output.

However, other mixed results, to a large extent, suggest the necessity for clarifications of constructs related to L2 development or further research to obtain more consistent and reliable findings. Before looking at the specific studies, I will briefly explain how I selected the studies that have been included in the review. There are a great number of studies on the use of SCMC for the development of different aspects of L2 knowledge such as vocabulary (de la Fuente, 2003) and grammar (Salaberry, 2000), or the development of L2 in different skills areas such as speaking (Payne & Whitney, 2002) and writing (Coniam & Wong, 2004), or L2 development as assessed by measures of L2 grammatical and lexical complexity (Warschauer, 1996), accuracy (Coniam & Wong,
Moreover, some studies have focused on the influence of SCMC on learners’ language use and used constructs such as communicative competency (Chun, 1994) in analyzing learners’ L2 development. To provide a better idea of the range of constructs and operationalization of L2 development used in studies of SCMC, no particular definition of L2 development was used in selecting the empirical studies being reviewed. However, the following clarification of the researcher’s understanding of what L2 development is and what can count as evidence of it may help with the interpretation of the findings of the current study.

In SLA and language testing (LT), L2 development could refer to the development of language components such as vocabulary and grammar that can be subdivided as morphology and syntax, or the development of language skills such as speaking and writing. Second, within the domain of language components, a fine distinction has been made to separate linguistic knowledge from the ability or competence to use it (Bachman & Cohen, 1998). The researcher believes that L2 knowledge and L2 use cannot be completely separated. Having L2 knowledge makes it possible for one to use the L2, and it is in the use of the L2 that shows, to a great extent, one’s linguistic knowledge of the L2. Therefore, this current study relies on measures taken from the students' language use in the target context to assess L2 development. Specific measures will be described in details in Chapter 3.

Now, to come back to the issues caused by the variations of construct and operationalization, the most noticeable difference is the use of different types of evidence to support the arguments about L2 development. Specifically, the effects of SCMC on L2 development have been examined either directly through measures obtained from
learners’ language production in some outcome tests, or indirectly through evidence of negotiation of meaning or attention to form identified in SCMC discourse and the theoretical assumptions behind them. The former usually focuses on measuring learners’ linguistic knowledge (Sauro, 2009) or some aspects of their language use (Coniam & Wong, 2004) using research designs involving a pre-test and a post-test. The later, on the other hand, relies mostly on evaluating aspects of learners’ language use during SCMC interactions (Pellettieri, 2000). Table 1 provides a summary of the two types of evidence used in studies of SCMC and L2 development, the assumptions behind them, and selected examples.

Table 1. Different types of evidence for L2 development

<table>
<thead>
<tr>
<th>Assumptions</th>
<th>Empirical Studies</th>
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<tr>
<td><strong>Direct</strong></td>
<td></td>
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<tr>
<td>Outcome measures that test the change of linguistic knowledge from a pre-test to a post-test</td>
<td>Fiori (2005); Sauro (2009)</td>
</tr>
<tr>
<td>Outcome measures that test the change of linguistic performance from a pre-test to a post-test</td>
<td>Coniam &amp; Wong (2004); Fiori (2005)</td>
</tr>
<tr>
<td>Emergence of linguistic features</td>
<td>Salaberry (2000)</td>
</tr>
<tr>
<td>Negotiation of meaning or form draws attention to form and may result in corrections of mistakes; therefore its presence constitutes positive evidence for favorable L2 learning conditions, if not L2 development</td>
<td>Blake (2000); Blake &amp; Zyzik (2003); Bower &amp; Kawaguchi (2011); Fernández-García &amp; Martínez-Arbelaitz (2002); Fernández-García &amp; Martínez-Arbelaitz (2003); Lee (2001); Pellettieri (2000)</td>
</tr>
<tr>
<td><strong>Indirect</strong></td>
<td></td>
</tr>
<tr>
<td>Features of SCMC discourse that may affect attention to form</td>
<td>Collentine (2009); Liang (2010); Weininger &amp; Shield (2003)</td>
</tr>
</tbody>
</table>

As shown in Table 1 above, studies using direct evidence usually rely on outcome measures of either linguistic knowledge or L2 performance to show changes from a pre-test to a post-test or a delayed post-test, or observations of the emergence of a target
structure, or measurements of error rates in learners’ online production. For example, to examine the effects of SCMC on the acquisition of morphological markers of past tense in Spanish, the percentage of morphological features, as predicted by three acquisition stages, in SCMC was compared to the percentage of the same features in face-to-face interactions, and the result was used to support the interpretation that the morphosyntactic development was more clearly identified in SCMC (Salaberry, 2000). Researchers have also relied on outcome measures of linguistic knowledge to assess L2 development. Sauro (2009), for example, used acceptability judgment tests to measure the acquisition of the English zero article with abstract uncountable nouns as affected by different types of corrected feedback through SCMC, and the test results were used as the basis for the conclusion that to provide feedback was more helpful than not in SCMC, and that explicit feedback, or meta-linguistic feedback, was slightly better than implicit feedback, or recast, although the difference was not statistically significant. It is possible that empirical studies on SCMC, relying on different constructs related to L2 development, may yield different findings concerning how SCMC may affect L2 development.

Empirical studies on the role of SCMC in L2 development framed by the Interaction approach may have been influenced by the vague stance of the approach on the definition of what counts as evidence of L2 development. As mentioned in Section 2.2.1, the Interaction approach seems to be concerned about both the learning of L2 form and the learning to use L2 form to express meaning, but has not clearly described the difference and connections between linguistic knowledge and linguistic performance. Therefore, in studies of SLA informed by the Interaction approach, the definition and operationalization of L2 development differ greatly. As a result, many different measures
of L2 development have been used. This may have resulted in the use of different constructs related to L2 development in studies of SCMC, and probably contributed to some of the conflicting findings. Moreover, in their investigation of the effects of SCMC tasks on L2 development, empirical studies have defined and operationalized the construct of L2 development in different ways, resulting in inconsistent measurement of L2 development in different studies. When different definitions or measures of the same construct are used, research may yield different results that would confound the understandings of the role of SCMC tasks in L2 learning. The following section explores some the baffling issues concerning the use of different definitions and operationalization of the same construct.

2.2.4 Controversies caused by construct definition and operationalization: L2 CAF

Complexity, accuracy, and fluency (CAF) are widely used constructs in measuring students' L2 performance and/or L2 proficiency in speaking and writing assessment, and in gauging their progress in language learning (Housen & Kuiken, 2009). Studies have examined CAF both as dependent and independent variables in research on L2 acquisition, and most would regard CAF as unified constructs. However, different definitions and interpretations of the three constructs do exist and some researchers even suggest that the three constructs themselves are multifaceted and multidimensional and can be sub-divided into smaller constructs. Therefore, this section examines different definitions and interpretations of L2 grammatical and lexical complexity, accuracy, and fluency, and how the differences may affect studies on the use of SCMC tasks and L2 development.
There is a lack of appropriate definitions of CAF supported by theories of linguistics and language learning (Housen & Kuiken, 2009). Moreover, the operationalization of CAF varies from holistic and impressionistic ratings to quantifiable measures of general or specific linguistic features. The lack of appropriate definition and consistent measures has posed great challenges in interpreting findings from studies using CAF as dependent variables to assess L2 performance and L2 development.

Researchers generally agree that complexity refers to the "size, elaborateness, richness, and diversity" of learners' L2 linguistic system (Housen & Kuiken, 2009, p. 464). However, many researchers believe that the construct of complexity is probably the most problematic one among the CAF constructs, and some even suggest that it could be further divided into different sub-constructs (Housen & Kuiken, 2009; Pallotti, 2009; Larsen-Freeman, 2009). Grammatical complexity in writing usually measures the variation and sophistication in using grammatical structures. According to Wolfe-Quintero, Inagaki, and Kim (1998), the presence of grammatical complexity means that the learner can access a wide variety of both basic and sophisticated structures. In other words, the focus of grammatical complexity is the variation and sophistication of some production units. Grammatical variation is usually measured by the number of a production unit, such as a clause, within a larger production unit, such as a sentence, and grammatical sophistication is usually measured by the presence of specific grammatical structures in relation to clauses, t-units, or sentences (Wolfe-Quintero et al., 1998, p. 71). A frequently used measure for grammatical variation is the number of clauses per t-unit (C/T). However, it is more related to program or school level than to short-term change in classes (Wolfe-Quintero et al., 1998, p. 85), and that sentence may be a better
comparative unit for measuring complexity for adult learners because sentences show how adult learners view the structure of the English sentences and avoid the artificial separation of sentences that are intended to be units by the learners (Bardovi-Harlig, 1992, p. 391).

Findings concerning the role of SCMC in facilitating the development of L2 grammatical complexity are mixed. Positive findings showed that learners seemed to use more complex and formal language in SCMC. For example, in a study comparing the grammatical complexity, or what was termed as syntactic complexity, of SCMC discourse and face-to-face interactions, Warschauer (1996) used Coordination Index and found that forty-seven point five percent of the combined clauses in the face-to-face interactions were based on coordination, as opposed to only eighteen point five percent of the combined clauses in SCMC discourse through coordination. Since coordination is usually considered less complicated than subordination, the author’s interpretation was that SCMC discourse was characterized by higher level of grammatical complexity (p. 21). However, the concern is that research has shown that the correlation between the Coordination Index and second language development is quite weak (Wolfe-Quintero et al., 1998, p. 94), and thus it may not be a reliable measure to distinguish different levels of grammatical complexity.

On the other hand, some negative findings suggested that the text-based feature of SCMC might not make a difference in drawing learners’ attention to form, and at the same time, it might be less effective in facilitating the L2 development because typing was more time-consuming than speaking. For example, Hamano-Bunce (2010) compared the complexity of SCMC and face-to-face interactions using the total number of words in
the interaction divided by the total number of analysis of speech units. The author found the level of complexity was lower in SCMC than it was in face-to-face interactions, and offered additional observation that the students spent most of the time trying to type the messages rather than conceptualizing, formulating, or monitoring their production (p. 6). However, the measure used in the study is a variant of the total number of words per t-unit that has been regarded as a fluency rather than complexity measure (Wolfe-Quintero et al., 1998) because it measures how comfortable and effortless one is while using a second language rather than how varied or sophisticated one’s language use is. Therefore, the finding may not adequately address the effect of SCMC on L2 complexity.

Sauro and Smith's (2010) study has provided more insights on how SCMC may affect L2 complexity. She looked at how some learners actually made use of the extra processing time enabled in SCMC to monitor their own production, and examined how such monitoring behavior may affect their L2 syntactic complexity, as measured by the number of clauses per c-unit. The results showed that when there was evidence of online planning, the learners’ language production in SCMC was syntactically more complex. Therefore, it seems that the slower processing speed enabled by SCMC could provide potential opportunities for developing L2 complexity for learners who act upon the opportunities. At the same time, the measure of syntactic complexity in Sauro and Smith (2010) is different from that used in Warschauer (1996) or Hamano-Bunce (2010), the differences could also have been partly caused by the use of different measures.

Similar to the sub-division of the construct of grammatical complexity, L2 lexical complexity is also further divided into two sub-constructs: lexical variation and lexical sophistication. Lexical variation measures the extent to which learners’ use of words
varies, and lexical sophistication measures learners’ ability to go beyond basic words (Wolfe-Quintero et al., 1998, p. 101). The most frequently used measure of lexical variation is probably type token ratios, but they have been criticized for the lack of sensitivity to text length (Wolfe-Quintero et al., 1998). Type token ratios are also found to be inappropriately sensitive to length when writing samples are produced under timed conditions. Specifically, within the same time limit, if one learner produces a longer writing sample with a certain proportion of word types, and another learner produces a shorter writing sample with the same proportion of word types, they would receive the same type token ratio score while it is more desirable to have a measure that can distinguish the one who has kept the same type token ratio in a longer writing sample by assigning it a higher lexical complexity score (Wolfe-Quintero et al., 1998, p. 102). A slightly more complicated measure, the number of word types divided by the square root of two times the total number of words ($WT/\sqrt{2w}$), takes into account the effect of text length. With this measure, the lexical complexity score increases when the length of the text or the number of types increases.

Research on the effect of SCMC on lexical complexity seems to have more positive evidence in support of its benefits. For example, Warschauer (1996) used type token ratios to measure the lexical complexity of SCMC and face-to-face interactions and found that the level of lexical complexity of language use in SCMC was significantly higher than that in the face-to-face interactions (p. 17). In a study comparing how the same learners differ in their level of lexical complexity, or what is termed as lexical range in SCMC and face-to-face interactions, Fitze (2006) also used type token ratios and found that the lexical complexity score in SCMC was greater than that in the face-to-face
interactions. However, Sauro and Smith (2010) used the Index of Guiraud, or the number of lexical types operationalized as unique content and function words divided by the square root of tokens (p. 565), to measure the level of lexical diversity of learners’ language use in SCMC, and found that the lexical diversity of SCMC discourse seemed to be influenced also by whether or not there was evidence that learners used online planning to monitor their own language production. The measure of lexical complexity used in Warschauer (1996) and Fitze (2006) are comparable and both studies produced similar findings; while Sauro and Smith (2010) employed a slightly different measure, the study also provided evidence for the benefits of SCMC tasks. In addition to the differences in the goals of these studies, it is noticeable that differences in the findings on L2 lexical complexity could indicate differences in the selected measures or different aspects of the construct that have been measured, instead of the real difference in L2 use or performance.

The most contested issue is the positive and negative impact of SCMC on the development of L2 accuracy. The controversy emerged in early exploratory research. A number of studies noticed the decline of linguistic accuracy in learners’ SCMC discourse as they were engaged in discussions in communicative tasks focusing on meaning (Beauvois, 1992; Kelm, 1992), while some also reported that the use of the transcripts from the chat sessions can encourage the noticing of L2 form and thus be facilitative for the development of formal accuracy (Beauvois, 1992; Chávez, 1997; Kelm, 1992; Nicholas & Toporski, 1993; Oliva & Pollastrini, 1995). The concern over the negative influence of SCMC on linguistic accuracy was echoed in Kern (1995) who reported
increased quantities of interactions at the expense of formal accuracy, and cautioned against the use of SCMC due to its perceived “chatty” (p. 460) nature.

However, a closer examination indicates that the decrease of linguistic accuracy could have alternative explanations and that there is not enough evidence to disentangle the effects of SCMC from the influence of other possible confounding factors. The observation and report from Kelm (1992) and Beauvois (1992) can serve as an example to illustrate how learners’ attention to form or meaning can be directed by the instructor’s pedagogical priorities. Both have documented the use of InterChange, an early computer networking program, in a fourth-semester Portuguese language class. Kelm (1992) reported from the perspective of the course designer and instructor while Beauvois (1992) from that of a class observer. Both researchers have noticed the students’ growing indifference to the appropriate use of language at the beginning when the instructor’s priority was communication, and the students’ increasing attention to accuracy and a reduction of grammar errors in later chat transcripts after the instructor explicitly drew the students' attention to L2 form by having them use chat transcripts to learn grammar lessons.

Thus, depending on the context of use, or more specifically the instructor’s pedagogical priorities, learners’ attention in SCMC could be either focused on a communicative goal or L2 form. Therefore, it is necessary to examine the purpose of a teaching situation and the theoretical basis of specific SCMC tasks in order understand how the use of SCMC could potentially facilitate L2 learning, and be fully integrated into the instructor’s pedagogy.
The significance of contextualizing a technological tool has been emphasized by Garrett (1991) who suggested to ask "what kind of software, integrated how into what kind of syllabus, at what level of language learning, for what kind of language learners, is likely to be effective for what specific learning purposes?" (p. 75) in a CALL study in order to better understand how an instrument could be effectively used for a set goal. Since it is clear that “any benefits from engaging in CMC are not automatically or deterministically derived from the tools themselves” (Blake, 2007), the effect of SCMC on accuracy merits further research in light of how it is used in service of promoting L2 accuracy as compared to the effects of a similar pedagogical approach used in a face-to-face environment.

Furthermore, controversies also exist with regard to measures of L2 accuracy, although among the three constructs of CAF, accuracy is probably the most straightforward. First, this study does not intend to be involved in the debate about whether or not interlanguage should be compared to target-like language use or be analyzed in its own terms. Instead, the researcher takes the stance expressed by Wolfe-Quintero et al (1998) and believes that the comparison of learner language to target-like language use serves the purpose of knowing the learners’ ability to avoid errors when communicating in writing and speech (p. 33), and can indicate the extent to which the learner's language production is automatized (Mackay, 1982).

Studies on the effect of SCMC on L2 accuracy have employed a few different measures as well. For example, in a study on the effect of SCMC on learners’ L2 accuracy in writing, Coniam and Wong (2004) collected writing samples before and after the study, and identified and categorized errors related to the use of finite verbs. Using
the number of finite verb errors per t-unit, the researchers calculated their students’ L2 written accuracy before and after the study and concluded that there was no significant difference between the treatment group and the control group in terms of their L2 accuracy scores on the post-study writing samples. However, the authors noted that qualitatively, the errors occurred in the writing samples from the SCMC group tended to be associated with the use of more complex sentence structures (p. 333). Thus, the main finding from Coniam & Wong (2004) is that the effect of SCMC on L2 accuracy was inconclusive because it was not clear whether or not the lack of difference in the accuracy scores was caused by the treatment condition, or by different levels of willingness to use more complex language, which may also be related to the treatment condition.

In another study comparing the linguistic accuracy of SCMC and face-to-face interactions, Hamano-Bunce (2010) focused on lexical and morphosyntactical accuracy, operationalized as the proportion of lexically or morphosyntactically accurate AS-units (analysis of speech units) in relation to the total number of AS-units (p. 5). In Hamano-Bunce (2010), the analysis was performed on chat transcripts. The study found no significant difference between the two groups in terms of the accuracy scores. However, the accuracy measure used in this study did not focus on the use of specific target structure while the measure used in Coniam and Wong (2004) did. Thus, the findings from the two studies may not be comparable.

An additional complexity in studies on the effect of SCMC on L2 accuracy is the approach to error identification. Different error taxonomies (Chan, 2010; Dagneaux, Denness, & Granger, 1998) exist, and although there may be overlaps, definitions of what counts as errors and what should be coded as errors in each can be quite different.
Therefore, it would be necessary to be explicit about the types of errors being coded and counted for findings of L2 accuracy to be meaningful.

L2 fluency mostly refers to issues of rate and length, after taking away characteristics that can be captured by accuracy and complexity. Therefore, there are both rate measures and length measures. Wolfe-Quintero et al. (1998) introduced only one rate measure, the number of words per minute, but it was found to be able to predict the holistic rank ordering of essays (p. 22). The use of length measures for fluency, however, has been controversial because although some consider length measures to be fluency measures, they have traditionally been considered as complexity measures (Wolfe-Quintero et al., 1998).

The idea that SCMC may benefit learners’ written fluency was probably first mentioned in Beauvois (1992). Since then, other studies have noted that SCMC may facilitate the development of L2 fluency more than it does to the development of linguistic accuracy based mainly on observations of learners’ language use in SCMC (Lee, 2002). However, not many studies have examined how fluency may change because of the use of SCMC. As an exception, Blake (2009) studied the potential of SCMC in facilitating L2 oral fluency by comparing the gains of fluency of one group participating in SCMC tasks, one participating in face-to-face tasks, and a third control group involving no interactions between the students. Moreover, in measuring L2 fluency, Blake (2009) used five different measures: speaking rate, phonation time ratio, articulation rate, mean length of run, and average length of pauses. The findings showed that the face-to-face group did not have significant gains on any of the five measures of fluency as compared to that of the control group. The SCMC group, however, was found
to have significantly higher gains of fluency on the measure of phonation time ratio and mean length of run, as compared to both the face-to-face and the control group (p. 237). The fluency gains on the other three measures were not found to be significant and no explanation was provided. One might wonder if the lack of significant difference on the other measures may indicate that they are measures of different aspects of the same construct, and thus yield different results, or that the inconsistency of the results may be an indication that the role of SCMC in developing L2 oral fluency is inconclusive.

In addition to the lack of clear and consistent definitions for CAF supported by theories of linguistics and language learning and the variations in construct operationalization, the interdependence between the three constructs of CAF may pose concerns for findings about L2 development based on measures of only one or two of the three constructs (Larsen-Freeman, 2009; Norris & Ortega, 2009). Although some researchers believe that simultaneous improvement of complexity and accuracy is possible (Robinson, 2001, 2003), others have shown that the psycholinguistic processes involved in acquiring and using L2 knowledge are different, and thus with limited attention mechanism and processing capacity, learners may focus on one of the three dimensions "to the detriment of the other two" (Housen & Kuiken, 2009, p. 465). Therefore, it is questionable to draw conclusions on L2 development based on the assumption that learners' development of CAF would follow a "co-linear trajectory of greater accuracy, fluency, and complexity" (Norris & Ortega, 2009). Instead, it would be more informative to look at how SCMC tasks may affect the development of L2 grammatical and lexical complexity, accuracy, and fluency in one study.
2.2.5 Controversies caused by construct definition: Attention to form

In addition to the contrast of relying either on direct or indirect evidence to show L2 development and the variations in the definition and operationalization of L2 grammatical and lexical complexity, accuracy, and fluency, issues also exist in empirical studies relying on the same type of evidence. Specifically, some empirical studies rely on the analysis of SCMC discourse to make inference of L2 development, and they usually share the fundamental assumption that attention to L2 form can facilitate input comprehension and the noticing of L2 form and/or linguistic gap, and thus facilitate L2 development (Robinson, 1995; Schmidt, 1990). However, most of them have operationalized the construct of attention to form in different ways. Table 2 below displays a summary of different ways of operationalization of attention to form, their assumptions behind, and selected exemplar studies.

Table 2. Attention to form: Different ways of operationalization

<table>
<thead>
<tr>
<th>Operationalization</th>
<th>Assumption</th>
<th>Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instances of negotiation of meaning</td>
<td>Negotiation of meaning helps learners to focus on L2 form that causes miscommunications and makes it more salient and ready for learning</td>
<td>Blake (2000); Blake &amp; Zyzik (2003); Bower (2011); Kötter (2003); Lee (2001); Pellettieri (2000); Toyoda &amp; Harrison (2002)</td>
</tr>
<tr>
<td>Language-related episodes</td>
<td>Collaborative dialogues where learners identify and solve a language problem provide a complete record of noticing, discussion, and resolution</td>
<td>Shekary &amp; Tahririan (2006); Yilmaz &amp; Granena (2010)</td>
</tr>
<tr>
<td>Instances of noticing through stimulated recalls</td>
<td>Stimulated recalls from participants may provide more explicit support for whether there is noticing or not</td>
<td>Lai &amp; Zhao (2006)</td>
</tr>
</tbody>
</table>

As shown in Table 2 above, there are three main ways in the operationalization of the construct of attention to form. The first group of studies usually examines the quantity
or characteristics of negotiations in SCMC to identify evidence of L2 development. Here, the meaning of negotiation is based mostly on Varonis and Gass’ (1985) definition of negotiation episodes as the “exchanges in which there is some overt indication that understanding between participants has not been complete” (p. 73) and their model of negotiation sequences as involving a trigger, an indicator, a response, and an optional reaction to the response, or Long’s (1996) updated Interaction Hypothesis where negotiation for meaning is defined as utterances that trigger interactional adjustments by the NS or the more competent interlocutor (pp. 451-452). In either case, negotiation sequences are viewed as being able to create favorable conditions to increase input comprehension, to draw attention to L2 form, and to facilitate the correction of specific mistakes (Gass, 1997; Gass, Mackey, & Pica, 1998; Varonis & Gass, 1985).

Blake (2000), for example, investigated the quantity of negotiation of meaning in SCMC discourse produced by student pairs in three types of communicative tasks – jigsaw, information gap, and decision-making (Pica, et al., 1993) over ten one-hour chat sessions in two semesters. He found that the total number of negotiation of meaning consisted only “a small fraction of the overall conversational turns, ranging from 0.3% to 3.8%” (p. 127), and that lexical confusions triggered the majority of the negotiations, seventy-five percent and ninety-five percent for the two semesters respectively (p. 129) while the syntactic problems hardly caused any negotiations. Blake and Zyzik (2003) have observed similar results from a study involving dyads of L2 Spanish learners and heritage speakers working on similar tasks. Pellettieri’s (2000) analysis of negotiation of meaning produced by ten dyads of learners of Spanish working on five different SCMC
tasks has confirmed that most triggers of negotiations are lexical items and overall content of utterances.

The lack of instances of negotiations triggered by morphosyntactic features in SCMC, however, may be attributed to three reasons other than SCMC itself. First, since learners’ priority in a communicative task is to convey a message, they may have ignored morphosyntax that carries a relatively low communicative load as learners may do in face-to-face discussions (Brock, Day, & Long, 1986, as cited in Pellettieri, 2000, p.70). Second, people in general are more conscious of vocabulary than they are of grammar (Halliday & Martin, 1993), and L2 learners in particular process an item for meaning before they process it for anything else (VanPatten, 1996). In the above-mentioned studies, the researchers might have overlooked other instances where learners discussed about certain lexical choices that did not cause communication breakdown. In fact, the last question has also been raised in studies on face-to-face interactions and SLA (Foster & Ohta, 2005), and in studies on SCMC (Yilmaz & Granena, 2010).

In order to address this issue and expand the scope to look for L2 learning opportunities emerged in interactions in face-to-face interactions and SCMC, a new way of operationalization has been proposed to examine language-related episodes (LREs). However, the use of LREs is not without problems. The idea of LREs is largely based on Swain’s (1995, 1998, 2000) work based on sociocultural theory of L2 learning, but LREs are quite often used within the framework of the Interaction approach, and have caused some confusion. Detailed explanation of LREs will be provided in the next section on sociocultural theory of L2 learning, but for now, briefly, in Swain’s (2000) definition, LREs are collaborative dialogues where learners are engaged in co-constructing linguistic
knowledge (p. 97). Thus LREs are utterances where learners discuss a language issue or a linguistic form, and try to solve the problem or come up with a more sophisticated form through discussion. In LREs, whether or not the discussion of certain linguistic forms is caused by misunderstanding or not is not the focus. Instead, the focus is that through co-construction of linguistic knowledge, L2 learning happens while learners are talking to each other. LREs may be able to capture a more complete picture of attention to form due to the low frequency of negotiation sequences (Pellettieri, 2000; Yilmaz & Granena, 2010), but using it within the framework of Interaction approach without clarifying the differences between LREs and negotiation of meaning may cause confusions.

In fact, the differences between negotiation of meaning and LREs are quite often blurred in empirical studies, and thus rendering the findings difficult to interpret. For example, Shekary and Tahririan (2006) emphasized that the focus of LREs is language problem but their research questions seemed to have subcategorized LREs under the framework of negotiation of meaning by stating that their aim was to investigate if “…L2 learners notice the gap in their interlanguage (i.e., produce LREs) during negotiation of meaning…” and the effects that “…incidental noticing have on subsequent language learning” (p. 561). Moreover, although Shekary and Tahririan (2006) emphasized uptake, or modified input, as an important move in LREs to demonstrate the effects of noticing, it does not necessarily represent a better evidence of noticing than does reaction in the negotiation routine. In fact, the coding scheme defined LREs’ structure as involving trigger, response, and uptake, which is more similar to the definition of negotiation sequences offered by Varonis and Gass (1985) than it is to the original definition of LREs provided by Swain (2000). In the Varonis and Gass’ (1985) definition, a negotiation
sequence includes trigger, indicator, response, and reaction, and in Shekary and Tahriran’s (2006) study, uptake was only option, leaving LREs as involving a trigger and a response. What makes it more confusing is the classification of the sources of LREs as caused by miscommunication or not. Specifically, the authors singled out code-related LREs where learners “negotiate meaning in order to increase their linguistic accuracy” (p. 563), and that in those LREs, learners have “…no difficulty in understanding the erroneous sentences” (p. 563).

Since negotiation of meaning and language-related episodes focus on different aspects of interactions that are believed to be beneficial for L2 learning, the researcher believes that it is necessary to clarify the theoretical framework behind each, and during the process of analysis, it is probably clearer if the data is coded for negotiation of meaning and language-related episodes separately. For example, Foster and Ohta’s (2005) analysis of L2 learning opportunities in face-to-face interactions are based on the perspective of negotiation of meaning and different types of language-related episodes. What makes the finding of the study clearer to understand is that the researchers clarified the two theoretical positions, and first coded the data for negotiation of meaning, and then coded the rest of the data for different types of language-related episodes. Thus, the final interpretation for the L2 learning opportunities in the interaction processes was based on the findings showing both the negotiation sequences and the language-related episodes emerged in the same stretch of interactions.

Both the construct of negotiation of meaning and the construct of language-related episodes, however, have been criticized as lacking explicit support for the effect of SCMC on noticing. Therefore, in an attempt to find more explicit support to the claim
that negotiation of meaning facilitates the noticing of L2 form, Lai and Zhao (2006) invited their participants to one-on-one stimulated recall sessions to go through instances of feedback and to tell the researchers what they were thinking when they saw the feedback. Since the researchers followed through a similar procedure of stimulated recall for a control group being assigned to work on the tasks face-to-face, they were able to compare the negotiation of meaning and noticing of L2 form in the SCMC and the face-to-face interactions in a more direct way. The results showed that the control group had more instances of negotiation of meaning, but the SCMC group had twenty percent more noticing on the average. Additionally, the authors found that recasts in SCMC focused more on morphosyntactic items while those in face-to-face communication focused more on lexical items, although the frequency of noticing of recasts in both groups was low. In other words, attention to form is probably difficult to achieve in both communication modes, but SCMC may offer more helpful. The limitation of the study, however, lies in the fact that the researchers only know as much as the participants have reported.

Finding evidence for language acquisition could be a challenge (Chapelle, 1998; Ellis, 2005), although the ultimate goal of SLA research is to define L2 knowledge and describe how the knowledge develops overtime (Ellis, 2005). The challenge is carried over to research on the effects of SCMC on L2 development due to the common difficulties of obtaining consistent evidence as explained above and the possibility of lacking systematic examination of L2 development.

For example, the most noticeable controversy in studies on the role of SCMC in L2 development is probably its effect on linguistic accuracy. However, a closer look at studies that contain discussion of implications of SCMC for L2 accuracy has shown that
the majority of the findings are based on the analysis of chat transcripts. In other words, these studies showed concerns for the negative impact of SCMC on learners’ linguistic accuracy only because their language use in SCMC was not highly accurate or formal. Moreover, some interpretations are based on anecdotal experience rather than systematic examinations. For example, Kern (1995) reported that SCMC did not serve the purpose of formal accuracy based on a note claiming “learners produced many errors in InterChange discussion and were exposed to faulty French” (p. 472). No coding for the accuracy of language use in SCMC or that in the face-to-face interactions was reported. The questionnaires of the students’ and the instructors’ impressions, too, included only three general questions asking their comments on the effects of SCMC on the development of language skills. The problem is that with a comparison of the level of the accuracy between SCMC and face-to-face interactions, it may be that the accuracy level of SCMC is higher than that of the face-to-face interactions, even though the accuracy of language use in SCMC may not be as satisfactory as an instructor or a researcher would expect. Also, a comparison of the accuracy of SCMC between different groups of students may show that individuals may differ in their priorities in SCMC. In other words, some students may produce less accurate language because their focus is not language form while others may have a strong focus on linguistic accuracy and tend to use more accurate language. Further comparisons of longitudinal data from the same students may also reveal students' change of language use over time. Table 3 below summarizes the measures that have been used in some studies of SCMC to examine its effect on L2 accuracy, and the major findings and interpretations. It is clear that quite some interpretations were based on observations rather than valid measures.
### Table 3. Measures and interpretations of SCMC and L2 accuracy

<table>
<thead>
<tr>
<th>Study</th>
<th>Measure</th>
<th>Major Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collentine (2009)</td>
<td>Observation</td>
<td>• Learners may perceive SCMC to be informal</td>
</tr>
<tr>
<td>Coniam &amp; Wong (2004)</td>
<td>Error rates</td>
<td>• No statistical differences between the SCMC and face-to-face groups</td>
</tr>
<tr>
<td>Fiori (2005)</td>
<td>Outcome tests</td>
<td>• Form-and-meaning focused group had more accurate production of target forms</td>
</tr>
<tr>
<td>Kelm (1992)</td>
<td>Observation</td>
<td>• Pedagogical priority may influence accuracy</td>
</tr>
<tr>
<td>Kern (1995)</td>
<td>Observation and Questionnaires</td>
<td>• Grammatical accuracy in chat transcripts suffered and consequently learners read “defective” L2</td>
</tr>
<tr>
<td>Lee (2002)</td>
<td>Counted errors and corrections</td>
<td>• SCMC may not benefit L2 accuracy</td>
</tr>
<tr>
<td>Lee (2008)</td>
<td>Counted self-repair moves and follow-up turns that incorporate corrections</td>
<td>• SCMC makes L2 forms more salient to the learners</td>
</tr>
<tr>
<td>Sotillo (2000)</td>
<td>Error rates</td>
<td>• More errors in SCMC than that in asynchronous CMC</td>
</tr>
<tr>
<td>Yilmaz &amp; Granena (2010)</td>
<td>Coded LREs and</td>
<td>• The types and outcomes of feedback differed by task types</td>
</tr>
<tr>
<td></td>
<td>counted the accuracy rate of the outcome of negotiation of form</td>
<td>• Difference in task implementation could affect the findings and interpretation</td>
</tr>
</tbody>
</table>

Among the studies in Table 3 above, Sotillo (2000) is an exception that used the proportion of error-free t-units in relation to the total number of t-units to measure learners’ linguistic accuracy in SCMC and asynchronous CMC. Sotillo’s (2000) comparison of the linguistic accuracy of SCMC and asynchronous CMC showed that the accuracy level in SCMC was significantly higher than that in the asynchronous CMC group. The author also compared the grammatical complexity level between SCMC and asynchronous CMC and found that the grammatical complexity of language generated in
asynchronous CMC was significantly higher than that for the language in SCMC. The findings about linguistic complexity and accuracy seem to confirm that there are some trade-off effects between accuracy and complexity. In fact, research has not provided clear accounts of “what is traded-off with what and under what conditions” (Ellis & Barkhuizen, 2005, p. 144), and their dynamic relationships have been extensively explored in a special issue of *Applied Linguistics* (December, 2009). However, in the author’s interpretation, the accuracy level of the language use in SCMC was higher because the students were engaged in real-time communication in which learners’ priority may be meaning and thus they were more likely to use shorter or simpler sentences to express their ideas, and thus may have avoided errors.

Coniam and Wong (2004) is another exception that has examined the effect of SCMC on changes of linguistic accuracy using a pre-test and a post-test. In their exploratory study among twenty-six secondary school students in Hong Kong, the authors examined how SCMC may affect changes of linguistic accuracy in the students’ writing. Writing samples were collected both before and after the study, and were coded for a frequently occurring error type among Cantonese speakers, finite verb errors. Error rates measured by the number of errors per t-unit were calculated for each writing sample. Their findings showed that there was no significant difference between the accuracy levels of the treatment and the control group on the post-study writing samples. However, the authors noted that the errors from the SCMC group were mostly associated with more complex sentences, indicating that the lack of favorable evidence to support the role of SCMC in developing L2 accuracy can be attributed to its potential to encourage students
to try more complex sentence structures, which could be one of the reasons that lead to the increasing number of errors in language use in SCMC.

Therefore, although the Interaction approach to SLA seems to lend theoretical support for the role of SCMC in L2 development, empirical studies drawing on the Interaction approach have produced mixed results with regard to the effects of SCMC on L2 development, particularly the development of grammatical and lexical complexity, accuracy, and fluency. Section 2.2 reviewed important concepts from the Interaction approach to SLA, and selected empirical studies based on the Interaction approach to demonstrate how the use of different constructs related to L2 development and different definitions and operationalization of the same construct may lead to misunderstandings or misinterpretations of findings on the role of SCMC on L2 development. The following section introduces important concepts and constructs from the framework of sociocultural theory of L2 learning, and reviews selected empirical studies informed by this approach to make a case for the use of both perspectives in the investigation of the effects of SCMC on L2 learning.

2.3 SCMC and Sociocultural Theory of L2 Learning

2.3.1 Background

Originated from the work of the Russian psychologist L. S. Vygotsky (1997a; 1997b; 1998, as cited in Ratner, 2002) and his colleagues, sociocultural theory (SCT) holds that human mentation is essentially mediated by cultural artifacts, activities, and concepts (Ratner, 2002, pp. 10-11). Specifically, SCT aims to describe and explain the psychological processes (language learning being one of them) by drawing upon key constructs including mediation and the zone of proximal development (ZPD), as well as
activity theory (Luria 1973, 1979; as cited from Lantolf, 2000, p. 8). These major theoretical principles and constructs have been interpreted and elaborated by SLA researchers to provide a new perspective on the processes and conditions of language learning (Lantolf, 2000; Lantolf & Thorne, 2007; Thorne, 2000; van Lier, 2000).

The most fundamental concept is mediation, or that people develop cognitive abilities in social activities through mediating tools (Ratner, 2002). Considered in the context of language learning, the concept emphasizes that language learning takes place in interactions that are mediated by language, a cultural artifact and a powerful symbolic tool (Lantolf & Thorne, 2007, p. 205). Moreover, SCT identifies two main kinds of interactions – social interactions (Artigal, 1992) and private speech (Lantolf & Thorne, 2007). In social interactions, experts help create a context for novices to learn through participation, and provide developmental-sensitive support for the novices when necessary (Antón, 1999). Recent development in SCT goes beyond the expert-novice interaction, and emphasizes instead the co-construction of contexts and opportunities where expertise becomes a relative and shared notion (Ohta, 2000). Even in expert-novice interaction, language learners would creatively transform, or imitate (Lantolf, 2000, p. 17), the expert’s models, and in doing so they move from object/other-regulation to self-regulation. Similarly, in private speech, people construct a dialogue with themselves in order to gain or maintain control over a task. Research shows that private speech, which resembles language use in social interaction, has an important role in mediating language learning and help learners to achieve self-regulation (Ohta, 2001).

The ability to self regulate language use constitutes internalization, a term defined as “the process through which members of communities of practice appropriate the
symbolic artifacts used in communicative activity and convert them into psychological artifacts that mediate their mental activity” (Lantolf, 2006, p. 90), and explicated as involving “both increased control over L2 forms and functions and also, crucially, the ability to use the L2 to regulate thought” (Ellis, 2008, p. 533).

To better explain the mediation process, SCT draws upon another key construct, the ZPD. Vygotsky (1978) defines the ZPD as “the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers” (as cited in Lantolf & Thorne, 2007, p. 210). However, the ZPD has been interpreted in different ways by L2 researchers and practitioners. Kinginger (2002) discussed three main interpretations: the ‘skills’ interpretation, the ‘scaffolding’ interpretation, and the ‘metalinguistic’ interpretation. The ‘skills’ interpretation mostly employs the ZPD as a stand-alone construct to justify a view of language learning as ‘skills’ development, and thus was considered as having “stripped of” the original meaning of the construct (Kinginger, 2002, p. 253). The ‘scaffolding interpretation refers to analyses of instructional discourse that were typically found in classrooms and were modeled as expert-novice interactions. The question there is the extent to which the Initiation-Response-Feedback (IRF) episodes could indicate the presence of ZPD because students only “comply” rather than “appropriating” the resources (Kinginger, 2002, p. 255). The ‘metalinguistic’ interpretation came from research on collaborative dialogue by Swain and colleagues (Swain, 2000; Swain & Lapkin, 1998). Swain (2000) maintains that collaborative dialogue is “knowledge-building dialogue” (p. 113), and if developmental cognitive processes result from social
interaction, then metalinguistic function can be directly observed in language-related episodes where learners engage in interactions focusing on solving language-related problems. Researchers have shown support for the ‘metalinguistic’ interpretation, and have suggested that the ZPD provides a basis to validate and account for the role of collaborative activity in language learning (Kinginger, 2002; Lantolf & Thorne, 2007).

Moving from a focus on how L2 learning happens through interactions to how it happens during interactions, researchers elaborated the idea of broadening the focus of interaction studies to fully understand how interactions help create favorable environment for L2 learning. For example, Swain (2000) proposed the concept of collaborative dialogues where learners try to resolve a linguistic issue through interactions. The value of collaborative dialogue, from a sociocultural perspective, is that it draws attention to a linguistic problem and to the verbalized alternative solutions (Swain, 2000, p. 104). Thus sociocultural theory believes that language learning happens during interaction, which is also mediated by the semiotic too, language.

Although Swain (2000) linked language-related episodes to collaborative dialogues, they were first proposed within the framework of Output Hypothesis, and were defined in a study of the effect of pushed output on L2 acquisition as any segment of learners’ language production in which “a learner either spoke about a language problem he/she encountered while writing and solved it either correctly or incorrectly, or simply solved it (again, either correctly or incorrectly) without having explicitly identified it as a problem” (Swain & Lapkin, 1995, p. 378). However, the key idea of using language-related episodes to emphasize L2 opportunities in interactions beyond negotiation of meaning has been elaborated by other researchers from the sociocultural perspective.
In Foster and Ohta (2005), the researchers first coded the interaction data based on the framework of negotiation and found very few instances of negotiation of meaning, and even fewer instances of modified output as a result of negotiation of meaning (pp. 418-419). In the subsequent analysis of the interaction data except those that have been identified as negotiation sequences, the authors looked for instances where learners jointly created an utterance (co-construction), one learner corrects his or her partner (other-correction), a learner corrects himself or herself (self-correction), or one learner is interested in what the other is saying and encourages him or her to go on (continuers). The key is that all the instances show a focus on form rather than communication breakdown. Another particular emphasis in identifying these instances in Foster and Ohta (2005) is that they all reflect the learners’ assistance to each other in using linguistic devices to express meaning.

The idea that Swain’s (2000) expanded explanation of output need a new label was commented by Steve Thorne (p. 103). In response, Swain (2000) used “collaborative dialogue” to replace “output” to emphasize a new perspective of the role of interactions in L2 learning (p. 103). Other researchers have also discussed the use of other terms, such as “affordance” (van Lier, 2000) to describe the opportunities for L2 learning in interactions. A brief explanation of Activity Theory may help understand the key ideas behind the concept of affordance.

Activity Theory is a vital concept of sociocultural theory, and the central idea that a unit of analysis should be an activity came from Vygotsky’s early ideas that “human behavior results from the integration of socially and culturally constructed forms of mediation into human activity” (Lantolf, 2000, p. 8). These ideas were developed by A.
N. Leontiev in his theory of activity. In the theory, activity is defined as doing something that is motivated either by a biological need or a culturally constructed need (Lantolf, 2000, p. 8). Thus, briefly, an activity system consists of a first layer involving the subjects, the object of the activity, and the meditational means; and it also contains a second layer of the contextual framework built by the community of subjects who share the same object of the activity and understand the rules that govern the community and the division of labor within the activity system (Figure 1).

An important implication is that activities are differentiated from each other by their objects and motives and not necessarily by their concrete realization as actions (Lantolf, 2000, p. 9). In SLA, this means that even if all students in a class participate in the same task, they may not be engaged in the same activity. Students with different motives often have different goals as the object of their actions, despite the intentions of the teacher (Lantolf, 2000, p. 12). In other words, while task-based instruction could yield positive learning outcomes, there may be exceptions, because individual learners may decide to be engaged in the task with different motives.

![Activity system](image)

Figure 1. Activity system (Engeström, 1987, as cited from Basharina, 2007, p. 85)
Meanwhile, group dynamics can affect the outcomes. When students take part in activities, they enter into different social relations and learn to use meditational means. As a result of division of labor, students begin to think of themselves as playing different roles in an activity (Lantolf, 2000, p. 13). In language learning classrooms, this means that how students would come to view themselves in group-tasks, in addition to their personal motives, would affect the overall learning process and outcome. In addition, multiple activity systems are always at work and thus contradictions within and between activity systems would also affect learning. Therefore, by focusing on activity systems rather than any single component, researchers may capture the interactions between the components and thus provide more comprehensive descriptions of the dynamic processes of language acquisition and better explain variations between individuals.

Following this line of research, van Lier (2000) suggests an ecological approach to language learning, and explains how the potential of interaction for language learning could be expanded using such a new perspective. From a sociocultural perspective, interactions are semiotic activities where active learners engage in meaning-making activities with each other using the opportunities emerged in the context of the interaction. Such opportunities were termed as “semiotic budget” or “affordance” (van Lier, 2000, p. 252). Since there may be seeming different kinds of opportunities for different individuals engaged in the same interaction, van Lier (2000) questions the value of some previous research, pointing out two problems. First, the fact that quite a few studies found low frequencies of negotiation of meaning in interactions may suggest that negotiation sequences are probably not a common way for learners to learn a second language; instead, learners may benefit from other opportunities that cannot be identified using the
negotiation framework. Second, there may also be a problem in studies that are designed to examine negotiations if they select or design an interactional context that would favor the occurrence of negotiation based on prior theoretical assumptions, and then test the frequency of negotiations in that context (van Lier, 2000, p. 248). In other words, in a manipulated or laboratory environment, what have been observed may not represent how learners really benefit from interactions naturally.

To address these problems, van Lier (2000) proposes the ecological approach, and points out that the focus of this approach to the research on interaction and language learning is to study the interaction in its “totality”, and thus the researcher need to show “the emergence of learning, the location of learning opportunities, the pedagogical value of various interactional contexts and processes, and the effectiveness of pedagogical strategies” (p. 250). Fortunately and unfortunately, there is no fixed research procedure for using an ecological approach in the analysis of interaction processes.

First, fortunately, without a fixed definition of affordance or a scheme of classifications of different affordances, a researcher may be allowed the best opportunities to study the interaction in its own terms. As emphasized by van Lier (2000), an important reason to use “affordance” as an alternative to “input” is because it enables the researcher to take the agency of the individuals in the interaction into account. In other words, “what becomes an affordance depends on what the organism does, what it wants, and what is useful for it” (van Lier, 2000, p. 252). Thus, in the same interaction, some learners may be engaged and more perceptive of L2 learning opportunities, or linguistic affordances, and as a result, they would be more active in acting upon the opportunities and develop their second language. At the same time, other learners may
not be as motivated or curious and thus would not have the same opportunities as the
more engaged members do. Therefore, to identify linguistic affordances, a researcher
cannot focus only on the input, output, or the interaction in general, but also need to take
into account the relationships between the properties of the environment (or the possible
learning opportunities in the interaction) and the active learner (van Lier, 2000, p. 257).
The unfortunate part of the absence of a fixed procedure for the ecological approach is
the lack of support for inexperienced researchers in analyzing interaction processes to
examine how different learners may benefit from the same interaction in different ways.
Longitudinal data set and multiple sources of language learning experiences may help
enhance the trustworthiness of such studies.

Researchers informed by sociocultural theory have also noticed the frequent
occurrences of language play in learners’ interactions and its possible benefit for L2
learning. There is not yet an agreement on the definition of language play. Sullivan (2000)
suggests that play involves fun. In her study of language play in an English class in
Vietnam, Sullivan (2000) defines language play as utterances that include teasing, joking,
puns, word play, and oral narratives, and concludes that language play helps engage
students and serve as tools that result in “awareness of language meaning and form” (p. 123).
Lantolf (1997), on the other hand, believes that the purpose of language play is not
fun. Instead, he views language play as primarily a rehearsal in private speech and argues
that playful language can facilitate the cognitive development of a learner by allowing
him or her to move beyond his or her current level of competence.

Researchers have also come up with different categories of language play. The
most frequently cited classification is based on Cook’s (2000) work that distinguishes
three types of language play: linguistic, semantic, and pragmatic based on the characteristics of playful language. Linguistic play usually involves playing with rhythm and sound, repetition, and rhyming, and is usually the focus of poetry, rap, and puns. Semantic play often contains references to an alternate reality found in role-playing and inversions of the language/reality relation. Pragmatic play usually focuses on the performance and the speaker/writer often works toward or against the established social order. Cook (2000) argues that the benefits of language play for language learning are probably the opportunities it offers to draw learners’ attention to the interdependency of form and meaning, and suggest that language play offers a solution to the either-or dilemma of meaning and form in language teaching.

Therefore, sociocultural theory seems to offer a theoretical framework to examine the potential benefits of interactions for L2 learning from a different perspective. First, it lends itself well to the examination of the microgenetic changes in L2 learning process (Lantolf & Thorne, 2007, p. 201). Specifically, SCT specifies the need to incorporate a historical or genetic perspective in analyses of either long-term longitudinal data or a single interaction (p. 211), and that evidence of development may be obtained by examining how learners move from object/other regulation to self-regulation. Thus, researchers can track the changes of frequency and quality of assistance offered by others to prompt the performance, and also the use of private speech by learners themselves to achieve or maintain control of certain tasks.

With regard to noticing and L2 development, SCT affords a holistic view that regards noticing as a parameter of language development. For instance, Aljaafreh and Lantolf (1994) examined the relationship between corrective feedback and interlanguage
development through a sociocultural theory perspective. They chose to focus on four frequently occurring grammatical features in the essays from their participants: articles, tense marking, prepositions, and modal verbs. In their operationalization of the construct L2 development, “varying instantiations” of the students’ need for intervention, their noticing of an error and correcting the error were used to gauge learners’ developmental level displayed in interactions. The study examined the interactions audio-recorded during one-on-one tutoring sessions aiming to provide students with corrective feedback on their essays. A thirteen-level “regulatory scale” of the behavior of the tutor and the student in negotiating corrective feedback was constructed. The scale has a lower end where the tutor provides strategic and implicit feedback and the student demonstrates independence in noticing and correcting errors, and a higher end where the tutor provides explicit feedback and the student demonstrates needs of assistance. Thus, movement of the negotiated behavior from higher end to lower end, either during the same session on the same linguistic feature or in the subsequent sessions on the same feature, was considered as evidence for L2 development.

Similarly, the holistic view may help to build a more unified picture of the role of interactions in L2 development by linking the ideas based on Interaction Hypothesis (Long, 1996, p. 451) and those built around collaborative dialogues or language-related episodes (Swain, 2000).

Furthermore, by revealing variations between individuals in the microgenetic growth and demonstrating their relevance to explanations of L2 development under certain instructional treatment, SCT would help to clarify the effects of instructional treatments on different individuals. To illustrate, the microgenetic analysis in Aljaafreh
and Lantolf (1994) showed more clearly that different types of corrective feedback from
the tutor need to be tuned to individual student’s ZPD, and thus may or may not lead to
L2 development depending on whether feedback matches developmental level or not.
The account of the interaction between corrective feedback and individual student’s
response has complemented previous understanding of the effects of corrective feedback
on L2 development in general by providing insights on how different types of corrective
feedback may be received in different ways by individual students.

Therefore, although SCT does not offer a completely coherent account of the
relationships between its key theoretical principles and constructs and thus may be
susceptible to various interpretations, its similarities and differences as opposed to the
Interaction approach can be valuable in understanding key issues concerning L2
development through interactions.

2.3.2 The role of SCMC in L2 learning

While empirical studies based on the Interaction approach have provided evidence
showing how the use of SCMC may or may not affect the cognitive processes of
language learning and the learning outcomes, an increasing number of studies framed by
sociocultural theory of L2 learning have been conducted to examine the nature of the
SCMC discourse (Lee, 2008; Uzum, 2010; Yamada & Akahori, 2007), and the
importance of learning activities as conditioned by other related factors such as
sociocultural actors, technological settings, or cultural backgrounds (Darhower, 2007;
O’Rourke, 2005; Thorne, 2003).

The intercultural approach, which is also referred to as telecollaboration, is a
recent development and involves mostly email exchanges between participants of
different cultures with some components of SCMC (Belz, 2002, 2003; Belz & Reinhardt, 2004; Belz & Vyatkina, 2008). These and other studies have offered different perspectives on the role of SCMC in L2 development and their contribution to the understanding of this issue will be reviewed in the following sections.

Most research based on the sociocultural framework has examined the nature of SCMC discourse from a holistic perspective and enriched the understanding of the role of SCMC in L2 development. Some studies have identified interactive features of SCMC and found them to be facilitative for developing learners’ linguistic and pragmatic competence (Darhower, 2002). Some studies have focused on the collaboration between participants in SCMC and found it to be helpful for the development of learners’ linguistic and cognitive abilities (Lee, 2008). Others have pinpointed the concern over the possible negative impact of SCMC on the development of linguistic accuracy (Collentine, 2009; Liang, 2010). In particular, larger proportion of content discussion as opposed to negotiation of meaning (Liang, 2010), and frequent use of informal expressions in SCMC (Collentine, 2009; Sotillo, 2000) have become the main reasons causing the concern. Furthermore, some researchers have suggested that the traditional approach of focusing on specific proportion or aspect of a whole SCMC discourse may lead to the neglect of potentially significant features of learners’ SCMC discourse, such as playful and creative uses of language, and how they may affect L2 learning (Warner, 2004).

The Interaction approach specifies that communication breakdown and negotiation of meaning are the keys to orient learners’ attention to form, and would thus facilitate noticing and language acquisition. However, the findings that negotiations are rarely triggered by morphosyntactic structures (Blake, 2000; Pellettieri, 2000) have left
the question of grammar acquisition unsatisfactorily addressed. In fact, an increasing number of research has began to examine the role of interaction in L2 development by looking at other aspects of interaction including episodes where there is no communication breakdown but interlocutors choose to talk about a language-related problem (Shekary & Tahririan, 2006; Yilmaz & Granena, 2010), collaborative dialogues aiming to solve language-related problems in contexts such as peers discussing revision problems in writing (Liang, 2010), and tutoring sessions where language problems are discussed and corrective feedback is given (Sauro, 2009). Moreover, researchers taking the sociocultural perspective of SLA cautions against the use of the negotiation framework, and suggests that negotiation of meaning may not be easily identified in interactions because it can be “tedious and face threatening” and that “its surface structures are often ambiguous” (Foster & Ohta, 2005, p. 407).

Empirical studies framed by sociocultural theory of L2 learning have also looked into the question of how SCMC or CMC in general may afford opportunities for the occurrences of language play, and how language play in CMC can benefit L2 learning (Belz & Reinhardt, 2004). In a case study of a 19-year-old American college student learning German through telecollaboration with several German keypals and the correspondence with his German-speaking girlfriend, Belz and Reinhardt (2004) documented the nature of adult foreign language play in CMC, and analyzed how CMC can afford opportunities for the occurrences of language play. Belz and Reinhardt (2004) first reviewed two approaches to defining language play, one of providing a list of characteristics of language play, and the other of viewing language play more as a mode rather than any specific behavior. The authors opted for a “learner-sensitive” and form-
based approach and define language play as “the conscious repetition or modification of linguistic forms such as lexemes or syntactic patterns” (p. 328). Belz and Reinhardt (2004) further synthesized major findings of previous studies and summarized five characteristics of foreign language play among adult learners. The five characteristics suggest that adult foreign language play is common and often involves different levels of play, the use of L1, resemioticization of the foreign code, and conscious flouting of FL rituals and conventions (p. 326). The data from the case study demonstrated different types of language play including: play with word formation, play with derivation, play with nominal compounding, play with letters (repetition of certain letters in a word, such as blaaaaaaaaaaaaaaaaah), and re-voicing of salient bits of language (Belz & Reinhardt, 2004). With regard to the functions of the language play, Belz and Reinhardt (2004) believes that foreign language play serves as a vehicle for pleasurable activity, a way to learn or to be familiar with grammar, and a way to show one’s linguistic creativity. Belz and Reinhardt (2004) suggest that language involves conscious repetition or modification of linguistic forms and thus is an inherently creative act because it “requires knowledge of linguistic convention and some type of alternative perspective on that convention” (p. 343). According to the report of their focal student, Seamus, he was engaged in language play, mostly because he enjoyed the pleasure of linguistic creativity (Belz & Reinhardt, 2004). Foreign language play is also regarded as a means of personal relationship building. Specifically, foreign language play presents positive face, because the act indicates that one’s linguistic ability and verbal agility are desirable traits (Belz & Reinhardt, 2004). In other words, learners engage in language play to establish that they are interesting and worthwhile conversational partners. Belz and Reinhardt (2004) have
also discussed some possible reasons why CMC affords the occurrences of language play and concluded with the following reasons. First, the slower processing speed in CMC would “open up an interstitial space” where language learners can find time to be creative with the language code (p. 347). Herring (1999) also observed that some interlocutors would take the advantage of the disrupted adjacency, turn overlapping and topic delay for the purpose of play. Second, the fact that CMC is the “verbalization of writing” opens up room for re-negotiation of the rules of interactions and thus there would be more possibilities of “slippage, artifice, burlesque, farce, gimmick, ruse, and play” (Belz & Reinhardt, 2004, p. 348). The researchers conclude by emphasizing the opportunities beyond linguistic accuracy that CMC can afford for L2 learning.

Therefore, the sociocultural perspective shares the interests in examining the role of interactions in L2 learning, and takes a largely complementary approach in analyzing how L2 learning happens through interactions. Table 4 below summarizes the different aspects that the Interaction approach and the sociocultural perspective focus on in their examination of interactions and L2 learning. Briefly, the Interaction approach focuses on examining how L2 development happens through interactions while sociocultural theory of L2 learning examines how L2 learning happens in interactions. Thus, the Interaction approach relies on evidence of instances such as negotiation sequences that have been shown to be able to create favorable cognitive and social conditions for L2 development, and sociocultural theory of L2 learning relies on constructs such as language-related episodes and affordances to help understand the interaction as a whole and identify different processes that may benefit L2 learning to understand how L2 learning can happen in the interaction while learners are engaged in interactions to express meanings.
Table 4. Evidence of L2 learning through and in interactions

<table>
<thead>
<tr>
<th>Construct Source</th>
<th>The Interaction approach</th>
<th>SCT</th>
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Features
- Trigger, indicator, response, & reaction to response
- Focus on form
- Co-construction of utterances
- Other-correction
- Self-correction
- Language play
- No fixed features
- Focus on the relationship between the learner and the environment

Therefore, it seems that incorporating sociocultural theory of L2 learning in the examination of the role of SCMC in L2 learning would offer a complementary (Lantolf, 2000) and at least “thought-provoking” (Foster & Ohta, 2005, p. 404) picture of how L2 learning happens in and through SCMC.

2.4 Functional Views of Language, SCMC, and Academic Literacy

2.4.1 Background

The Interaction approach and sociocultural theory of L2 learning would help provide a fairly clear picture of how different cognitive and social processes during the interaction in SCMC may benefit the development of L2, particularly the development of learners' basic communicative competence. However, they may be inadequate in explaining the processes of language learning beyond the sentence level (Luo, 2005), or the development of the ability to use different linguistic devices to express certain meaning (Belz, 2003). Admittedly, the inadequacies should not be viewed as inherent to the Interaction approach or sociocultural theory of L2 learning. Rather, it seems to be
their underlying views of language that results in a focus on language form at or below the sentence level. While some researchers believe that a certain perspective is usually associated with certain orientations towards and an understanding of language and language learning, and that the psycholinguistic views of SLA are mostly connected to the structural linguistic view (Luo, 2005), it is arguable that the Interaction approach does not specify its view on the nature of language knowledge, and that sociocultural theory of L2 learning emphasizes the social nature of language knowledge (Ortega, 2007). Therefore, an alternative view of language or approach to the analysis of language learning may be able to provide insights on language learning beyond the development of basic communicative competence.

The need to know how SCMC may benefit L2 development beyond the basic communicative competence becomes clearer when the use of SCMC is situated in a classroom where learners are expected to learn both the language and the content or the subject matter. In an ESL academic writing course, for example, the goal is to help learners develop both L2 and academic literacy. Moreover, most often, L2 learners need to learn the language and the subject matter simultaneously, or to learn the subject matter through the medium of the language and to learn to use the language to communicate the subject matter that need to be learned (Mohan, 1986). It is thus desirable to taken an integrated approach to the teaching of the language and the subject matter, including the instructional use of SCMC. The number of empirical studies on the use of SCMC in developing academic literacy is quite limited, although SFL has been proposed as an alternative view to investigate the impact of CMC on the development of discourse in the sociocultural context of social practices (Mohan & Luo, 2005).
As an exception, Luo (2005) adopted SFL in her examination of the interaction data collected from a hybrid class (face-to-face and online instruction) of native and non-native English speaking graduate students. Among other things, Luo (2005) examined the students’ experience of constructing the online registers, and the development of their academic discourse as shown in their interactions in an online forum. Different from the studies reviewed in the previous sections, Luo (2005) viewed online discussion as a new and unfamiliar social practice for the graduate students and investigated, and explored the students’ perspectives and thoughts to see how the social practice of online discussion was “shaped and reshaped”, and just like face-to-face discussion, online discussion is a social practice of “conflicts and complexities” (p. 8). Moreover, instead of studying the discourse features of the online discussion, Luo (2005) regarded the online discussion as dynamic and changing, and examined how the students constructed and co-constructed the register of online discussion. The findings have shown that the online registers had been shaped by the students’ perceptions of field, tenor, and mode, which were not only different between different students, but were different for the same student in different contexts, and thus in examining online discourse, researchers should focus on both linguistic dimensions and the sociocultural and interpersonal dimensions of the construction of online register (p. 198). In addition, Luo (2005) looked at the effect of functional recasts on the development of academic discourse including the use of technical terms, nominalization, and more sophisticated, literate ways to express meaning.

Luo’s (2005) study of CMC and language learning from the SFL perspective has illustrated how some of the concerns raised from studies framed by the Interaction approach and the sociocultural theory can be addressed by a functional approach. First, a
functional approach can help address learners’ development of both language and academic literacy. Second, functional views of language may help interpret learners’ language use online as influenced by different contextual factors. Therefore, the following section reviews functional views of language and language learning, and key concepts from the SFL and explain in more details how functional approaches can help address the above-mentioned two issues.

2.4.2 Functional views of language and language learning

Many researchers have emphasized the differences between functional views of language and the traditional structural linguistic view of language (Bardovi-Harlig, 2007; Derewianka, 1990). Frequently emphasized differences include the following three points. First, functional views are mostly concerned about how language is used to express meaning. Second, functional views regard language as resources for meaning-making, and thus focus on how people use different linguistic resources to construct meaning. Third, functional views recognize that language use in texts differ in particular ways according to context.

Therefore, a functional approach to language learning usually builds on the linguistic analysis of what structures are grammatical to examine the extent to which language users can make use of the available linguistic resources in real-life communication (Bardovi-Harlig, 2007; Purpura, 2004). Because of its emphasis on the communicative use of language, and the compatibility with the cognitive-processing idea that it is necessary to understand not only what a learner knows about L2 but also how such knowledge can be put to use, the functional approach has been increasingly integrated into psycholinguistic analysis of L2 performance (Cooreman & Kilborn, 1991,
Specifically, functional approaches put considerable emphasis on language use in communication. To that end, functional approaches break the traditional dichotomy between form and meaning (Painter, 1989, p.20), and the formal separation between sub-components in language such as morphosyntax, semantics, and pragmatics (Cooreman & Kilborn, 1991, p. 196). Therefore, a functional approach to L2 learning assumes a multi-level analysis.

Meanwhile, functional approaches are mostly interested in describing the development process of the target language itself (Derewianka, 1990, p. 4). Specifically, a structural approach would favor error analysis or obligatory occasion analysis, both of which aim to compare samples of learner language to a target norm, sentence by sentence, and identify, describe, classify, and sometimes explain and evaluate errors (Ellis & Barkhuizen, 2005, p. 57). Frequency analysis would be used to avoid the comparative fallacy (Bley-Vroman, 1983), but its orientation is still the degree of conformity of learner language to target forms. With a functional approach, learner language would be examined in its own right, and the focus would be the actual process of how learners develop their linguistic repertoire to meet a communicative need. However, such a difference is not always clear-cut. Some studies that are guided by a functional approach have also used ideas from obligatory occasion analysis and described learner language through comparisons with target norms (Bardovi-Harlig, 1994), and structural view of grammar, on the other hand, could also provide an account of interlanguage development through frequency analysis (Berdan, 1996). Therefore, a functional approach to language
learning may indicate a broader orientation on L2 development that may or may not be based on references to target norms.

More importantly, instead of focusing on the formal characteristics of learner language, functional approaches look at multiple form-function or function-form mappings, and how such mappings change over time in the developing interlanguage system. Ellis and Barkhuizen (2005) distinguish form-function analysis from function-form analysis. Although both are concerned with the mapping between function and form, the later is also informed by work in pragmatics, and particularly speech acts (Ellis & Barkhuizen, 2005, p. 137).

Functional approaches to the analysis of language development are also different. With a form-function approach, the linguistic form(s) to be investigated need to be chosen first. The linguistic form(s) can be either a target language form or an interlanguage form, and the choice can be made based on previous research or a pilot study. Ideally, such a decision should precede data collection, although it is preferable that researchers do not purposely elicit the use of the chosen form(s). Then, all occasions of the use of the form(s) need to be identified. Next, the functions of the form(s) need to be determined and described. Lastly, the frequency of each function that is realized by the form(s) need to be tallied. Therefore, the researcher is able to see “what the dominant function served by the form at one developmental point is” (Ellis & Barkhuizen, 2005, p. 121).

1 The functions can refer to semantic function, semantico-grammatical function, pragmatic function or discourse function. Studies usually choose one of them although a full account of all would be desirable (Ellis & Barkhuizen, 2005, p. 121).
In function-form analysis, a specific function\(^2\) to be investigated need to be determined first. The term ‘function’ is quite flexible in its meanings. It could refer to semantic functions (for example, futurity), or pragmatic functions (for example, modality), and within each category, for example, modality, it could refer to narrower concepts, such as certainty, necessity, or conviction (Ellis & Barkhuizen, 2005, p. 126; Johnson, 1982, p. 35). Again, the function to be investigated would be preferably decided before data collection so that learner language collected may contain enough instances where learners do perform the target function(s). Thus, functional views not only help broaden the focus of examination of L2 learning, but also provide tools to assist the analysis of how learners develop their abilities to use linguistic resources to construct meaning.

Functional views of language also emphasize the influence of different aspects on language users’ linguistic choices. Specifically, the register theory describes three aspects of context that affect people’s language choices: field, mode, and tenor (Eggins, 2004). Field refers to what the language is being used to talk about, or the topic of an activity. A broader definition of field suggest that it varies along a dimension of technicality (Eggins, 2004, p. 107), meaning that a situation can be anywhere on a continuum from highly technical and specialized that assumes a high level of knowledge among the interlocutors about the focus of an activity to everyday situations that do not. In different texts, technicality is encoded in lexis and abbreviated, non-standard syntax (Eggins, 2004, p. 108). Mode refers to the role the language is playing in the interaction. Again, the definition of the role of language is expanded to include variations along two dimensions.

\(^2\) This may also be referred to as concept or notion (Bardovi-Harlig, 2007, p. 58).
The first dimension is the “spatial/interpersonal distance,” where the continuum moves from situations with both visual and aural contact and thus the possibilities of immediate feedback between the interlocutors, to situations where there is no visual or aural contact and thus no possibility of immediate feedback (Eggins, 2004, p. 91). The second dimension is the “experiential distance,” where the continuum moves from situations where language use comes simultaneously with some social process, with the purpose of achieving some ongoing action, to situations where language is used to reflect social experience, rather than enact it (Eggins, 2004, p. 92). The combination of the two dimensions mode can help explain the differences between the characteristics of language use in written and the oral communication in terms of lexical density and rhetorical organization. Finally, tenor refers to the social relationships between the interlocutors. Eggins (2004) also introduced three dimensions of continua to understand the concept: power, contact, and affective involvement. The power continuum ranges from situations with interlocutors having equal power, such as among friends, to situations with interlocutors having unequal power such as between a student and a teacher. The contact continuum defines how frequent the contact is depending on the roles of the interlocutors. For example, friends may have more frequent contact than acquaintances. The continuum of affective involvement characterizes the level of emotional involvement of interlocutors from high, such as between family members, to low, such as between colleagues.

2.4.3 SCMC, L2 learning, and the development of academic literacy

Two of the issues in studies of the role of SCMC outlined in Chapter 1 may be addressed using functional approaches. First, the register theory may offer some help in interpreting characteristics of learners’ language use in SCMC. Specifically, learners’
language use in SCMC, similar to their language use in face-to-face conversations, could vary depending on how they interpret different aspects of a communication context (Eggins, 2004). Thus, findings on typical moves or characteristics of SCMC discourse based only on observations of learners’ language use in one or two chat sessions could be misleading (Collentine, 2009; Liang, 2010; Vandergriff & Fuchs, 2009). Thus, to analyze the learners’ language use in a longitudinal data set and to triangulate with learners’ reports of their perceptions of the factors that affect their choice of language use may provide more insights.

Second, and more importantly, a functional approach would help link the learning of L2 and the subject matter. In the current study, the use of SCMC was situated in an undergraduate level ESL academic writing course. Therefore, the students were required to develop L2 and academic literacy, or more specifically, academic writing.

There is already a trend in empirical studies to examine the use of SCMC for not only purposes of L2 development, but also the learning of the subject matter (Belcher, 1999; Chen, Belkada, & Okamoto, 2003; Liang, 2010). For example, Liang (2010) explored how SCMC can be used to facilitate EFL writing. In her study of twelve university students, Liang (2010) examined how peer review workshops for two different paper assignments were carried out in SCMC and the extent to which the revision-related discourse identified in SCMC may facilitate subsequent writing and revision. In other words, Liang (2010) focused on how SCMC may benefit the students’ revision and writing. In the study, the students participated in two SCMC peer review sessions, with one on a book review, and the other on a research paper. The students were given a checklist of questions during the sessions and additional questions were posted on the
class forum to help facilitate the peer review sessions in SCMC. In analyzing the SCMC discourse, Liang (2000) distinguished revision-related discourse and non-revision-related discourse. The revision-related discourse includes meaning negotiation, content discussion, error correction, and task management, while the non-revision-related discourse includes social talk and technical action. The author then attempted to link the findings on the patterns in the revision-related discourse to the students’ revision and subsequent writing. Liang (2010) found that overall, most of the students’ moves in the two peer review workshops in SCMC aimed at content discussion, task management, and social talk. Within the category of revision-related discourse, the frequencies of meaning negotiation and error correction were quite low, in comparison to that of content discussion and task management (p. 53). Moreover, Liang (2010) found the relationships between the patterns shown in the SCMC discourse and subsequent composing and revision actions were complex and dynamic. Although this study represents a trend of studying SCMC in a writing class, it did not provide convincing evidence for the possible link between SCMC discourse and the improvement of writing and revision. A possible reason is that Liang’s (2010) focus on the development of revision and writing skills is too broad. With a narrower focus, such as a particular genre of writing or a more specific writing skill, it is likely that the “content discussion” move can be further classified and then linked to different moves in a subsequent writing.

Belz (2003) illustrates how by identifying a narrower focus, learners’ development of abilities to use different linguistic devices can be linked to their language use online in a more convincing manner. Specifically, Belz (2003) follows a functional approach in examining how three learners developed their abilities to use linguistic
resources to express attitudes in a telecollaboration project. Attitude is regarded as a necessary component of intercultural competence. To further narrow down the focus, Belz (2003) focused on three subcategories of a subsystem of attitude – appraisal (affect, judgment, and appreciation). Narrowing down the focus makes it easier to identify the specific lexical and grammatical choices that learners make in order to express themselves. Specifically, Belz (2003) was able to identify the words and phrases that the learners used to express different attitudes in different ways. The final aggregation of the frequencies of the words and phrases demonstrated a clear pattern of how the three learners differed in their way of expressing attitudes and why some frustrations and misunderstandings happened in the telecollaboration project. Therefore, to effectively use a functional approach to examine learners’ development in using linguistic devices to express meaning, it is important to have a clear and narrow focus.

As shown in the discussion of Liang (2010) above, revision or writing skills might be too general for a study to present convincing evidence of the influence of SCMC. A review of important aspects of academic writing and the goals and difficulties in teaching ESL academic writing has suggested that a key issue in teaching ESL academic writing is how to teach students to develop their abilities to construct effective arguments and to project a credible authorial identity.

Academic discourse refers to “the ways of thinking and using language which exist in the academy” (Hyland, 2009, p. 1). As it is essentially connected to social activities, it is necessary to learn important conventions of academic discourse to be able to become a competent user. The main purpose of academic discourse is not just to “report research that plausibly represents an external reality”; rather, academic discourse
aims to transform research findings or reflections into academic knowledge (Hyland, 2009, p. 12). As Kuhn (1970) talks about scientific knowledge as “the common property of a group or else nothing at all” (p. 201), Hyland (2009) defines academic knowledge as “a product of the situations in which it is created, rooted in disciplinary argument, affiliation and agreement-making” (p. 11). In other words, academic persuasion is a key aspect of the use of academic discourse.

Among different types of academic discourse, academic writing has been frequently emphasized (e.g., Chen, 2010; Hinkel, 1999; Hyland, 2000; 2002; Swales, 1981; Yoon, 2008) because it contains rich information about the social practices of academics, and it is the primary way of communication between members of academic communities (Hyland, 2000). Despite some disciplinary differences, academic writing in general is concerned with knowledge-making, and thus is in essence a conversation between the author and the reader where the author “crafts texts in ways which will be persuasive to readers” (Hyland, 2009, p. 12). However, the difficulty of presenting convincing written arguments lies in the fact that the author may not be able to fully control how the reader may interpret a particular finding. Therefore, the key to the construction of a persuasive argument is the author’s ability and attempts to anticipate possible negative responses from the reader to his or her own arguments, and to be able to do these, the author need to rely on persuasive practices of the academic community to frame arguments in ways that are acceptable and thus will be more likely to be regarded as persuasive (Hyland, 2009). Admittedly, specific persuasive practices are different in different disciplines. However, since the focus of the current study is the undergraduate-
level academic writing, the shared aspects of effective academic writing are emphasized instead of the specific persuasive practices of different disciplines.

The importance and difficulties of teaching students to learn to construct effective arguments and to project authorial identity have been particularly reflected by research on teaching and learning of argumentative reading and writing among both L1 and L2 writers (Chandrasegaran, 2008; Newell, Beach, Smith, VanDerheide, 2011; Hyland, 1997, 2002; Knoblauch, 2011). For example, Newell et al. (2011) have reviewed studies of the teaching and learning of argumentative reading and writing in k-12 and college writing classrooms, and have discussed the following challenges. First, most students seem to have difficulties in making informed and critical judgments about written text. Second, students also demonstrate a lack of advanced reading comprehension and critical literacy skills needed in understanding and analyzing different perspectives or opposing views in their own writing. Third, most students have problems in presenting a clear position and consistent support with transitions from one point to the next. In fact, students’ difficulties in recognizing rhetorical structures of argumentative essays and applying them in their own writing (Chambliss & Murphy, 2002), in generating relevant and specific evidence (Hinkel, 1999; Kuhn, 1991), and in responding by giving cogent reasons, counter arguments, and rebuttals (Chandrasegaran, 2008; McCann, 1989) have been well documented in research on the teaching and learning of both L1 and L2 writing. To learn to construct effective arguments may be more challenging for L2 writers due to the influence of L1 cultural background and unfamiliarity with L2 literacy practices. Specifically, researchers have noticed that Chinese L2 writers relied more heavily on historical allusions and direct assertions rather
than justification and reasoning devices, and thus sound less persuasive (Hinkel, 1999; Scarcella, 1984), and ESL writers, especially those who are from countries embracing Confucian, Taoist, and Buddhist philosophies, were less likely to present a balanced argument in an objective manner (Carlson, 1988; Hvitfeldt, 1992). Hinkel (1999) further discussed the differences between the rhetorical tradition of Korea, China, and that the emphasis of objectivity in the Anglo-American tradition of academic writing, and concluded that cultural differences presented a big challenge for ESL writers to learn to present effective arguments in English because from the perspective of other rhetorical traditions, the need for an effective argument to be based on objective analysis of different perspectives may be considered “artificial, cumbersome, and unnecessary” (p. 4). Similarly, Hyland’s (1997, 2002) work comparing L1 and L2 writers’ use of linguistic devices to express certainty and doubts have also indicated that the objective of maintaining an appropriate level of confidence and doubt in presenting arguments is more challenging for L2 writers.

Newell et al. (2011) also explored possible reasons of the difficulties in the teaching and learning of argumentative reading and writing. The authors mentioned five specific reasons that can be largely characterized as a conflict between the complex and dynamic nature of learning to construct effective arguments and the over simplification on the part of the teacher and the textbook (Knoblauch, 2011) and the relatively artificial and formulaic way of instruction. Effective instruction of argumentative reading and writing is not always easy as schools try hard to maintain a friendly environment for learning and thus may discourage any sort of disagreement and engaging discussion of conflicting views. Moreover, to develop learners’ awareness of the reader and the
purpose of their own arguments can be difficult by assigning students to practice writing on given topics or even the topics of their own choices. The problem that students have “conflicted perceptions of the purposes and audiences for formulating arguments in a classroom setting” (Newell et al., 2011, p. 277) may not have an easy solution. A closer examination of the possible reasons for such a problem shows that the conflicts in students’ perceptions are possibly a result of a combination of the following characteristics of their experiences in learning argumentative reading and writing in a classroom setting. First, if a student is assigned an argumentative essay that is going to be evaluated by the teacher, it is difficult to convince the student that their peers and some imaginary audiences of their papers are also important. Second, if a student does not have the opportunity to experience the consequences of the effectiveness of their arguments based on feedback from audiences other than the teacher, which is what is happening in a writing classroom most of the time, the student may perceive an argumentative essay merely as an assignment and thus will not be motivated to be engaged in serious discussion of different perspectives in constructing arguments. Notice that peer review workshops that are common in most writing classes do not necessarily provide the opportunities for learners to experience the consequences of the effectiveness of their arguments because the workshops most often aim to share views on different aspects of the writing rather than its subject matter. Additionally, when the teacher is viewed as the primary audience and that the judge of an argumentative writing, the student may attempt to avoid taking positions that may not be supported by the teacher.

All the challenges and the possible causes of them discussed above seem to suggest that in helping students to develop abilities to construct effective arguments and
project credible authorial identity, it is essential to create opportunities for learners to experience constructing and responding to arguments in meaningful contexts with immediate audiences through which they would possibly develop perceptions of the need to anticipate different views and responses to their arguments, and strategies of constructing effective arguments by experimenting with different ways of incorporating these views and response in counter arguments and experiencing the consequences of the effectiveness of their counter arguments from the feedback given by their audiences.

The need to engage learners in interactions to practice constructing and responding to arguments may be at odds with the objective of schools to maintain a relatively friendly environment. The integration of task-based approach and SCMC seems to offer a possible solution to this problem. Research has indicated the great potential of SCMC as a medium for task-based language learning (Peterson, 2010). In reviewing the interactionist and sociocultural perspectives of the impacts of SCMC interaction on language learning, Peterson (2010) acknowledged possible limitations, but largely confirmed the potential benefits of tasks carried out in SCMC. Moreover, to engage students in SCMC tasks designed to practice constructing arguments will add some perceived distance to group discussions and thus help mediate the competitive environment, will provide an immediate and more meaningful audience, and will provide opportunities of collaborative work in co-constructing arguments.

Newell et al. (2011) have reviewed studies on the use of online discussion to engage students in dialogic interaction and found that although results with regard to the effectiveness of such practices were mixed, it is clear that the online discussion has more advantages in providing students with opportunities to experience the processes of
presenting arguments, getting responses, and incorporating alternative views and modifying the original arguments. Among others, Newell et al. (2011) identified studies showing that online discussion has the potential of inviting participants to join the “back-and-forth rhetoric” and thus experience argumentation as a process rather than a product (p. 295). Naturally, when individuals choose to participate in an online debate, they should be interested in the topic and thus would take it seriously. An important implication of this study is that for any types of discussion or debates to be motivating, topics are important. If the topics are more closely related to learners’ experience, they may be more motivated to participate and share their views. It is also suggested that learners have developed their abilities to frame arguments as a result of participating in online discussion, although the quality of arguments differed considerably between individual students (Laurinen & Marttunen, 2007).

In another study, Chandrasegaran (2008) also confirmed some potential advantage of online discussion in providing opportunities for learners to practice constructing effective arguments. Specifically, Chandrasegaran (2008) compared the argument practices in an academic writing from a post-graduate student and those shown in the forum postings of three secondary students. The findings indicated that in both contexts, there were stance assertion and stance support, but counter arguments were only found in the forum postings. Chandrasegaran (2008) also found that the stance support in online discussion was clearer and explicit while that in the academic writing was vague and weak. Thus, it seems that learners may benefit from being aware of and possibly apply these different strategies in online discussion in their own writing. However, since Chandrasegaran’s (2008) comparison was between writing and forum postings from
different students, it remains to be a question with regard to the direct evidence of learning of argument strategies transferred from online discussion to academic writing.

Therefore, the study aims to continue along this line of research and document learners’ development in both SCMC and academic writing in an effort to obtain direct evidence of learning. Specifically, in addition to the examination of the benefit of SCMC for L2 development based on the Interaction approach and the sociocutlural theory, the study also looks at the potential of SCMC for developing learners’ abilities to construct effective arguments and project credible authorial identity in academic writing.

Based on functional perspectives, effective arguments in an academic essay are characterized by coherent move structures that contain at least the following six components: background or orientation, thesis, support, definition, opposing views, and summary (Derewianka, 1990; Veel, 1997). Background or orientation is where an issue is described and explained, and possibly some background information of the development of the issue is provided. The purpose of providing background information is to help the reader understand the issue that the author is going to discuss. Thesis and support are where the author presents his or her opinion on the issue and supporting points and evidence. Definition is usually used to clarify the author’s understanding or position on ambiguous terms either in the thesis or the support. Definition can be quite important because the reason why some issues are controversial is because of people’s different understanding of certain key terms. An effective argument should also contain some acknowledgement or discussion of opposing views. The summary is where the author reinforces his or her opinion and main supporting points.
Admittedly, the presence of these six moves can only serve as an indication of the effectiveness of an argument, because the effectiveness of an argument also depends on how each move is executed. For example, in defining key terms, the author who identifies more relevant key terms will probably present a stronger case than those with less relevant ones. Also, in examining opposing views, formulaic acknowledgement of the existence of different views will be less likely to reach the reader as compared to an engaging discussion of possible strengths and weaknesses of a different view. At the same time, an effective argument does not necessarily need to follow the order of the moves mentioned above. Therefore, the analysis of move structures in academic writing may be more effectively summarized by descriptions rather than numbers.

The argument moves in SCMC discourse are different from the move structures in an academic essay primarily because of its dialogic nature. In addition to the construction of one’s own arguments, there are frequent occasions when responses to arguments and counter arguments are necessary. In this current study, the coding scheme for the SCMC discourse was developed based on an analysis of a sample of the chat transcripts from the participants. The coding scheme is described in detail in Chapter 3.

Functional approaches also provide a set of tools to examine the use of linguistic resources to project credible authorial identity. Since the key to academic persuasion is to be aware of the “community-generated” and “community-maintained” (Hyland, 2009, p. 12) nature of academic knowledge, the author of an academic writing is rarely neutral. Instead, the author is always “engaged in that they realize the interests, the positions, the perspectives and the values of those who enact them” (Hyland, 2005, p. 4). In other words, in an academic writing, the author also creates an image of his or her credibility
and audience-sensibility by conveying attitudes, judgments, and emotions towards different perspectives. The way the author express his or her attitudes, judgments, and emotions towards different perspectives in an academic essay can then have “social impact” on the reader’s interpretations of the author’s meaning. Therefore, the ability to project a credible authorial identity in academic writing can also contribute to the construction of effective arguments.

Hyland’s (2005) work on meta-discourse provides a framework and tools to examine the linguistic resources that the author can use to “negotiate interactional meanings in a text, assisting the writer (or speaker) to express a viewpoint and engage with readers as members of a particular community” (p. 37). Hyland (2005) further clarifies that meta-discourse is an open-ended set of language items used to engage receivers and encourage them to accept the author’s positions, and put forward three key principles of meta-discourse. First, meta-discourse helps convey the author’s beliefs and attitudes toward the propositional aspects of discourse (p. 38). Second, all meta-discourse devices should be seen to be used to engage the reader for successful communication (p. 41). Third, meta-discourse distinguishes external and internal relations (p. 45). Notice that the same meta-discourse item used in different contexts could perform different functions. Where as “internal” relations refer to the logic relationships within the discourse, “external” relationships refer to the logic relationships embedded in the external activities.

Based on a review of different taxonomies of meta-discourse markers (Crismore, Markkanen, & Steffensen, 1993; Vande Kopple, 1985), and the above-mentioned definition and principles of meta-discourse, Hyland (2005) has proposed an interpersonal
model of meta-discourse that distinguishes two broad categories of the functions of meta-discourse devices. The researcher believes that this model offers a more comprehensive and coherent account of how different linguistic resources, including both stance and engagement markers, can be used to help the author engage the reader in a way to help the author achieve his or her goals. Specifically, the first category of meta-discourse devices are used to help guide the reader through the text, and this category involves resources such as transitions, frame markers, endophoric markers, evidentials, and code glosses. The second category of meta-discourse devices are used to help involve the reader in the text, and this category includes resources such as hedges, boosters, attitude markers, self-mentions, and engagement markers. Clearly, the first category of linguistic resources aim to help the reader interact with the text while the second category of linguistic resources focus more on the interaction between the author and the reader.

Since this current study analyzes learners’ language use in both academic writing and in SCMC, the researcher believes that the second category of linguistic resources, or what is termed as the interactional resources by Hyland (2005), would be a better focus as the use of these resources would be relevant in both contexts. Table 5 below provides a summary of the features of different interactional resources and examples.

Table 5. Meta-discourse: Interactional resources

<table>
<thead>
<tr>
<th>Category</th>
<th>Function</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hedges</td>
<td>• Withhold commitment and open dialogue</td>
<td>might; perhaps;</td>
</tr>
<tr>
<td>Boosters</td>
<td>• Emphasize certainty or close dialogue</td>
<td>definitely; it is clear that;</td>
</tr>
<tr>
<td>Attitude markers</td>
<td>• Express the author’s attitude to proposition</td>
<td>surprisingly;</td>
</tr>
<tr>
<td>Self-mentions</td>
<td>• Explicit reference to author(s)</td>
<td>I; me; we;</td>
</tr>
<tr>
<td>Engagement markers</td>
<td>• Explicitly build relationship with reader</td>
<td>You can see that;</td>
</tr>
</tbody>
</table>
As shown in Table 5 above, hedges are mainly used to indicate that the author decides to recognize that there may be other alternative views and thus he or she should “without complete commitment to a proposition” (Hyland, 2005, p. 52). Boosters, on the other hand, are devices used to strengthen the author’s choice of one view possibly out of many others. Attitude markers emphasize the affective attitude of the author. Self-mentions are linguistic devices that the author uses to explicitly show author presence in the texts. Engagement markers are devices the author uses to explicitly address the reader, “either to focus their attention or to include them as discourse participants” (Hyland, 2005, p. 53). Since Hyland (2005) holds the view that meta-discourse is an open-ended system and that the same linguistic devices may likely serve different purposes in different contexts, the examples given serves more to illustrate the kind of linguistic devices that one may encounter rather than as a rigid and exhaustive list of items that a researcher need to look for in an analysis.

2.5 Hypothesis Tests in Interaction Studies: Potential Issues and Solutions

In reviewing empirical studies on the use of SCMC, the previous three sections argue that the use of multiple theoretical perspectives can advance the understanding of the potential role of SCMC in facilitating learners’ development of L2 and academic literacy. This section, in response to some recent development in the conceptualization and the analytical techniques for data with nested sources of variability, reviews and analyzes specifically the quantitative treatment of interaction data or data from language tests in empirical studies examining the effect of SCMC on L2 development and discusses the potential issues and possible solutions.
Many studies rely heavily on descriptive statistics. They may focus on describing characteristics of SCMC discourse (Oskoz, 2009; Peterson, 2009), or how learners create and respond to particular learning opportunities emerged in SCMC (Díez-Bedmar & Pérez-Paredes, 2012). In either case, studies may use frequencies, means, standard deviations, and percentages to summarize and describe patterns shown in the sample. For example, in examining the types and results of feedback in a forum task and a wiki task, Díez-Bedmar and Pérez-Paredes (2012) used frequencies, percentages, and means to show the differences between groups in giving different types of feedback and their results. The limitation for using descriptive statistics is that it can only describe patterns in a sample, and thus findings based on descriptive statistics may not be generalized to the study population (Agresti & Finlay, 2009).

Many interaction studies also rely on different inferential statistics such as t-tests or analysis of variance (ANOVA). T-tests are used to compare the difference of means of two groups on a key variable (Fiori, 2005; Uzum, 2010), and different ANOVA procedures are used to test the difference of means between three or more groups, or to analyze effects in designs with both a between-subjects factor and a within-subjects factor (Sauro, 2009). However, an important assumption of t-tests and ANOVAs that the observations on the dependent variables are independent of each other is violated in interaction studies because by design, participants in interaction studies are not independent individuals any more. Instead, they are usually assigned to work in pairs (Sauro, 2009) or small groups or groups of unknown size (Fiori, 2005). In any of those cases, it is expected that participants within the same pair or small group will affect each other’s language use more than they do to the others outside of the pair or the small group.
As a result, the members of the same pair or the same small group may share more similar performance or scores on the outcome test than they do with members from other groups. In other words, an outcome data set consisting of test scores from participants in interaction tasks may demonstrate different degrees of dependence. For example, Sauro (2009) examined the effect of different types of corrective feedback in SCMC on the development of L2 grammar. In her study design, there were three conditions and a total of twenty-three student-participants. To satisfy the assumption of independence, the scores on the post-test of all the participants should not be related to each other in one way or another. However, since Sauro (2009) examined the effect of giving feedback during interactions, she arranged the twenty-three student-participants to work with one of the nine native speakers of English in dyads. Thus, it is likely that the student-participants who worked with the same native English speaker may share more similarities in their performance on the post-test than they do with students interacted with other native English speakers. In such case, the influence of grouping may also contribute to the difference of means between conditions.

The fact that differences exist between different pairs or small groups have been well documented in studies about characteristics of SCMC discourse (Collentine, 2009; Liang, 2010) and learners’ perceptions of SCMC (Luo, 2005), both of which may have impact on the influence of SCMC on learning outcomes. Therefore, it is necessary to use some alternative statistical methods that can model some of the small-group characteristics and take them into account in the analysis of the differential effects of SCMC and face-to-face tasks on L2 learning.
The register theory is usually used to analyze texts, but Luo (2005) provides an example to use the register variables to investigate learners’ perspectives on their decision of language use based on considerations of these aspects of context. Since learners’ perceptions of topic, group relationships and the role of language affect their language use may be affected by group members’ language use and perception, the register variables offer a starting point to conceptualize and model some relevant small-group characteristics that may in turn influence the way the SCMC tasks affect the learning outcomes. The variables modeling small group characteristics can then be aggregated and incorporated in analysis as covariates. Detailed description of the creation and assessment of the characteristics of the small groups are presented in Chapter 3.

2.6 Summary

In reviewing the selected empirical studies on SCMC framed by the Interaction approach and sociocultural theory of L2 learning, this chapter argues for the use of theoretical lenses in the examination of the potential of SCMC for L2 learning. Relevant concepts and constructs related to L2 learning from both perspectives were explained and discussed, and the rationale of how the integration of the two perspectives can help address some of the issues outlined in Chapter 1 were presented.

Moreover, this chapter argues for the compatibility of functional approaches with the Interaction approach and sociocultural theory of L2 learning. In reviewing essential features of functional views of language and language learning, this chapter demonstrated that functional approaches would add valuable components to the research of the use of SCMC tasks and L2 learning. Specifically, the register theory of SFL may help conceptualize and evaluate the possible influence of some small group characteristics on
the way the SCMC tasks affect learning outcomes. Meanwhile, the register theory can also help interpret how learners’ experiences and perceptions of SCMC may affect their language use in the interactions in SCMC and thus the learning outcomes. More importantly, the functional view of language and language learning provides a framework and tools to examine the important issue of how learners develop academic literacy while learning L2. In reviewing research on the teaching and learning of academic writing, this chapter has also identified the ability to construct effective arguments and to project credible authorial identity as a key aspect of academic writing, and thus the focus of the functional analysis in the current study.

It is obvious that these different constructs of L2 learning informed by different theoretical perspectives lend themselves to different approaches of analysis. Therefore, mixed research methodology is necessary to systematically integrate multiple theoretical perspectives and to draw upon different analytical approaches in order to address the following five research questions concerning the effects of SCMC tasks on the development of L2 and academic literacy. Chapter 3 will describe and explain the mixed research methodology used to address these questions in details.

1. How do average scores of grammatical and lexical complexity, accuracy, and fluency change from a pre-test to a post-test, respectively, and compare for treatment and control groups?

2. What interactional processes occur in the SCMC discourse of the focal students in the selected triads that may be considered beneficial for L2 learning?

3. How does the SCMC discourse of the focal students reflect their development in using argumentative moves to construct effective arguments? What patterns of
change can be observed concerning the use of argumentative moves in the timed writing samples of the same students? What connections, if any, are there between the characteristics of the use of argumentative moves in the SCMC discourse and the patterns of change in using argumentative moves in the writing samples?

4. How do the focal students learn to use meta-discourse devices in the SCMC discourse? What patterns of change can be observed concerning the use of meta-discourse devices in the timed writing samples? What connections, if any, are there between the use of meta-discourse devices in the SCMC discourse and the patterns of change in using meta-discourse devices in the writing samples?

5. What are the focal students' perceptions of the SCMC tasks, their triads, and their learning in the SCMC tasks?
CHAPTER THREE. METHODOLOGY

3.1 Introduction

This chapter describes the methodology of this study. As introduced in the previous chapter, this study investigates the extent to which the use of SCMC tasks may facilitate the development of L2 linguistic competence and L2 academic literacy through mixed methods research. As a methodology, mixed methods research has its own underlying philosophical assumptions that guide and influence the design and implementation of a study. It also has distinct research designs that help explicate the types of data and analyses needed to answer certain research questions, and methods of collecting, analyzing, and mixing datasets of different nature purposefully and systematically.

Therefore, the chapter begins with an explanation of the general assumptions of the study in Section 3.2. Based on the philosophical assumptions and the research questions, the selected mixed methods research design is presented and explained in Section 3.3. Following the explanation of the research design, the context and the participants of the study are described in Section 3.4 and 3.5. The description of the context and the participants is followed by an account of the instruments used in Section 3.6, an explanation of the procedure of data collection in Section 3.7, and a description and rationalization of the methods used in data analysis in Section 3.8. Lastly, issues concerning the quality of the study are discussed in Section 3.9.
3.2 Philosophical Assumptions of the Study

This project is a mixed methods study of the effects of SCMC tasks on L2 development. Methodologists believe that mixed methods research complements either pure qualitative or quantitative research and thus propose to promote the idea of epistemological and methodological pluralism particularly in educational research (e.g., Johnson & Onwuegbuzie, 2004). The pluralistic stance on epistemology and methodology originates from a focus on the similarities between the constructivist and the positivist paradigms rather than their differences. Acknowledging the existence of differences, such a stance emphasizes the fundamental similarities shared by the two paradigms in at least two aspects. First, both rely on empirical observations to address research questions (Johnson & Onwuegbuzie, 2004; Sechrest & Sidani, 1995). Second, the goal of using either approach in social sciences is to provide “warranted assertions about human beings” (Johnson & Onwuegbuzie, 2004, p. 15). In other words, the qualitative and quantitative traditions share similar objectives, scope, and nature of inquiry (Dzurec & Abraham, 1993). Therefore, there is reasonable ground to believe that the qualitative and the quantitative research traditions are not mutually exclusive in nature. At the same time, since issues in educational research, or in social and behavioral studies in general, are complex and dynamic, researchers need to examine both “holistic phenomena such as intentions, experiences, attitudes, and culture” and “more reductive phenomena” (Johnson & Onwuegbuzie, 2004, p. 15) such as effects of instructional methods, correlation between different forms of measurements, and identifying predictor variables for achievement-related dependent variables. Therefore, it is not only possible,
but also desirable to take a non-purist or pluralistic stance in conceiving ways to address the variety of complex research questions.

The philosophical framework of pragmatism provides further support for the rationale of combining the qualitative and the quantitative approaches in research. According to Johnson and Onwuegbuzie (2004), the pragmatic rule of considering any notion by tracing its respective practical consequences started with Charles Sanders Peirce (1878) and was strengthened by James (1907) who argued that such an approach offers a possible solution to the otherwise interminable metaphysical disputes.

The pragmatic rule is “effects- or outcome-oriented” (Johnson & Onwuegbuzie, 2004, p. 16) and it states that the current meaning or provisional truth value of an expression should be determined by the experiences or practical consequences of belief in or use of the expression in the world (Murphy, 1990). The pragmatic principles have greatly influenced educational philosophy and practices, and researchers began to realize that indeed the emphasis should be what actions to take or how to approach a problem in order to better address real-world issues (e.g., Dewey, 1920, as cited in Johnson & Onwuegbuzie, 2004).

The primary focus of pragmatism on research problems and how to approach the problems (Creswell & Plano Clark, 2007; Johnson & Onwuegbuzie, 2004) provides a particularly beneficial middle position for research methodology. Many researchers agree that both qualitative and quantitative research traditions have their own advantages and disadvantages, and they are, to a large extent, complementary to each other (e.g., Creswell & Plan Clark, 2007; Johnson & Onwuegbuzie, 2004). Meanwhile, researchers have shown that some research questions can be addressed more effectively by
combining the qualitative and the quantitative approaches (Creswell & Plano Clark, 2007). Therefore, the pragmatic rule of selecting research designs based on the consideration of how to address a research question more effectively provides an eclectic position that allows researchers to make their own decisions based on research questions rather than forcing them into one set of research methods because of an epistemological paradigm.

Pragmatism also offers a more rational framework that allows the development of a two-way relationship between epistemological paradigms and research methods. Traditionally, the relationship goes one-way from paradigms to research methods. Qualitative research, for example, although lacking uniformity (Denzin & Lincoln, 2005; Silverman, 1997), has largely operated under the paradigm of constructivism; quantitative research, on the other hand, has been adopted by researchers following the paradigm of positivism (Creswell & Plan Clark, 2007; Johnson & Onwueguzie, 2004). The constructivist paradigm claims the existence of multiple-constructed realities, and thus context-independent generalizations are neither possible nor desirable (Lincoln & Guba, 2000). Meanwhile, the constructivist paradigm holds that researchers cannot and should not be separated from the research process because they are the only source of reality (Guba, 1990). The positivist paradigm emphasizes that scientific knowledge is purely based on observation, and it is rational and free from the interests, values, purposes, and psychological schemata of individuals (Maxwell & Delaney, 2004). Purists on both sides have argued that paradigms represent a researcher’s worldview of what is truth and how to go about looking for truths, and thus should determine the kind of work one may be engaged in during an inquiry or an investigation. However, the idea that a paradigm may
need to be modified in response to the demands to understand different aspects of an issue or to address a problem from different perspectives has been largely neglected under the rigid thinking of the relationship between paradigms and research methods (Howe, 1988; Johnson & Onwuegbuzie, 2004). Methodologists have pointed out that the relationship between epistemological paradigms and research methods are closely connected and interactive, and that they may require mutual adjustments (Howe, 1988; Kaplan, 1964). Therefore, forcing a choice between qualitative and quantitative research methods because of the presupposition of epistemological paradigms seems dogmatic (Howe, 1988) and may not be of much help in advancing the understanding of complex social and behavioral issues.

I will now wrap up this section by defining mixed methods research and summarizing the underlying philosophical assumptions that have guided my research. Johnson and Onwuegbuzie (2004) have provided a quite inclusive definition of mixed methods research: “the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study” (p. 17). Furthermore, the authors have characterized mixed methods research as “inclusive, pluralistic, and complementary” (p. 17). Although this definition has revealed the eclectic nature of mixed methods research, clarification could be added to provide a clearer guidance for researchers considering conducting mixed methods research. Creswell and Plano Clark (2007) have considered different views of what mixed methods research is and provided the following definition:

Mixed methods research is a research design with philosophical assumptions as well as methods of inquiry. As a methodology, it involves philosophical assumptions that guide the direction of the collection and analysis of data and the
mixture of qualitative and quantitative approaches in many phases in the research process. As a method, it focuses on collecting, analyzing, and mixing both quantitative and qualitative data in a single study or series of studies. Its central premise is that the use of quantitative and qualitative approaches in combination provides a better understanding of research problems than either approach alone. (p. 5)

This definition has clarified that mixed methods research can be regarded as an alternative research methodology with its own underlying philosophical assumptions and research designs. This is the position that I took in designing and conducting the current study. The section above has explained how pragmatism, or “methodological compatibilism” (Howe, 1988, p. 15) provides a compatible philosophical foundation for mixed methods research. To summarize, pragmatism orients researchers to the problems at hand rather than the assumptions of epistemological paradigms, and emphasizes the similarities between the qualitative and quantitative research traditions. In other words, pragmatism provides a more flexible and meaningful framework to guide researchers in selecting research methods based on the criterion of “what works” in response to their needs to understand different questions (Creswell & Plano Clark, 2007; Howe, 1988; Johnson & Onwuegbuzie, 2004), and allows them to choose from two sets of research tools and to fit together insights provided by both (Johnson & Onwuegbuzie, 2004). The following section presents a description and a rationale for the specific research design that has been used for the current study.

3.3 Research Design

My decision to use mixed methods research in the study was because the combination of qualitative and quantitative approaches can help me better understand the effects of the chosen instructional method, the SCMC tasks, on both the learning
outcomes and the learning processes. Similarly, the decision of the specific mixed methods research design was also largely based on the considerations of how to address my research questions effectively. Therefore, in this section, I first summarize major efforts in outlining and classifying different designs of mixed methods research and the framework that I used in selecting the research design in my study, and then describe the selected research design and explain how it can advance the understanding of the effects of the SCMC tasks more effectively than either research tradition alone.

Research designs provide specific guidelines for researchers to collect and analyze data, and interpret and report findings (Creswell & Plano Clark, 2007). Methodologists studying mixed methods research have provided a variety of ways to classify different types of mixed methods research. For example, Johnson and Onwuegbuzie (2004) have reviewed many previous typologies of mixed methods research (e.g., Morgan, 1998; Morse, 1991; Onwuegbuzie & Teddlie, 2003; Tashakkori & Teddlie, 1998;), and provided a framework to specify dimensions to be considered in classifying different mixed methods research designs. They have then used the framework to describe two main types of mixed methods research designs with subcategories of each, and to explain the processes of mixed methods research. According to Johnson and Onwuegbuzie (2004), the classification of mixed methods research should be based on the considerations of six dimensions, including whether mixing happens within a single stage or across different stages of research, paradigm emphasis, sequencing of qualitative and quantitative components, the degree of mixing, the specific location of mixing (objective, data collection, analysis, or interpretation), and whether the overall orientation is explicitly ideological or not (pp. 19-20). Based on these
considerations, Johnson and Onwuegbuzie (2004) have proposed two main types of
designs of mixed methods research: mixed-model designs and mixed-method designs.

Table 6 below summarizes the two main types of designs with their subcategories and the
major classifying factors.

Table 6. Johnson and Onwuegbuzie’s (2004) classification system

<table>
<thead>
<tr>
<th>Design</th>
<th>Subcategories</th>
<th>Classifying Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed-model</td>
<td>Within-stage</td>
<td>• Conceptualize research as involving three stages:</td>
</tr>
<tr>
<td></td>
<td>QL + QL + QN</td>
<td>identifying research objectives,</td>
</tr>
<tr>
<td></td>
<td>QL + QN + QL</td>
<td>collecting data, and analyzing data</td>
</tr>
<tr>
<td></td>
<td>QL + QN + QN</td>
<td>Consider when mixing would happen</td>
</tr>
<tr>
<td></td>
<td>QN + QL + QL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>QN + QL + QN</td>
<td></td>
</tr>
<tr>
<td></td>
<td>QN + QN + QL</td>
<td></td>
</tr>
<tr>
<td>Mixed-method</td>
<td>Equal emphasis + Concurrent</td>
<td>• Consider emphasis given to different paradigms</td>
</tr>
<tr>
<td></td>
<td>Equal emphasis + Sequential</td>
<td></td>
</tr>
<tr>
<td></td>
<td>One dominants + Concurrent</td>
<td>• Consider timing of components</td>
</tr>
<tr>
<td></td>
<td>One dominants + Sequential</td>
<td></td>
</tr>
</tbody>
</table>

*Note. QL = qualitative; QN = quantitative.*

Johnson and Onwuegbuzie’s (2004) classification system outlined in Table 6
above offers a way to plan a mixed methods study, but the differences between the two
basic types of designs do not seem to be very clear, and to some extent, there is overlap.
Meanwhile, the classification system seems to focus mostly on questions about when and
where mixing happens, and thus does not provide much help for researchers to make the
important connections between specific types of research designs and their research
questions. In addition, whereas the open-ended nature of the system lends itself to
modifications for more complex and creative research designs (Johnson and
Onwuegbuzie, 2004), it also creates difficulties for researchers using mixed methods
research to establish basic and consistent practices. Although Johnson and Onwuegbuzie
(2004) have presented a process model summarizing the major steps in conducting mixed
Based on a more comprehensive review and summary of different ways of classifying mixed methods research designs, Creswell and Plano Clark (2007) have developed a “parsimonious and functional” classification system (p. 59). The authors first distinguish four main types of designs according to the overall purpose of using mixed methods: triangulation, embedded, explanatory, and exploratory. Each design has subcategories that are termed as variants or models that seem to differentiate more specific purposes of research. For example, the first main type, triangulation, has four variants: convergence, data transformation, validating quantitative data, and multilevel. The purpose of the triangulation design overall is to obtain complementary data to better address a research question, and its first variant, the convergence model, aims to compare and contrast results based on qualitative and quantitative data on the same phenomenon and to converge findings during the interpretation. In explaining the differences between the four major designs and their variants, the authors focus on the general procedure involved, the characteristics of the timing and phases of mixing, and the weight of the qualitative and quantitative components. Since the classification system outlined by Creswell and Plano Clark (2007) follows a functional approach, it is more helpful in conceptualizing and comparing how different research designs may be used to achieve a research purpose, and subsequently in identifying the most appropriate one based on one's research questions. Table 7 below displays the four main types of research designs and their variants.
Table 7. Creswell and Plano Clark's (2007) classification system

<table>
<thead>
<tr>
<th>Design Type</th>
<th>Variants/Models</th>
</tr>
</thead>
</table>
| Triangulation | • Convergence  
|              | • Data transformation  
|              | • Validating quantitative data  
|              | • Multilevel  |
| Embedded     | • Embedded experimental  
|              | • Embedded correlational  |
| Explanatory  | • Follow-up explanations  
|              | • Participant selection  |
| Exploratory  | • Instrument development  
|              | • Taxonomy development  |

Therefore, the research design of the current study was selected based on Creswell and Plano Clark's (2007) classification framework. Specifically, the purpose of my study was to investigate how the SCMC tasks may affect the development of L2 linguistic competence and L2 academic literacy, and that I was interested in understanding such development demonstrated in outcome tests and as they unfold in the learning processes. The outcomes were planned to be measured by timed writing tests and thus would generate quantitative data to demonstrate the overall effects of SCMC tasks. To examine the processes of L2 development, however, entails observations of language use over time, and thus it would require move-involved analyses of qualitative data. Therefore, I chose the participant selection model within the two-phase explanatory design, as illustrated in Figure 2 below. The decision to use the two-phase explanatory design, and more specifically the participant selection model, came from an iterative process of considering the possible research designs against my research questions and the feasibility of and the practical concerns for implementing each. The purpose of the explanatory design is to use the rich qualitative data to provide more insights and explanations for the quantitative results, which fits my overall research objective of
examining both the outcomes and processes of L2 development, and more importantly provides a clear road map of carrying out such a study in two phases.

More specifically, a quantitative quasi-experiment in the first phase could be used to examine the overall effects of the SCMC tasks on L2 development as shown in outcome tests, and a qualitative component in the second phase could be adopted to further investigate the processes of the development of L2 linguistic competence and L2 academic literacy. Within the explanatory design, there are the follow-up explanation model and the participant selection model. The main difference between the two models is whether the qualitative component is used to explain the previous quantitative results or to conduct in-depth analyses of some aspects of certain participants selected based on the previous quantitative results. Thus, the follow-up explanation model focuses on the quantitative component while the participant selection model focuses on the qualitative component. As explained above, my purpose of including a qualitative component was to

![Figure 2. The participant selection model within the two-phase explanatory design. QUAN = quantitative; QUAL = qualitative.](image)
look into the details of L2 development as it emerges in the processes of language use, and I planned to connect such development to the possible changes in the learning outcomes. Therefore, I decided to use the participant selection model that would allow me to select focal students representing different levels of improvement based on the outcome tests from the first phase of the quantitative quasi-experiment, and to further analyze the focal students’ development of both L2 linguistic competence and L2 academic literacy throughout the study as reflected in their language use in the SCMC discourse and samples of academic writing.

To further illustrate, the quasi-experiment in the first phase was designed to test the effects of SCMC tasks on learners’ development of L2 linguistic competence in academic writing, and to provide a context for the subsequent in-depth analyses of the development of L2 linguistic competence and L2 academic literacy of the selected focal students. Global measures of L2 written accuracy, complexity, and fluency were used to code forty-four participants' writing samples collected from a pre-study and a post-study timed essay test, and to assess the effects of SCMC tasks on L2 development in academic writing. The quasi-experiment involved twenty-one participants in a treatment condition and twenty-three participants in a control condition. The outcome data set was first analyzed following the suggested analytical techniques for the experimental design with one between-subjects factor and one within-subjects factor in the same study, or what is sometimes called a split-plot design (Maxwell & Delaney, 2004, pp. 592-610) or a mixed-model ANOVA design (Shannon & Davenport, 2001, p. 273). Furthermore, the same data set was re-analyzed using concepts and techniques informed by multilevel analysis to account for the variability on the dependent variables possibly caused by
nested sources as a result of the SCMC tasks having been carried out in small groups (Snijders & Bosker, 2012). The results from the two approaches to the analysis of the data from the quasi-experiment were converged to determine whether or not the participants’ change of L2 accuracy, complexity, and fluency from the pretest to the posttest was dependent upon their membership in the treatment group, and whether or not the conclusions based on the mixed-model ANOVA analysis can still hold after making further distinction between the variability cased by the treatment condition and that caused by characteristics of the small groups.

In addition to testing the overall effects of SCMC, the results from the quasi-experiment have also provided a clear context to identify interesting focal students to further examine the processes of the development of L2 linguistic competence and L2 academic literacy. The dependent variable on which the SCMC tasks had significant effects was used for the selection of the focal students, and three participants from each of the two conditions were selected to represent different levels of improvement on the chosen dependent variable: high, middle, and low.

Thus, the second phase involved multiple case studies of the six focal students and their small group members. The processes of L2 development of the selected students were examined using three types of data. First, two additional timed essay tests were administered during the study, and thus a total of four samples of academic writing was collected from each of the focal students. Second, the SCMC interactions of the focal students and their group members in the treatment condition were saved as chat transcripts, and four selected sessions of the SCMC interactions of the focal students were included in the analysis. The samples of academic writing were first measured by
L2 accuracy, complexity, and fluency, and then assessed by the extent to which they constituted effective academic arguments. The SCMC discourse, on the other hand, was first coded for the opportunities for L2 acquisition based on both the Interaction approach and the sociocultural perspective of L2 learning, and then coded for the opportunities emerged for the students to learn to construct effective arguments by responding to each others' views and from exposure to and practices of the use of meta-discourse devices. The opportunities for L2 acquisition and the development of the ability to construct effective arguments were then connected to the changes in the two aspects shown in the students' samples academic writing. Lastly, the focal students' self-reported data were used to examine their views on the use of the SCMC tasks and their change over time. The multiple case studies in the second phase relied on in-depth analysis to reveal the learning processes by identifying the opportunities for L2 learning in the SCMC discourse, and explored the connections between the learning outcomes, the learning processes, and the students' perspectives by connecting patterns observed in the SCMC discourse and themes emerged from the students' reflections to changes shown in the samples of academic writing of the focal students.

Therefore, the participant selection model within the two-phase explanatory design fits the objectives of the study, and has effectively helped its conceptualization and implementation, with the qualitative and the quantitative components being connected purposefully and systematically. In other words, the mixed methods research design has allowed the researcher to draw upon the complementary strengths of the qualitative and the quantitative research traditions to examine both the overall effects of SCMC tasks and the details of the processes of learning emerged in the SCMC discourse,
and therefore the mixed methods research design has enabled the researcher to address the research questions concerning the role of SCMC tasks in facilitating the development of L2 linguistic competence and L2 academic literacy more effectively.

3.4 Context

The study was conducted in two sections of an ESL academic writing course in a major university in the Midwest in the United States in the fall of 2011. The university emphasizes the integration of technology in teaching, learning, and research, and the Applied Linguistics program that coordinates the ESL courses focuses on the use of technology in language teaching and learning. In addition to using technologies in teaching online writing courses, instructors of the ESL writing courses are encouraged to use various tools in WebCT (replaced by Blackboard in Spring 2012) and Moodle to create learning opportunities in the classroom. Most computer-assisted language learning activities follow the idea of using technologies to provide authentic language input, to motivate students to be engaged in collaborative activities, and to facilitate focusing on form in activities with a communicative goal by using text-based communication platforms such as text-based chat, discussion boards, blogs, wikis, and emails.

The Applied Linguistics program offers two levels of ESL writing course for incoming undergraduate international students. The lower-level course focuses on paragraph writing and the basics of English grammar, and the higher-level course focuses on essay writing and English grammar in the context of academic writing. Placement decisions are made based on the results of a writing test students take upon entering the university. Some students need to take both the lower-level and the higher-level course
while others may only need to take the higher-level course prior to their enrollment in the first year composition courses.

The study was conducted in the higher-level ESL academic writing course because the research objectives are more compatible with its curriculum goals. Different sections of the writing course share a basic curriculum that emphasize the process writing pedagogy and the teaching of modes-based writing strategies. Throughout a semester, students are expected to complete four major paper assignments: a personal essay, a cause-and-effect essay, a comparison-and-contrast essay, and an argumentative essay. For all the paper assignments, students are required to write a rough draft, to go through some review and editing activities, and to produce a revised draft. Lectures and classroom activities are provided to move students along this writing process for the four paper assignments. Two sections of the higher-level ESL academic writing course taught by the researcher were involved in the current study.

Prior to the study, the researcher had taught the same course four times and observed that a major challenge in teaching academic writing to inexperienced ESL writers is to help them develop their abilities to construct convincing arguments. Research suggests that argumentative writing activities quite often lack the meaningful contexts that lead to “students’ conflicted perceptions of the purposes and audiences for formulating arguments in a classroom setting” (Newell et al., 2011, p. 277). It is true that students usually regard the teacher as the primary audience for their writing assignments, and they may not be motivated enough to attempt to persuade in serious ways. Rather, students’ goal is, quite often, to complete a writing assignment. For ESL writers, additional difficulties in constructing arguments in English academic essays may be
caused by their “L1 discourse traditions, conventions, and rhetorical value systems” (Hinkel, 1999, p. 1). For example, L2 writing was found to lack support and discussion of opposing views, and was generally perceived as more subjective as compared to L1 writing (Chandrasegaran, 2008; Hinkel, 1999). Moreover, to help students practice presenting and defending their own points of views by organizing face-to-face discussion or debate in a classroom setting may create a competitive environment where some students may engage in combative disputes while others may be hesitant to participate because they may want to avoid confrontations or they are not confident enough in their oral language proficiency.

Organizing group discussion or debate through computer-mediated communication tools may offer some possibilities to address these concerns. Research suggests that the integration of SCMC and the task-based approach has great potential for language teaching and learning (Peterson, 2010). In reviewing the interactionist and the sociocultural perspectives of how interactions in SCMC may affect language learning, Peterson (2010) has acknowledged possible limitations, but largely confirmed the potential benefits of tasks carried out in SCMC. Moreover, to engage students in SCMC tasks designed to practice constructing arguments would add some perceived distance between group members during their discussions and thus may help mediate the potentially competitive environment while keeping the sense of the immediate and meaningful context and audience created by group discussions.

Meanwhile, most ESL students enrolled in the higher-level ESL academic writing course are confronted with the challenge of using more complex and accurate words and sentence structures to express their ideas precisely and appropriately. As explained in
Chapter 2, SCMC tasks seem to have great potential in facilitating learners' noticing of language form due to the visual saliency and the slower processing speed enabled by the new medium. Therefore, the higher-level ESL academic writing course provides a natural context to carry out the SCMC tasks and to investigate how the SCMC tasks may affect the students' development of both L2 linguistic competence and L2 academic literacy.

3.5 Participants

3.5.1 Participants in the quasi-experiment

The quasi-experiment was carried out in two sections of the higher-level ESL academic writing course taught by the researcher over a sixteen-week semester. There were twenty-one students in the section assigned to the treatment condition, and twenty-four students in the section assigned to the control condition. Both sections used the same textbooks, were given the same writing assignments, and met in the morning on Tuesdays and Thursdays, with the treatment section meeting between 9:30am and 10:50am and the control section meeting between 11am and 12:20pm. Moreover, the students in both sections were divided into small groups of three, and worked on the same set of weekly group tasks. By design, the two sections differed on the between-subjects variable: condition. Specifically, the students in the treatment condition completed the weekly group tasks using seven separate group chat rooms in WebCT in a computer lab while the students in the control condition completed their weekly group tasks in eight small groups face-to-face in a traditional classroom.

The participants in the study were from two intact sections. However, the researcher believes that the possibility of systematic differences between the participants
assigned to the two conditions is low because of the following reasons. First, as a basic preparatory course for the incoming undergraduate international students who may benefit from extra coursework in writing, the ESL academic writing course offers many sections every semester to accommodate students’ schedules. Thus, the main consideration for a student to choose to enroll in a particular section of the course is probably his or her schedule. In the fall semester of 2011 when the study was carried out, there were altogether eight sections. Second, the teaching assignment was decided based on the researcher’s schedule, and the decision was made before most of the students enrolled in the two sections. Furthermore, the researcher had assigned one section to the treatment condition and the other to the control condition before the semester started. With the same basic syllabus, textbook, paper assignment sheets, teacher, and the English placement test results indicating similar level of English writing proficiency, there is no strong reason to believe that the two sections differed systematically on major confounding variables. Table 8 below provides more background information of the participants in the quasi-experiment. One student in the control section dropped out of the course toward the end of the semester and thus the number of participants involved in the final analyses was twenty-one in the treatment section and twenty-three in the control section.

As shown in Table 8 below, the participants in the two sections were essentially comparable in terms of the gender ratio, L1 background, English proficiency level, length of formal English education, and the values for the range and the mean of the students’ English use outside class and technology use in learning English as measured by a pre-study questionnaire.
Table 8. Background information of the participants (means in parentheses)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Treatment (n = 21)</th>
<th>Control (n = 23)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>11</td>
<td>15</td>
</tr>
<tr>
<td>Female</td>
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<tr>
<td>Mongolian</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Nepalese</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Vietnamese</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Finish</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Turkish</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>English proficiency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOEFL iBT range</td>
<td>530-620 (575)</td>
<td></td>
</tr>
<tr>
<td>TOEFL PBT range</td>
<td>71-90 (79)</td>
<td>71-104 (86)</td>
</tr>
<tr>
<td>IELTS range</td>
<td>6-6.5 (6)</td>
<td>6-6.5 (6)</td>
</tr>
<tr>
<td>Formal English education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-3 years</td>
<td>5%</td>
<td>9%</td>
</tr>
<tr>
<td>3-4 years</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Over 4 years</td>
<td>90%</td>
<td>87%</td>
</tr>
<tr>
<td>English use outside class</td>
<td>2-25 (14)</td>
<td>5-25 (12)</td>
</tr>
<tr>
<td>Technology in learning</td>
<td>9-32 (19)</td>
<td>13-33 (21)</td>
</tr>
</tbody>
</table>

Specifically, in both sections, the number of male students was larger than that of the female students, although there were several more male students in the control section. Both sections had over 70 percent of L1 Chinese speakers, and around 20 percent of L1 Asian language speakers. The students’ scores on standardized English proficiency tests were also quite similar. The range and mean of TOEFL iBT scores were comparable, except for one outlier (104) in the control section that pulled the mean of the control section toward the higher end, based on the score interpretation guide provided by ETS (http://www.ets.org). The range and the mean of IELTS scores for both sections were the same. According to the IELTS website, the total IELTS score is reported as an overall
band score using a Band Scale from 1 to 9 (http://www.ielts.org). A few students in the treatment section reported TOEFL PBT scores, and the range (530-620) and the mean (575) also fell within the low intermediate to high intermediate range. According to the official website of ETS, the total TOEFL PBT score is reported on a scale that ranges from 310 to 677 (http://www.ets.org). In terms of formal English education prior to this study, 90 percent of the students in the treatment section and 87 percent of the students in the control section reported that they had over 4 years of English education prior to the beginning of the current study.

The results from the pre-study questionnaire also indicated that the students enrolled in the two sections were comparable in their English use outside class and technology use in learning English. The pre-study questionnaire measured the students’ English use outside class using a scale ranging from 0 to 36, with 0 indicating minimum use of English outside class and 36 indicating high frequency of English use outside class. The class means on English use outside class were 14 and 12 for the treatment and the control section, indicating that the students in neither section used English very much in their daily life. The pre-study questionnaire also measured the students’ use of technology in learning English, using a scale ranging from 0 to 48, with 0 indicating minimum use of technology in learning English and 48 indicating high frequency of using technology in learning English. The class means on using technology to learn English were 19 and 21 for the treatment and the control section, suggesting that the students in the two sections were quite similar in their moderate frequency of using technology in learning English.
As described above, the participants in the quasi-experiment can be regarded as representative of undergraduate international students enrolled in a major university in the Midwest of the United States during the same period of time who need additional help with ESL academic writing. Additionally, since the purpose of the study was to examine the effects of an instructional method, setting up the quasi-experiment in the two intact classes may, with careful planning to reduce threats to the internal validity of the experiment, strengthen the external validity of the quasi-experiment because findings would be based on multiple observations of students’ language use in a more natural context overtime, instead of results from particular experimental manipulations in a more controlled environment.

### 3.5.2 Participants in the multiple case studies

The second phase involved multiple case studies of twelve focal students selected based on the findings from the quasi-experiment. Specifically, three students from the treatment section, Herman, Frederick, and Hannah, and three students from the control section, Charles, Dennis, and Frank, were selected to represent different levels of improvement from the pre-test to the post-test on the key dependent variable on which the SCMC tasks have been shown to have significant positive impact. Since the analyses of the interaction data of the three focal students from the treatment condition also involved their small group members, and that the three selected focal students were all from different small groups, the total number of the focal students involved in the second phase was twelve. Table 9 below displays the background information of the selected focal students and their group members.
<table>
<thead>
<tr>
<th></th>
<th>Gender</th>
<th>L1</th>
<th>English proficiency</th>
<th>Formal English education (years)</th>
<th>English use outside class</th>
<th>Technology use in learning English</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Treatment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Herman</td>
<td>M</td>
<td>Malay</td>
<td>90</td>
<td>Over 4</td>
<td>22</td>
<td>25</td>
</tr>
<tr>
<td>Finley</td>
<td>M</td>
<td>Chinese</td>
<td>86</td>
<td>Over 4</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td>Lambart</td>
<td>M</td>
<td>Chinese</td>
<td>71</td>
<td>Over 4</td>
<td>9</td>
<td>15</td>
</tr>
<tr>
<td>Frederick</td>
<td>M</td>
<td>Chinese</td>
<td>71</td>
<td>Over 4</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>Wynne</td>
<td>M</td>
<td>Chinese</td>
<td>71</td>
<td>Over 4</td>
<td>14</td>
<td>17</td>
</tr>
<tr>
<td>Zach</td>
<td>M</td>
<td>Chinese</td>
<td>78</td>
<td>Over 4</td>
<td>20</td>
<td>22</td>
</tr>
<tr>
<td>Hannah</td>
<td>F</td>
<td>Chinese</td>
<td>76</td>
<td>Over 4</td>
<td>13</td>
<td>26</td>
</tr>
<tr>
<td>Sarah</td>
<td>F</td>
<td>Chinese</td>
<td>74</td>
<td>Over 4</td>
<td>16</td>
<td>23</td>
</tr>
<tr>
<td>Patricia</td>
<td>F</td>
<td>Vietnamese</td>
<td>530*</td>
<td>Over 4</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td><strong>Control</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Charles</td>
<td>M</td>
<td>Chinese</td>
<td>6.5b</td>
<td>Over 4</td>
<td>13</td>
<td>26</td>
</tr>
<tr>
<td>Dennis</td>
<td>M</td>
<td>Chinese</td>
<td>72</td>
<td>Over 4</td>
<td>5</td>
<td>19</td>
</tr>
<tr>
<td>Frank</td>
<td>M</td>
<td>Chinese</td>
<td>Missing</td>
<td>3 - 4</td>
<td>7</td>
<td>13</td>
</tr>
</tbody>
</table>

Note. M = Male; F = Female.

*a* This refers to a TOEFL PBT score. *b* This refers to an IELTS score. All the others are TOEFL iBT scores.

Nine focal students, or three triads, from the treatment section were selected, including Herman, Frederic, and Hannah, and their respective group members. Since the analysis of the data from the control section did not involve any interaction data, only three focal students from the control section were selected, including Charles, Dennis, and Frank. Among the twelve participants, only one triad consisted of female students. Except for a Malay speaker and a Vietnamese speaker, all the other participants were Chinese speakers. Based on the reported scores on the TOEFL iBT, TOEFL PBT, and IELTS tests, the twelve participants can be all regarded as intermediate to high intermediate English learners, except for Frank whose language test score was not reported. They all probably had similar lengths of formal English education. Frank reported that he had 3-4 years of English education, and all the others have reported having over 4 years of English education. With regard to English use outside class, the
tendency among the twelve participants were toward the lower end of the scale. On a scale of 0 to 36, only Herman (22) and Zach (20) scored above 18. Moreover, five out of twelve scored lower than 10. The participants’ scores on technology use in learning English seemed to be more encouraging. On a scale of 0 to 48, four people, Herman (25), Finley (24), Hannah (26), and Charles (26) scored at or above 24. No one scored less than 10 in using technology to learn English.

3.6 Instruments

The instruments used in this study included 1) a pre-study questionnaire to collect information about the participants’ English learning background, English proficiency, frequency of English use outside class, frequency of technology use in learning English and other demographic information, 2) topics and materials for the twelve weekly group work sessions including the first training session, 3) four prompts for timed essay tests, 4) nine reflection questions, and 5) a post-study group evaluation questionnaire.

The pre-study questionnaire consisted of six general background items, nine items on English use outside class, and twelve items on using technology for English learning (Appendix A). The general background questions asked the students about their gender, native language(s), scores on some widely accepted language proficiency tests, years of English education prior to the study, lengths of stay in the United States, and the number of other English classes they were taking during the same semester of the study. The students completed this part of the questionnaire by filling blanks. The sub-scale of English use outside class consisted of nine items. Each item was phrased as a statement, and was followed by five choices of different levels of frequency that were assigned a
corresponding score of 0, 1, 2, 3, and 4. The highest possible score for English use outside of class was thus nine times four which equals thirty-six. The sub-scale of technology use in learning English consisted of twelve items. Each item was phrased as a question of frequency, and was followed by five choices of different level of frequency that were assigned a corresponding score of 0, 1, 2, 3, and 4. The highest possible score for technology use in learning English was thus twelve times four which equals forty-eight.

Second, discussion topics and materials were prepared to elicit language in interaction in the twelve weekly group work sessions (Appendix B). Group work sessions consisted of discussion or role-play discussion tasks that aimed to facilitate the students’ participation in discussion of controversial issues, thus helping them learn to understand concepts related to writing strategies and relevant essays through the participation in the use of academic discourse to construct effective arguments. The group discussion tasks had three distinctive features. First, all discussion tasks had a controversial issue or a problem as a focus, and all the selected issues and problems were closely related to the students’ life experience or learning experience in the writing course. Second, all discussion tasks were based on readings assigned ahead of time. Most of the group tasks were based on essays written by experienced writers, and the purpose of using them was to spark students’ interests in an issue and to help them think from different perspectives. Some of the group tasks were based on the students' own writing, and for those tasks, the purpose of using readings was to have the students focus on the small but important details of some language features through intensive analysis with an aim to find better ways to express their ideas. Third, all the discussion tasks required the groups to reach an
agreement either in answering a question of opinion, or in resolving a problem, and to summarize their results in writing.

All the group activities meet the requirements of being regarded as tasks based on Ellis (2003) because they all have “a plan for learner activity” and “a primary focus on making meaning,” allow students to engage in authentic language use, focus on developing some aspects of language skills, invite students to use cognitive skills to accomplish a goal, and have “a defined communication-based learning outcome” (pp. 9-10). The readings were all assigned at least one class period before the group work sessions, and the students had access to the readings in the textbook and the electronic copies of the readings provided by the instructor on WebCT. The instructions for the weekly group work sessions were printed out on paper and distributed to the students individually at the beginning of each session.

Third, four essay prompts were used to elicit argumentative writing under timed conditions. The four prompts (Appendix C) all followed the same pattern of first providing some background information to prepare the students to understand the controversial issue to be stated, and then stating the issue and presenting a key question asking the students to express and argue for their own position. Lastly the prompts provided hints on taking into account of different perspectives in writing up the arguments. The four prompts were all about sixty words long.

Fourth, to understand the students’ experiences and perspectives of the group work in SCMC and face-to-face interaction, nine reflection prompts were used. The reflection prompts (Appendix D) asked the students to share their experiences and views of the group tasks, the dynamics in their groups, and their learning in the group tasks. All
reflection prompts contained some open-ended questions that aimed to understand the students’ experiences and perspectives. Some questions asked about the students’ overall reaction to the group tasks or groups, while others asked more specific questions on different aspects of their group work such as their perceptions of the topics and their language use, and their interpersonal relationships in the groups. The treatment and the control section shared the same prompts for reflection one through five, but starting from reflection six, they had slightly different prompts to allow more specific questions to lead the students to reflect on different aspects of the group work in the SCMC and the face-to-face condition respectively.

Lastly, a post-study group evaluation questionnaire was used. The group evaluation questionnaire (Appendix E) consisted of fourteen Likert items designed to measure the participants’ perception of 1) how effective their groups were, 2) the extent to which their language use in group interactions approximate formal academic discourse, 3) the perceived social distance between the group members, and 4) their own expertise in English in relation to that of their group members. Table 10 below provides a summary of how the four constructs were measured and the information concerning the reliability of the sub-scales. The items were all phrased as statements and the students were asked to respond by indicating their degree of agreement or disagreement with regard to each statement.

<table>
<thead>
<tr>
<th>Construct</th>
<th>Item</th>
<th>Reliability (Cronbach’s alpha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group effectiveness</td>
<td>1, 2, 3, 4, 5, 6, 12</td>
<td>.94</td>
</tr>
<tr>
<td>Group language use</td>
<td>7, 8, 14</td>
<td>.82</td>
</tr>
<tr>
<td>Group social distance</td>
<td>11, 13</td>
<td>.82</td>
</tr>
<tr>
<td>Group language proficiency</td>
<td>9, 10</td>
<td>.91</td>
</tr>
</tbody>
</table>
The first sub-scale of group effectiveness was expected to measure the students’ perception of the extent to which their groups were engaged in interactions about the topics assigned by the instructor, and the degree to which their group members were willing to help each learn during the interactions. Since group effectiveness can be a very broad concept, seven items were used to measure the construct. The second sub-scale of group language use aimed to assess the students’ perception of whether their language use in group interactions can be mostly characterized by formal English academic discourse, and whether or not they used their native language in group interactions. Three items were created to measure this construct. The third sub-scale of group social distance was expected to measure the students’ perception of how close they were to their group members both in discussions in the classroom and outside class. Two items were used in this sub-scale. The last sub-scale of others’ language proficiency aimed to assess the students’ perception of their own language proficiency level in relation to their group members’ language proficiency levels. Two items were used in this sub-scale. The Cronbach’s alpha computed by the reliability analysis procedure in SPSS (Furr & Bacharach, 2008) for the four sub-scales was .94, .82, .82, and .91 respectively, indicating that the items in each of the sub-scales were quite consistent in measuring the same construct, considering the small number of items in each of the sub-scales.

3.7 Data Collection

The study was carried out in the fall semester of 2011. Slightly different from the data collection procedure laid out in the prototypical participant selection model within the two-phase explanatory design, the current study did not distinguish the focal students
from the rest of the participants in the data collection process. Furthermore, the quantitative data and the qualitative data were collected almost simultaneously while the study was carried out. Therefore, the following explanation describes how different types of data were collected chronologically throughout the semester. Table 11 below summarizes the major steps involved in the data collection process.

Before the first class, the students in both sections were assigned to triads on a random basis. Thus, the treatment section had seven triads and the control section had eight triads. There were a few adjustments to the triad assignments during the first two weeks because some new students signed up for the course while others dropped. After the first two weeks, most of the triads were together for the whole semester. One student from the control section dropped out in week 10, leaving one group in the control section with only two members.

Table 11. Procedure: Data collection

<table>
<thead>
<tr>
<th>Week</th>
<th>Data collection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>• Pre-study questionnaire</td>
</tr>
<tr>
<td></td>
<td>• Pre-test</td>
</tr>
<tr>
<td></td>
<td>• Other preparations</td>
</tr>
<tr>
<td></td>
<td>• Training session of group work</td>
</tr>
<tr>
<td>2-12</td>
<td>• Weekly group work session (chat transcripts)</td>
</tr>
<tr>
<td></td>
<td>• Individual reflections</td>
</tr>
<tr>
<td></td>
<td>• 2 in-class timed writing tests (week 5 &amp; 9)</td>
</tr>
<tr>
<td>13</td>
<td>• Post-test</td>
</tr>
<tr>
<td>15</td>
<td>• Post-study questionnaire: Group evaluation</td>
</tr>
</tbody>
</table>

During the first week, the researcher obtained the students’ informed consent to participate in the study, administered the pre-study questionnaire and the pre-test using the first writing prompt. The pre-test was a 25-minute essay test that was completed in the classroom using pencils and paper. The first group work session in week 1 was a
training session where the triads in the treatment section learned to work with each other in their separate chat rooms embedded in the course website on WebCT, and the triads in the control section mainly took the opportunity to know each other and to establish some norms of group work.

From week 2 to week 12, the triads worked in twelve weekly group work sessions in SCMC and face-to-face environment respectively. The interaction data in the treatment section were saved automatically as chat transcripts every week on WebCT while that from the control section were not collected due to the purpose of the research. In addition, the triads in both sections were required to submit a written response at the end of each group work session as part of the course requirement. The triads in the treatment section typed their response in MS word documents and uploaded the files online, and the triads in the control section wrote their response on paper and handed it in at the end of each session. Group work sessions for the treatment section were carried out in a computer lab where each student had a computer workstation while the group work sessions for the control section were carried out in a regular classroom.

During the period between week 2 and week 12, the participants in both sections also completed two writing tests using writing prompt 2 and 3, and nine individual reflections. The two writing tests were both 25-minute essay tests that were completed in the classroom using pencils and paper. The individual reflections were completed outside class and were typed up on MS Word documents and uploaded to WebCT.

The post-test was administered in week 13. The post-test was a 25-minute timed essay test using writing prompt 4. The participants completed the test in the classroom
using pencils and paper. In week 15, the participants completed their evaluation of their groups in the post-study questionnaire.

Using the five main types of instruments described in the previous section and following the procedure explained above, the researcher collected from each of the forty-four participants 1) four writing samples under timed condition, 2) responses to the two questionnaires, and 3) individual reflections. In addition, the researcher collected the interaction data, or the automatically saved chat transcripts, from the participants in the treatment section.

3.8 Data Analysis

The above-mentioned four main types of data, writing samples, responses to questionnaires, individual reflections, and chat transcripts, were analyzed sequentially in two phases (Creswell & Plano Clark, 2007, p. 142), in line with the basic procedure of data analysis laid out in the participant selection model within the two-phase explanatory research design. Briefly, the analysis in the quasi-experiment in the first phrase aimed to test the effects of SCMC tasks on L2 writing proficiency in general, and to identify representative cases for follow-up analyses in the second phase. For these purposes, quantitative methods were used in analyzing quantitative data. In the second phase, the purpose was to identify cases that can represent different levels of improvement on the key dependent variable on which SCMC tasks have been shown to have significant positive impact, to look more closely at the opportunities emerged in the SCMC discourse to help the focal students develop their L2 linguistic competence and L2 academic literacy, and to explore the connections between the opportunities in the SCMC
discourse and the demonstrated changes in the writing samples. Therefore, both qualitative and quantitative methods were used in analyzing qualitative data in the second phase.

3.8.1 Data analysis in the quasi-experiment

The analysis in the first phase focused on the eighty-eight writing samples from the pre-test and the post-test, and the participants’ responses to the pre-study and the post-study questionnaire. The following four steps have guided the data analysis in this phase. The first step was to prepare the eighty-eight writing samples and the data from the two questionnaires for analysis. Specifically, all the writing samples were typed up by the researcher into MS Word documents as they appeared on paper. Capitalization, punctuation, paragraphing, and spelling mistakes were kept as they were. Unrecognized words, however, had to be typed up based on the researcher’s judgment. Phrases, sentences, or paragraphs that were crossed out by the students were left out. Paragraphs were indicated in the MS Word files when students signified so by using indentation, line spacing, or other marks. The researcher checked the electronic files against the paper files immediately after each handwritten file was typed up, and corrected inconsistencies immediately. Converting handwritten files into MS Word files has greatly facilitated the subsequent coding for grammatical complexity, lexical complexity, accuracy, and fluency.

All the MS Word files were then converted into text files that are readable by corpus tools. As was explained in Chapter 2, the measures chosen for the four constructs of grammatical complexity, lexical complexity, accuracy, and fluency were the number of clauses per sentence (C/S), the number of word types divided by the square root of two
times the total number of words (WT/√2w), the number of errors per clause (E/C), and the number of words per minute (W/M). The third column from the left in Table 12 below shows more specifically the basic variables needed to calculate the values on the four measures for each of the writing samples. The last column from the left in Table 12 also indicates how the coding of the basic variables was done.

Table 12. Constructs and measures

<table>
<thead>
<tr>
<th>Construct</th>
<th>Measure</th>
<th>Basic Variables</th>
<th>Coded By</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grammatical</td>
<td>The number of clauses per sentence (C/S)</td>
<td>• The number of clauses</td>
<td>• The researcher</td>
</tr>
<tr>
<td>complexity</td>
<td></td>
<td>• The number of sentences</td>
<td>• UAM CorpusTool 2.7.2 &amp; the researcher</td>
</tr>
<tr>
<td>Lexical</td>
<td>The number of word types divided by the square root of two times the total number of words (WT/√2w)</td>
<td>• The number of word types</td>
<td>• AntWordProfiler 1.200m</td>
</tr>
<tr>
<td>complexity</td>
<td></td>
<td>• The total number of words</td>
<td>• UAM CorpusTool 2.7.2</td>
</tr>
<tr>
<td>Accuracy</td>
<td>The number of errors per clause (E/C)</td>
<td>• The total number of errors</td>
<td>• UAM CorpusTool 2.7.2</td>
</tr>
<tr>
<td>Fluency</td>
<td>The number of words per minute (W/M)</td>
<td>• The total number of words</td>
<td>• Given: 25 minutes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Time limit</td>
<td></td>
</tr>
</tbody>
</table>

Specifically, to measure the grammatical complexity of the writing samples, the researcher first hand coded the clauses and counted the total number of clauses, and then imported the text files into UAM CorpusTool (O'Donnell, 2011) that automatically counted the number of sentences in the files. The researcher then hand coded the sentences in the files to confirm the automated counts. The files with different counts from the researcher and the software were hand coded again, and the final hand-coded results were used. To measure the lexical complexity of the writing samples, the saved
text files were imported to AntWordProfiler (Anthony, 2012) and UAM CorpusTool (O'Donnell, 2011) respectively, and the software then processed the text files and provided automated counts of the number of word types and the number of words respectively. The coding for the accuracy measure was more intensive. First, the error-coding scheme created based on a pilot study was imported into UAM CorpusTool (O'Donnell, 2011) as an annotation layer, and then all the writing samples saved as text files were imported. Then, the researcher identified and classified all the errors in the writing samples by underlining the error segments and assigning them an error category from a drop-down menu that contains all the twenty-seven categories of errors specified in the final error coding scheme. The total number of error segments in each text file that was counted automatically was recorded as the total number of errors. The researcher coded this part of the data set twice with an intra-rater reliability of 95 percent in error identification and 90 percent in error classification. According to Mackey and Gass (2005), the researcher may decide to have a second rater to code between 10 percent and 100 percent of the data set, depending on the nature of the data and the coding scheme (pp. 242-243). Thus, a second rater coded about 10 percent of the writing samples, and had an agreement rate of 86 percent with the researcher in error identification and 83 percent in error classification. A third rater coded another sub-set of about 20 percent of the writing samples, and had an agreement rate of 91 percent with the researcher in error identification. All disagreements were resolved through discussion.

With regard to the fluency measure, since both the pre-test and the post-test were completed within twenty-five minutes, and that the total number of words had been counted by UAM CorpusTool, no additional coding was done for this measure. All the
counts on the basic variables were recorded in an MS Excel file, and the values on the four measures for each writing sample were computed in the Excel file. The computation thus generated each individual participant’s scores on the four key dependent variables on both the pre-test and the post-test: grammatical complexity (C/S), lexical complexity (WT/\sqrt{2w}) , accuracy (E/C), and fluency (W/M).

Preparing the questionnaire data for analysis was more straightforward. The participants completed the pre-study and the post-study questionnaires using pens and paper, and their responses on the questionnaires were coded and then entered into an MS Excel file by the researcher. With regard to the pre-study questionnaire, the participants’ responses to the first six factual questions were entered as they were answered on the questionnaire. Responses to the nine items on the sub-scale of English use outside class were coded on a scale of 0 – 4. The participants were asked to indicate the frequency of English use in different situations for different purposes outside class by choosing from “0,” “1-2,” “3-4,” “5-6,” or “7 or more” hour(s) per week. Therefore, “0” indicated the lowest frequency and “4” indicated the highest frequency. The scores on the nine items were summed up to give an estimate of the frequency of English use outside class for each individual participant. Similarly, the participants’ responses to the twelve items on the sub-scale of technology use in learning English were coded on a scale of 1 – 4. The participants were asked to indicate the frequency of using different technologies in learning English in different situations by choosing either from “0,” “1-2,” “3-4,” “5-6,” or “7 or more” hour(s) per week, or from “never,” “seldom,” “sometimes,” “frequently,” or “always.” Thus, similarly, “0” indicated the lowest frequency and “4” indicated the highest frequency. The scores on the twelve items were summed up to give an estimate of
the frequency of using technology in the learning of English for each individual participant.

With regard to the post-study group evaluation questionnaire, the participants’ responses to the fourteen items were coded on a scale of 1 – 4. The participants were asked to indicate the extent to which they agree (or disagree) with the fourteen given statements by choosing from “disagree strongly,” “disagree somewhat,” “agree somewhat,” and “agree strongly,” which were coded as “1,” “2,” “3,” and “4” respectively. After the initial coding, the Excel file was imported to SPSS 19.0 and the participants’ responses to the negatively worded items (i.e., 7, 8, 11, and 12) were reverse coded in SPSS so that a higher value represents a stronger tendency to endorse the underlying desirable small group characteristics such as more frequent use of formal academic language, groups maintaining work relationships rather than friendship, and effectiveness of group work. The scores of the items that belong to the four sub-scales of group effectiveness, group language use, group social distance, and perceived language proficiency were summed up respectively to represent each individual participant’s evaluation of their own group and group work in terms of the four small group characteristics.

The second step was data exploration. The Excel file containing the values on the four dependent variables of L2 grammatical complexity, lexical complexity, accuracy, and fluency for all the eighty-eight writing samples was imported to SPSS 19.0, and was explored and summarized using histograms and descriptive statistics including the means, the standard deviations, and the estimates of the skewness and the kurtosis of the
distribution of the scores of the four dependent variables from the pre-test and the post-test.

The responses to the pre-study questionnaire were summarized by descriptive statistics including frequency counts, means, and standard deviations. The responses to the post-study group evaluation questionnaire were aggregated on the small group level by obtaining the mean score within each small group for each of the four variables measuring group effectiveness, group language use, group social distance, and group language proficiency. Subsequently, the individual value from each group member was replaced by the aggregated small group value shared within each small group.

The third step was hypotheses testing. Based on the first research question about the change of the average scores of L2 grammatical complexity, lexical complexity, accuracy, and fluency from the pre-test to the post-test in both sections, four sets of hypotheses were formulated as shown in Table 13 below.

The goal was to test the effects of SCMC tasks on changes of L2 grammatical complexity, lexical complexity, accuracy, and fluency by examining both the direction and the magnitude of the change of the average dependent variable scores from the pre-test to the post-test. Specifically, to test the effects of SCMC tasks on each of the dependent variables, different hypothesis tests were run in SPSS 19.0 or carried out by hand calculations, depending on the characteristics of the distribution of the dependent variable scores and the differences between the descriptive statistics. Depending on the interpretation of the results based on the descriptive statistics and the examination of whether or not the distribution of the data satisfy assumptions of normality, equal variance, equal co-variance, and others, different procedures were used (Table 13).
Table 13. Dependent variables, hypotheses, and analytical technique

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Hypotheses</th>
<th>Analytical Technique</th>
</tr>
</thead>
</table>
| Grammatical complexity | • There are some differences between the grammatical complexity scores on the pre-test and the post-test for both sections.  
• There are some differences between the treatment and the control section in terms of their grammatical complexity scores on the post-test.  
• The change of grammatical complexity scores from the pre-test to the post-test depends on treatment conditions. | • Within-subjects t-test (Shannon & Davenport, 2001, pp. 253-259) |
| Lexical complexity | • There are some differences between the lexical complexity scores on the pre-test and the post-test for both sections.  
• There are some differences between the treatment and the control section in terms of their lexical complexity scores on the post-test.  
• The change of lexical complexity scores from the pre-test to the post-test depends on treatment conditions. | • Between-subjects t-test (Shannon & Davenport, 2001, pp. 203-219) |
| Accuracy | • There are some differences between the accuracy scores on the pre-test and the post-test for both sections.  
• There are some differences between the treatment and the control section in terms of their accuracy scores on the post-test.  
• The change of accuracy scores from the pre-test to the post-test depends on treatment conditions. | • Confidence intervals for linear contrasts of means (Bonett, 2011, pp. 10-14)  
• Mixed-ANOVA procedure (Shannon & Davenport, 2001, pp. 273-284) |
| Fluency | • There are some differences between the fluency scores on the pre-test and the post-test for both sections.  
• There are some differences between the treatment and the control section in terms of their fluency scores on the post-test.  
• The change of fluency scores from the pre-test to the post-test depends on treatment conditions. | • Mixed-ANOVA procedure (Shannon & Davenport, 2001, pp. 273-284) |
Specifically, when the descriptive statistics of a pair of means showed that the gap was considerably large in comparison with results from other studies, depending on the extent to which the distribution of the corresponding dependent variable scores satisfy the normality and equal variance and covariance assumption, mixed-ANOVA, within-subjects t-test, between-subjects t-tests (Shannon & Davenport, 2001) were carried out in SPSS 19.0 (Table 13). For the pair of means whose distribution of scores met few assumptions, confidence intervals for linear contrast of means (Bonett, 2011) were calculated by hand. The t-tests helped to compare different pairs of means while the mixed-ANOVA procedure can test the interaction effects between the within-subjects factor of “time” and the between-subjects factor of “condition,” the main effects of the two factors, and their simple main effects at different levels of the other factor. Moreover, 95 percent confidence intervals for the linear contrast of means that can adjust for the violation of equal variance and covariance were obtained by hand computation to test the same interaction, main, and simple main effects (Bonett, 2011).

In the fourth step, statistical methods informed by the approach of multilevel analysis were used to re-examine the quantitative data set in combination with the participants’ responses to the post-study group evaluation questionnaire. As introduced in Chapter 2, the quantitative data set in the study was found to have some features of a multilevel data structure where the students within the same small group were more similar to each other in terms of their dependent variable scores than they were to the students in other small groups, possibly due to shared characteristics of small groups in group effectiveness, group language use, group social distance, and group members’ perceptions of their relative language proficiency, all of which have been shown to be
important factors of L2 development and thus may have moderating effect on the impact of SCMC tasks on learning outcomes. Thus, although the participants were measured in the pre-test and the post-test individually and that the scores on the dependent variables at the individual level was the primary focus in the current study, using traditional hypothesis tests to examine the difference between group means and ignoring the possibility of patterns of dependency of the observations within the small groups may produce inaccurate or misleading results.

Figure 3. Theoretical model of multilevel analysis

Therefore, to examine the degree of such dependency, or the clustering effect, and the extent to which such dependency may affect the results from the traditional hypothesis tests, a theoretical model was constructed to illustrate the conceptual issues
involved in treating data set with clustering structure using traditional hypothesis tests, and two statistical approaches were used to re-analyze the data set taking into account the clustering effect. Due to the small sample size at the macro-level units (i.e., the small groups), the two approaches were not based on tests of different components in a hierarchical linear model. Instead, the first approach partitioned the total variance of the dependent variable scores into between-group variance and within-group variance, and computed the intraclass correlation coefficients (ICC) and the design effect (DEFF) to obtain a corrected value for the standard error of the mean difference score. Then, using the corrected standard error value, the first approach calculated the corrected t ratio and its corresponding p value. Specifically, the ICC is usually referred to as \( \rho \) (rho), and is defined as “the degree of resemblance between micro-units belonging to the same macro-unit” (Snijders & Bosker, 2012, p. 17). In this current study, the ICC was calculated based on Equation 1 below to indicate the degree of similarity of the dependent variable scores from the participants in the same small groups. The partition of the total variance was based on calculations from random-effects ANOVA models in SPSS 19.0. According to Equation 1, a large ICC indicates that within-group variance is small and/or between-group variance is large.

\[
\rho = \frac{\tau_{00}}{\tau_{00} + \delta^2} \quad (1)
\]

The design effect (DEFF), or the "ratio of the sampling variability for the study design compared with the sampling variability that would be expected if the study used a simple random sample (SRS)" (McCoach & Adelson, 2010, p. 153), was then calculated based on Equation 2 below.
\[
\text{DEFF} = \frac{\text{var}(\text{design})}{\text{var}(\text{SRS})} = 1 + \rho(\overline{n}_j - 1) \quad (2)
\]

Research has shown that when the DEFF is equal to 1, there is no clustering effect; however, when the DEFF is larger than 1, it is likely that certain association or correlation between cases exist in the data set. Moreover, the square root of the DEFF, or the DEFT could be used as an approximation to estimate "the degree to which the standard errors need to increase to account for the clustering" (McCoach & Adelson, 2010, p. 154). Thus, based on the DEFT, the corrected t ratio and its corresponding p value were computed as more accurate results.

The second approach followed the general linear regression analysis framework (Cohen et al., 2002) to compare models and to find a parsimonious model that can best explain the variance in the dependent variable scores. The four small group characteristics were measured by the students' ratings of their perception of group effectiveness, language use, social distance, and relative language proficiency. The individual ratings were then aggregated and were used to examine how they have affected the students' learning outcomes alone, and together with the other variables, including a dummy coded variable of "condition" and an individual level variable of "pre-test." Finally, the results based on the two approaches were compared with the findings from the single-level analysis.

3.8.2 Data analysis in the multiple case studies

The analysis in the second phase focused on learner language and learner reports collected from the twelve focal students. First, three participants from each of the two sections were selected to represent the highest, medium, and the lowest level of
improvement on a key dependent variable on which significant impacts of SCMC tasks
were detected. Then the group members of the three selected participants in the SCMC
section, or a total of six other participants, were identified and included in the analysis.
Thus the total number of participants involved in the analysis in the second phase was
twelve. Data collected from the twelve focal students include: four writing samples and
nine individual reflections from all of them, and the transcripts of the SCMC discourse
from the three triads, or the nine focal students in the SCMC section. Among the four
writing samples, two writing samples were from the pre-test and the post-test, and the
other two were from the two additional essay tests administered during the semester.

The goal of the analysis in the second phase was to examine closely how the
group tasks carried out face-to-face and in SCMC may affect the learning processes, and
how such learning experiences may influence the participants’ perceptions of the SCMC
and the face-to-face tasks, and the learning outcomes. Therefore, the analysis followed
three main steps to examine the learning processes shown in the SCMC discourse and the
writing samples in terms of both the learning of a second language and the development
of L2 academic literacy, and the participants' perceptions of their learning in the group
tasks carried out face-to-face and in SCMC. The first step focused on identifying
opportunities for L2 learning emerged in the SCMC discourse of the three triads from the
SCMC section based on the Interaction approach (Long, 1996; Varonis & Gass, 1985)
and the sociocultural perspectives of L2 learning (Swain, 2000, 2001; Swain & Lapkin,
1998, 2001). Four SCMC sessions that were carried out in the same or immediately
following week of the timed writing tests were selected. The transcripts of the four
SCMC sessions of the three triads were coded for the opportunities for L2 learning based
on a coding scheme informed by both the Interaction approach and sociocultural theories of L2 learning (Appendix F). As introduced in Chapter 2, instances of negotiation of meaning, co-construction, other correction, self-correction, continuer, and language play all have potential benefits for L2 learning. While negotiation of meaning focuses on learners' efforts in resolving a linguistic problem when there is a communication breakdown, the other types of instances would capture important roles of interactions in language learning when there is no communication breakdown. Although language-related episodes may well complement negotiation of meaning in capturing the L2 learning opportunities in interactions, the study chose to use more specific categories in order to provide details of what was involved in the SCMC discourse when the participants were working on tasks. Raw frequencies were counted, and the percentages of each type of instances in the total number of turns in each group session were computed. The opportunities for L2 learning emerged in the SCMC discourse of the three triads were then examined in comparison with the change of grammatical complexity, lexical complexity, accuracy, and fluency across the four writing samples of the nine focal students.

Second, the transcripts of the SCMC discourse from the four selected sessions and the writing samples were re-analyzed to examine how the three triads were engaged in SCMC discussion to practice building arguments, and the extent to which the characteristics of the learning in the SCMC discourse may be transferred to academic writing. The SCMC discourse was examined to identify and classify instances or moves where the participants were engaged in building their own arguments or commenting on others' arguments. As introduced in Chapter 2, the coding scheme (Table 14) for the
argumentative moves in the SCMC discourse was informed by educational research that uses dialogues to help develop learners' ability to construct effective arguments (Kuhn et al., 2008).

Table 14. Coding scheme for the argumentative moves in the SCMC discourse

<table>
<thead>
<tr>
<th>Category</th>
<th>Move</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argument</td>
<td>Orientation</td>
<td>To present an issue and provide some background information</td>
</tr>
<tr>
<td>Thesis</td>
<td></td>
<td>To state one's opinion on the issue</td>
</tr>
<tr>
<td>Definition</td>
<td></td>
<td>To define controversial or ambiguous terms in order to make an argument more effective</td>
</tr>
<tr>
<td>Support</td>
<td></td>
<td>To provide specific supporting points</td>
</tr>
<tr>
<td>Opposing views</td>
<td></td>
<td>To acknowledge and discuss opposing views</td>
</tr>
<tr>
<td>Summary</td>
<td></td>
<td>To restate the thesis and summarize the main supporting points as a conclusion</td>
</tr>
<tr>
<td>Response</td>
<td>Questioning</td>
<td>To raise questions about others' argument</td>
</tr>
<tr>
<td>Disagreement</td>
<td></td>
<td>To indicate disagreement with others</td>
</tr>
<tr>
<td>Agreement</td>
<td></td>
<td>To indicate agreement with others</td>
</tr>
<tr>
<td>Support/clarification</td>
<td></td>
<td>To help others clarify or support their arguments</td>
</tr>
</tbody>
</table>

Based on the coding scheme, argumentative moves of the three triads were identified and classified into ten different types of moves that were divided into two main categories. The two main categories aimed to track the participants' development in attending to and integrating others' perspectives in building their own arguments.

Specifically, the increasing use of moves in the second category of "response" indicates an increase of awareness and practice of attending to and integrating others' perspectives in building one's own arguments. Raw frequencies of each move and category total were counted, and the percentages of the move to the total number of turns of each group session were computed to track the changes of percentage of each move and each category total.

Similar to the first step, the writing samples of the nine focal students were examined in comparison with the results from the analysis of the SCMC transcripts.
However, the analysis of the argumentative moves in the writing samples was based only on the coding of the six moves in the first category, and with some slight differences in their purposes in academic writing (Table 15). Both coding schemes were created based on findings from genre studies (Derewianka, 1990; Feez & Joyce, 1998; Schleppegrell, 2004; Veel, 1997).

Table 15. Coding scheme for the argumentative moves in the writing samples

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Move</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
<td>Orientation</td>
<td>The orientation aims to provide some background information of the issue to be discussed.</td>
</tr>
<tr>
<td>T</td>
<td>Thesis</td>
<td>The thesis states the author's position with regard to the controversial issue and may include a brief outline of the supporting points.</td>
</tr>
<tr>
<td>D</td>
<td>Definition</td>
<td>The definition helps the author clarify controversial terms from his/her perspective.</td>
</tr>
<tr>
<td>SP</td>
<td>Supporting points</td>
<td>The supporting points provide substantial reasoning or evidence in support of the author's view stated at the beginning.</td>
</tr>
<tr>
<td>OV</td>
<td>Opposing views</td>
<td>Awareness of and/or discussion of opposing view in light of the author's perspective may help provide support for the author's own views.</td>
</tr>
<tr>
<td>S</td>
<td>Summary</td>
<td>The summary aims to reinforce the author's views and the most important supporting points at the end.</td>
</tr>
</tbody>
</table>

The coding scheme for the writing samples included six essential moves of an effective argument: orientation, thesis, definition, supporting arguments, opposing views, and summary. The researcher believes that if the students use all the six moves in their writing, not necessarily in the order they are listed, they would produce an essay with a fairly effective written argument. The writing samples were analyzed in terms of their argumentative moves, and the presence and absence of each of the six moves in the four writing samples of each of the focal students were recorded, and the patterns of change
across the four writing samples were examined in comparison with the patterns of argumentative moves in the SCMC discourse.

Another aspect of the analysis of the development of the ability to construct effective written arguments focused on the use of meta-discourse devices. Based on the interpersonal model of meta-discourse (Hyland, 2005, p. 49), the interactional resources can help a writer/speaker engage the audience and “pull them along with their argument” (Hyland, 2005, p. 52). Therefore, the identification and classification of the instances of the use of meta-discourse devices in the SCMC followed part of Hyland's (2005) taxonomy of the meta-discourse resources introduced in Chapter 2 (Table 16).

### Table 16. Meta-discourse: Interactional resources

<table>
<thead>
<tr>
<th>Category</th>
<th>Function</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hedges</td>
<td>• Withhold commitment and open dialogue</td>
<td>might; perhaps;</td>
</tr>
<tr>
<td>Boosters</td>
<td>• Emphasize certainty or close dialogue</td>
<td>definitely; it is clear</td>
</tr>
<tr>
<td></td>
<td></td>
<td>that;</td>
</tr>
<tr>
<td>Attitude</td>
<td>• Express the author’s attitude to proposition</td>
<td>surprisingly;</td>
</tr>
<tr>
<td>markers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-mentions</td>
<td>• Explicit reference to author(s)</td>
<td>I; me; we;</td>
</tr>
<tr>
<td>Engagement</td>
<td>• Explicitly build relationship with reader</td>
<td>You can see that;</td>
</tr>
<tr>
<td>markers</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: This is adapted from Hyland (2005)

As introduced in Chapter 2, proper use of meta-discourse devices can help the author project an appropriate author identity in academic writing that involves maintaining a balance of tentativeness and assertion, and “a suitable relationship to one’s data, arguments, and audience” (Hyland, 2005, p. 54). Thus, five types of the interactional resources, hedges, boosters, attitude markers, self-mentions, and engagement markers, were identified in the SCMC transcripts. Raw frequencies of the devices were counted, and the percentages of the turns containing the devices to the total number of turns in each session were computed. Similarly, instances of the use of the five
types of the interactional resources in the writing samples were identified. Raw frequencies were counted and normed to counts per 10,000 words to facilitate a comparison to Hyland's (2005) study of the use of meta-discourse devices in postgraduate dissertations in different disciplines. The patterns identified in the SCMC transcripts were then compared with those shown in the writing samples. In both step one and step two, the focus was on the nine focal students from the SCMC section, but the writing samples of the three focal students from the control section were analyzed as a comparison. The coding of the SCMC transcripts for L2 learning opportunities, argumentative moves, and the use of the interactional resources was done twice by the researcher, with about 90 to 95 percent agreement in the identification and classification of the instances.

The third step involved an analysis of the reflections from the twelve focal students. The analysis of the reflections from the focal students in the SCMC section focused on examining how they constructed SCMC discourse over the semester, how discussion topics, interpersonal relationships in small groups, and modes of communication may have affected their choice of language in SCMC, and how their learning has been affected by the use of the SCMC tasks. Directed content analysis (Hsieh & Shannon, 2005) was used to identify themes emerged in the participants' perceptions of the following three aspects: the SCMC tasks, the group, and their learning through the SCMC tasks. The analysis of the reflections of the three students from the control section, on the other hand, focused on examining how they have constructed their face-to-face discourse over the semester, how discussion topics, interpersonal relationships in small groups, and modes of communication may have affected their choice of language during group work, and how their learning has been affected by the
use of face-to-face group work. Direct content analysis (Hsieh & Shannon, 2005) was used to identify themes emerged in the participants' perceptions of the following three aspects: the face-to-face group tasks, the group, and their learning through the face-to-face tasks. The themes in the SCMC and the control section were summarized and compared to examine the possible similarities and differences of the role of the SCMC tasks and the face-to-face tasks.

3.9 Legitimation of the Study

The purpose of this section is to discuss the legitimation (Onwuegbuzie & Johnson, 2006; Teddlie & Tashakkori, 2003) of the current mixed methods study. Legitimation is a term suggested by methodologist to be used to discuss the quality of mixed methods research, because as a “bilingual nomenclature” (Onwuegbuzie & Johnson, 2006, p. 48), legitimation is more acceptable to both quantitative and qualitative researchers. Since the current mixed methods study involved a quantitative and a qualitative component, as well as the mixing of the two, the following discussion of its legitimation is correspondingly divided into three parts: the quality issues in the quantitative quasi-experiment, the quality issues of the multiple case studies, and the quality issues of the mixing of the two components in making inferences about the effects of the SCMC tasks on the development of L2 linguistic competence and academic literacy.

Discussions of the quality of quantitative research have centered around the concepts of reliability and validity (Dörnyei, 2007; Mackey & Gass, 2005). Reliability refers to “the extent to which our measurement instruments and procedures produce
consistent results in a given population in different circumstances” (Dörnyei, 2007, p. 50).

In the current study, the consistency of the quantitative measurements was checked and improved through the use of multiple computer programs, three independent raters, and multiple items for a construct. First, the scores of grammatical complexity, lexical complexity, accuracy, and fluency on the two writing tests were partly based on the automated counts of the number of words and word types by a computer program. Therefore, based on computational analysis of texts, the measurements of grammatical complexity, lexical complexity, and fluency raised little concern.

For the other counts that were not generated by the computer software such as the number of clauses and sentences, the researcher counted twice and resolved the inconsistencies. Moreover, the accuracy scores were also based on the identification and classification of the errors in the writing samples. To ensure the consistency of the error coding procedure, an error-coding scheme (Appendix F) was created, and a corpus tool was used. More importantly, the researcher has provided training to two independent raters who coded ten percent and twenty percent of the data respectively. The researcher coded the eighty-eight writing samples twice for both error identification and classification, and the first rater coded the ten percent of the data twice for both error identification and classification. The second rater, however, coded the twenty percent of the data twice only for error identification (Table 17).

Table 17. Intra-rater and inter-rater reliability statistics for error identification

<table>
<thead>
<tr>
<th></th>
<th>The researcher</th>
<th>Rater 1</th>
<th>Rater 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>The researcher</td>
<td>95%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rater 1</td>
<td>86%</td>
<td>89%</td>
<td></td>
</tr>
<tr>
<td>Rater 2</td>
<td>91%</td>
<td>NA</td>
<td>92%</td>
</tr>
</tbody>
</table>
According to Table 17 and 18, the agreement rates on error identification were higher than those on error classification. Specifically, the intra-rater agreements on error identification were 95 percent, 89 percent, and 92 percent respectively for the researcher, the first rater, and the second rater. The agreements on error classification, however, were 90 percent and 83 percent for the researcher and the first rater. Since the researcher coded all the writing samples, and the other two raters coded different sub-sets of samples, some inter-rater agreement rates were calculated. The researcher and the first rater had an agreement rate of 86 percent on error identification and 83 percent on error classification. The researcher and the second rater had an agreement rate of 91 percent on error identification.

The initial percentage of agreement in error identification was acceptable based on commonly reported level of agreement in coding L2 writing samples (Hartshorn, Evans, Merrill, Sudweeks, Strong-Krause, & Anderson, 2010), and the disagreement was resolved through discussion. Therefore, the researcher was confident that the accuracy scores assigned based on the error identification (with intra- and inter-rater agreement rates around 90 percent) of the researcher and the two raters following the error-coding scheme were largely reliable.

The students' evaluation of the characteristics of the small groups was measured by four sub-scales on the post-study questionnaire, with a Cronbach’s alpha coefficient estimate of .94, .82, .82, and .91 respectively (Table 10). Although estimates of what
should be considered as an acceptable level of reliability depends on the purpose of
instrument (Porte, 2002), it has been suggested that in research on second language
acquisition, it is desirable to achieve a reliability coefficient estimate of over .70 to be
confident of the internal consistency of an instrument (Dörnyei, 2007, p. 207). Therefore,
the items on each of the four sub-scales can be regarded as, to a great extent, measuring
the same construct.

Validity here refers more specifically to research validity, or the internal validity
and the external validity of the quasi-experiment. The internal validity of an experiment
refers to the extent to which a researcher can establish that changes on the dependent
variable(s) are indeed a function of changes in the independent variable(s) (Bonett, 2011).
In this sense, several measures were taken to ensure the causal relationship between the
independent variable of “condition,” and the dependent variables of complexity, accuracy,
and fluency scores. First, to minimize the influence of possible confounding variables,
the participants’ background of English learning and technology use was assessed by the
pre-study questionnaire, and their initial level of L2 grammatical and lexical complexity,
accuracy, and fluency was measured by the pre-test. The pre-questionnaire showed that
the participants in the two sections were comparable in their background of English
learning and technology use, and the pre-test scores were included in the analysis as a
covariate. Second, only one participant dropped out toward the end of the semester, and
thus differential attrition (Bonett, 2011) did not seem to be a concern in the study. Third,
to minimize the Hawthorne effect (Dörnyei, 2007), the quasi-experiment was carried out
in a naturalistic classroom setting throughout a semester of fifteen weeks. It is believed
that longitudinal studies in a naturalistic classroom setting may help collect data
reflecting learners’ spontaneous use of language (Mackey & Gass, 2005). Fourth, to reduce the practice effects (Dörnyei, 2007), the prompts used for the pre-test and the post-test were different.

External validity refers to “the extent to which the results of a study can be generalized to different types of participants and different types of research settings” (Bonett, 2011, p. 18). Although random sampling has been considered as a basis for establishing external validity, the researcher believes that the participants from the two intact classes in the quasi-experiment were representative of the undergraduate international students enrolled in other sections of the ESL academic writing course in the same university in terms of English language proficiency, first language background, and majors, and were, to a less extent, representative of the undergraduate international students enrolled in preparatory ESL academic writing courses in major Mid-Western universities in the United States.

In qualitative research, a fundamental standard is to examine whether a study has captured “authentically the lived experiences of people” (Onwuegbuzie & Johnson, 2006, p. 49). More specifically, qualitative researchers have suggested that the concepts of credibility, transferability, dependability, and confirmability be used in examining the strengths and weaknesses of a qualitative study (Lincoln & Guba, 1985). The analysis in the multiple case studies in the second phase focused on the selected focal students’ language use in the SCMC discourse and samples of academic writing, and their reflections on their learning experiences through group tasks over the semester. Collecting samples of language use in different contexts over a relatively long period of time (Mackey & Gass, 2005) enhanced the credibility of the study. Moreover, the use of
multiple theoretical lenses in analyzing the same data set contributed to a better understanding of the meaning of the data. In terms of transferability, the provision of rich contextual information by descriptions and by situating the focal students in the results from a larger quasi-experiment would help the reader evaluate the extent to which the findings from the current study may be applicable to new contexts. The dependability of the findings was enhanced by having an experienced ESL teacher who was not familiar with the purpose of the study double check on the researcher’s initial interpretations of the participants’ reflections. With regard to confirmability, full details of the data including the students' language use and their reports of the learning experiences can be made available to other researchers to confirm or modify the researcher’s interpretations (Mackey & Gass, 2005).

Lastly, special legitimation issues arise when combining quantitative and qualitative approaches. Therefore, it is necessary to discuss the extent to which the combination of the quantitative quasi-experiment and the qualitative multiple case studies is justified. Literature has also termed this aspect of the quality of mixed methods research as design quality (Onwuegbuzie & Johnson, 2006) or design validity (Dörnyei, 2007). In addition to the description and rationale for the selected research design (Section 3.3), the mixing of the quantitative and the qualitative component allowed the study to draw upon the complementary strengths of each approach. On one hand, the multiple case studies allowed the researcher to examine the SCMC discourse and writing samples from multiple theoretical perspectives to provide details of how the participants were learning through and in their spontaneous language use in interactions in SCMC, and how such learning processes can be connected to changes shown in academic writing.
In addition, the multiple case studies also allowed the researcher to examine the students' perspectives. On the other hand, the quasi-experiment helped to contextualize the focal students in the follow-up case studies and thus contributed to a better understanding of the results concerning the focal students. Therefore, the mixing of the quantitative and the qualitative component would help advance the understandings of the effects of SCMC tasks by showing how the details of the learning processes may be connected to the learning outcomes.

### 3.10 Summary

This chapter has provided a detailed description of the research methodology in the current study. It started with an introduction of mixed methods research based on the pragmatic paradigm, and some general philosophical assumptions of the study in Section 3.2. The selected mixed methods research design was then described and justified in Section 3.3. Following the explanation of the research design, the context and the participants of the study were described in detail in Section 3.4 and 3.5. The chapter also provided a thorough account of the instruments used in Section 3.6, the procedure of data collection in Section 3.7, and the methods used in data analysis in Section 3.8. The chapter concluded with a discussion of the quality issues of the quasi-experiment and the multiple case studies, as well as the justification of the mixing of the two components in Section 3.9. The results are presented and discussed in the following chapter.
CHAPTER FOUR. RESULTS AND DISCUSSION

4.1 Introduction

This chapter aims to answer the five research questions about the effects of SCMC tasks on the development of L2 linguistic competence and academic literacy. Specifically, the first question aimed to test the effects of SCMC tasks on L2 grammatical and lexical complexity, accuracy, and fluency in academic writing by comparing the change of the SCMC section from the pre-test to the post-test with that of the control section. At the same time, the results for the first research question also served for the purposeful selection of the focal students in the subsequent multiple case studies. The second, third, and fourth research question followed up on the twelve focal students that were selected based on the results of the quasi-experiment to examine the extent to which the interactional processes in the SCMC discourse may provide opportunities for the development of L2 linguistic competence and academic literacy. The second research question aimed to examine the opportunities for L2 learning in the SCMC discourse of the focal students using multiple theoretical lenses. In addressing the second research question, changes of the scores of grammatical and lexical complexity, accuracy, and fluency from the academic writing samples were also examined, and the connections between L2 learning opportunities in the SCMC discourse and the patterns of change in the writing samples were discussed for each of the triads. The third research question aimed to examine the opportunities for the focal students to develop their ability to construct effective arguments in SCMC. The argumentative moves of the focal students were categorized according to the level of engagement with others' views, and
characteristics of the use of argumentative moves in the SCMC discourse were discussed in relation to the use of argumentative moves in academic writing. The fourth research question looked at the focal students' development in using meta-discourse devices in the SCMC discourse and explored the connections between such opportunities in SCMC and the use of the meta-discourse devices in academic writing. Lastly, the fifth research question explored the focal students' perceptions of the group tasks, their groups, and their learning during group work. Themes emerged from each triad were discussed separately and comparatively. In the discussion of the results for the last four research questions, the focus was on the nine focal students in the SCMC section, but the writing samples and reflections from the three focal students in the control section were also used to illustrate the similarities and differences of learning between the two sections. Results for each of the research questions are presented and discussed separately in Section 4.2, 4.3, 4.4, 4.5, and 4.6. The chapter concludes with a summary of the major findings and interpretations of the effects of SCMC tasks on the development of L2 linguistic competence and academic literacy.

4.2 The Effects of SCMC Tasks on L2 Complexity, Accuracy, and Fluency

The first research question is: How do average scores of grammatical and lexical complexity, accuracy, and fluency change from a pre-test to a post-test, respectively, and compare for treatment and control groups? The motivation to answer this question was two fold. First, previous research has produced mixed results with regard to how interactions in SCMC may affect the development of L2 complexity (e.g., Hamano-Bunce, 2010; Sauro & Smith, 2010), accuracy (e.g., Coniam & Wong, 2004; Liang, 2010; Vinagre & Muñoz, 2011), and fluency (e.g., Elola, 2010; Hamano-Bunce, 2010), and a
considerable number of studies have based their findings on the analysis of chat transcripts which alone may not reflect accurately what learners can do in other contexts. Second, an answer to this question can help identify representative focal students for an in-depth analysis of the learning processes, which would allow the researcher to identify and examine learning opportunities in the SCMC discourse, and to investigate the possible connections between such opportunities in SCMC and changes observed in academic writing. Therefore, the rest of the Chapter will present and discuss the findings concerning the effects of SCMC tasks on L2 grammatical complexity, lexical complexity, accuracy, and fluency.

4.2.1 Grammatical complexity

This section presents the descriptive statistics of the average scores of grammatical complexity of the SCMC and control sections in the pre-test and the post-test, explains the inferential statistics concerning the hypothesis tests of the means, and considers the findings in relation to the results from previous research. As explained in Chapter 2, an analysis of grammatical complexity in writing is concerned with how varied and sophisticated some production units are (Wolfe-Quintero et al., 1998). Since the study focused on variation, and that sentence may be a better comparative unit for measuring complexity for adult learners (Ishikawa, 1995) and sentence-level variation may be more indicative of short-term developmental growth (Bardovi-Harlig, 1992), grammatical complexity in the current study was measured by total number of clauses divided by total number of sentences (C/S). Table 19 below shows the means and standard deviations for the grammatical complexity scores for the control and treatment groups in both the pre-test and the post-test.
Table 19. Descriptive statistics for grammatical complexity scores

<table>
<thead>
<tr>
<th>Condition</th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (n = 23)</td>
<td>1.80</td>
<td>1.83</td>
<td>.03</td>
</tr>
<tr>
<td></td>
<td>.46</td>
<td>.52</td>
<td>.43</td>
</tr>
<tr>
<td>Treatment (n = 21)</td>
<td>1.76</td>
<td>1.66</td>
<td>-.10</td>
</tr>
<tr>
<td></td>
<td>.40</td>
<td>.32</td>
<td>.66</td>
</tr>
<tr>
<td>Total (N = 44)</td>
<td>1.78</td>
<td>1.74</td>
<td>-.03</td>
</tr>
<tr>
<td></td>
<td>.43</td>
<td>.44</td>
<td>.56</td>
</tr>
</tbody>
</table>

*Note. Difference = Post-test – Pre-test*

The results showed that the average grammatical complexity score of the control (or the face-to-face) section increased from 1.80 to 1.83 while that of the treatment (or SCMC) section decreased from 1.76 to 1.66. That means after working on the face-to-face tasks for one semester, the variation of the writing from the students in the control section increased from 1.80 clauses per sentence to 1.83 clauses per sentence while the variation of the writing from the students in the treatment section dropped from 1.76 clauses per sentence to 1.66 clauses per sentence. The increase of .03 in the control section is quite small, as opposed to the numbers reported in Ishikawa (1995). In her study of the development of writing proficiency among EFL learners of low-proficiency level in three months, she found the average scores of her two groups of students increased from 1.41 to 1.68, and from 1.60 to 1.68 respectively, using the same measure. The decrease of the average grammatical complexity score in the treatment section from 1.76 to 1.66 in the current study, however, is largely comparable to the magnitude of change reported in Ishikawa (1995). The standard deviation of the scores on grammatical complexity from the SCMC section, however, was reduced in the post-test while that from the control section saw an increase. Thus it is possible that the slight increase of the average score of grammatical complexity in the control section may come from several individuals rather than homogeneous improvement across the board.
Based on the descriptive statistics concerning the means of grammatical complexity scores, it is worthwhile to further examine whether or not the difference between the pre-test and the post-test from the SCMC section is significant using a matched-samples t-test (Howell, 2010) or a paired-samples t-test (Shannon & Davenport, 2001). The distributions of the grammatical complexity scores of both groups were also checked against several basic assumptions of hypothesis tests in order to decide if the tests of the differences of means would be meaningful.

In examining whether or not the grammatical complexity scores have satisfied the assumptions for the use of confidence intervals and hypothesis tests, some concerns were raised. First, to check whether the shape of the distribution of the data approaches a normal distribution, the statistics for the skewness and kurtosis of the distribution of the grammatical complexity scores in the pre-test and the post-test for both sections were obtained. For the control section, the statistics were 2.15 and 6.43 for the pre-test scores, and 2.08 and 6.85 for the post-test scores. For the treatment section, the statistics were .52 and 1.10 for the pre-test scores, and 1.04 and 1.95 for the post-test scores. According to Brown’s (1997) standard that an acceptable level of skewness or kurtosis is indicated by skewness or kurtosis statistics that fall within the range of the values of two standard errors of the statistics (pp. 20-21), the distribution of the scores on both the pre-test and the post-test for the treatment section can thus be regarded as approaching a normal distribution. Thus, a hypothesis test of the difference between the means of the pre-test and the post-test scores from the treatment section would yield more reliable results. However, the statistics obtained from the scores on both tests for the control section indicated that the distributions of these scores were positively skewed, suggesting that
most scores from the control section were below the means. The kurtosis statistics also showed that the distributions were very tall. In other words, a hypothesis test of the difference between the means of the pre-test and the post-test scores from the control section would possibly yield misleading results. Therefore, considering that the two sections were assigned to the treatment and control conditions on a random basis, and assuming the independence of the scores, a matched-samples t-test can still be carried out to examine the decrease of the grammatical complexity scores in the treatment section.

Table 20 below summarizes the results from the matched-samples t-test.

Table 20. T-test summary: Grammatical complexity scores from the treatment section

<table>
<thead>
<tr>
<th>Paired Differences</th>
<th>M</th>
<th>SEM</th>
<th>95% CI</th>
<th>t</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test – Post-test</td>
<td>.10</td>
<td>.09</td>
<td>[-.09, .30]</td>
<td>1.12</td>
<td>20</td>
<td>.28</td>
</tr>
</tbody>
</table>

*Note. CI = Confidence interval

The results showed that the decrease of the average grammatical complexity score from the pre-test to the post-test was not significant (t = 1.12, p = .28). This was also confirmed by the 95% confidence interval. The 95% confidence interval for the mean difference scores between the pre-test and the post-test suggested that a population mean difference between the pre-test and the post-test could occur in the range of (-.09, .30) 95% of the time. Therefore, statistically, the researcher is 95% confident that the population mean grammatical complexity score on the pre-test could be either .30 points higher than that on the post-test at most, or it could be, at most, -.09 points lower than that on the post-test. In other words, the effect of the SCMC tasks on grammatical complexity is inconclusive. However, the magnitude below zero (.09) is quite small in comparison to the magnitude above zero (.30). Accordingly to Bonett (2011), such confidence intervals, although produced insignificant results, should be examined in the context of the subject
matter to interpret its implications for the direction and magnitude of effects. In Ishikawa’s (1995) study using the same grammatical complexity measure, the increase from 1.41 to 1.68 (.27) in one class was found to be significant, and the increase from 1.60 to 1.68 (.08) in the other class was found to be not significant (p. 63). Therefore, the researcher believes that the positive effect (.09) could be neglected, and it is very likely that the use of SCMC tasks may result in a decrease of grammatical complexity by as much as .30 clauses per sentence. In other words, it seems that SCMC tasks may prompt learners to use sentences with fewer numbers of clauses or less variations.

The results concerning the negative effect of the SCMC tasks on L2 grammatical complexity in academic writing in the current study have provided some evidence for the possible negative influence of SCMC on grammatical complexity. Admittedly, some studies have shown that SCMC has the potential of helping language learners develop grammatical complexity because learners tend to use more complex and formal language in online discussion than in face-to-face discussion (Warschauer, 1996), and that the slower processing speed in a chat room may encourage learners to test emerging hypotheses about new lexical items or syntactic patterns (Payne & Whitney, 2002). Specifically, Warschauer (1996) examined the differences between the syntactic complexity of students' language use in SCMC and that of their interactions face-to-face using coordination index, or the number of independent clause coordination divided by the total number of combined clauses (independent coordination plus dependent subordination). His results have shown significant differences between the syntactic complexity of students' language use in SCMC and that in face-to-face interactions, with the language use in SCMC characterized by noticeably more complex subordination.
Moreover, Warschauer (1996) also suggests that SCMC discourse does not resemble face-to-face interaction in that it tends to include more formal expressions based on qualitative analysis of SCMC discourse (p. 19). It is important to point out, however, Warschauer's (1996) study was based completely on the comparison of language use online and that in face-to-face interaction, and it did not include samples of language use in other contexts. Thus, the findings may not provide adequate support for the benefits of SCMC for learners' development of grammatical complexity.

More importantly, an increasing number of studies have provided findings and observations to support the concern over the possible negative influence of SCMC on the development of grammatical complexity. For example, Sotillo (2000) specifically examined the discourse functions and syntactic complexity of SCMC discourse of twenty-five ESL students, in comparison with those of the students' language use in asynchronous CMC. In her study, discourse functions were defined as fourteen categories of online behavior, including greetings, topic initiation moves, assertions and/or imperatives, requests, responses, adversarial moves, off topic moves, topic shifts, humor, request for information, floor holding moves, corrective feedback, reprimands, and closing (p. 95); and syntactic complexity was operationalized by eight measures, including error-free clauses, total number of clauses, error-free t-units, total number of t-units, total number of words, total number of embedded subordinate clauses, total number of subordinate clauses, and t-unit length (p. 91). Her findings showed that although SCMC discourse was characterized by more discourse functions, the students' turns in SCMC were in general shorter and involved less use of complex sentence structure (pp. 99-100). However, Sotillo's (2000) study was also based completely on the comparison
of language use in SCMC and that in asynchronous CMC, and it did not contain samples
of language use in other contexts. Moreover, statistical significant results were obtained
for only one measure that is more often considered as an accuracy measure. In addition,
among the eight measures used in the study, only two can be considered valid measures
for syntactic complexity. The other measures are usually regarded as either accuracy
measures or fluency measures (Wolfe-Quintero et al., 1998).

Hamano-Bunce (2011) is another example of studies that provide support for the
negative influence of SCMC on the development of grammatical complexity. The
researcher examined the use of communicative tasks carried out in pairs in SCMC over a
ten-week period among sixteen college students in the United Arab Emirates, and
compared the complexity of the students' language use online and that in face-to-face
interactions using the total number of words in the interaction divided by the total number
of analysis-of-speech (AS) units (p. 430). His results showed that the students' SCMC
discourse did not have higher level of complexity than face-to-face interactions (p. 431).
At the same time, Hamano-Bunce (2011) observed that the students' language use online
was characterized by simple transaction of information. Again, the results are based on
samples of language use during interactions online and face-to-face, and thus may not be
adequate to support claims about the effects of SCMC on language use in other contexts.
Moreover, the complexity measure calculates the average length of AS units, which
would be more appropriately regarded as a fluency measure (Wolfe-Quintero et al., 1998).

Some recent studies have suggested that the controversies over the effects of
SCMC on grammatical complexity may be caused by students' different use of the tool
while working on a task. In particular, students' different reaction to the possibility of the
slower processing speed afforded by online chat may account for different levels of complexity of their language use in SCMC. To illustrate, Sauro and Smith (2010) used screen capture video records to examine twenty-three university learners of German's use of SCMC while working in pairs. Specifically, the researchers first categorized the turns in the SCMC discourse to differentiate those that can show that a learner was making use of the additional time afforded by SCMC for online planning and those that cannot, and calculated the linguistic complexity score for each category. In their study, linguistic complexity was operationalized as the number of clauses divided by the number of c-units (p. 565). Their results indicated that the linguistic complexity of the learners' language use in SCMC was significantly higher when there was evidence of planning and monitoring. In other words, learners who act upon the opportunities for slower processing speed in SCMC would benefit from the platform and be able to use more complex sentences in SCMC, while those who do not act upon such opportunities may not necessarily be able to produce more complex sentences in SCMC as compared to their language use in face-to-face conversations. Moreover, the possibility of slower processing speed allowed by SCMC may also differ depending on the specific tasks and groupings. For example, Sotillo's (2000) participants may not have the same opportunities for those in Sauro and Smith's (2010) study because the former study used many-to-many communication tasks while the later used pair work. Therefore, the effects of SCMC on grammatical complexity may be affected by the extent to which the tasks and grouping allow learners to make use of such slower processing speed in their interactions in SCMC, and more importantly, how much learners are acting upon such opportunities.
One of the few studies that have examined the effects of SCMC on the
development of L2 grammatical complexity using samples of language use in other
contexts is Coniam and Wong (2004) who collected students' written work before and
after the use of SCMC as an intervention from an experimental and a control group.
Specifically, the researchers investigated how SCMC interactions might help twenty-six
students in an English-medium-instruction secondary school in Hong Kong improve the
grammatical complexity of their formal writing. The students spent about twenty hours
throughout a month interacting with interlocutors of their own choice, and the focus of
the SCMC interactions was to help the students reinforce the grammatical rule that there
should be only one finite verb in one main clause in English. In order to provide a relaxed
and non-threatening learning environment, the SCMC tasks were not moderated and that
the students chose their own topics and interlocutors (p. 322). However, the students were
instructed to put a visual reminder by their computer screens each time they participated
in online discussions. Since the SCMC interactions were unmonitored, the specifics with
regard to the topics and forms of discussions were not clear. Coniam and Wong (2004)
counted the number of t-units in the students' writing to examine how SCMC may help
the students develop their "abilities or readiness to expand or discuss a topic in a foreign
language" (p. 328), and found that the increase of the average number of t-units in the
control group was much larger than that of the experimental group. The researchers did
not use inferential statistics because of small sample size, and according to their
interpretation, the findings indicated a systematic difference between the two classes in
terms of their requirements for the writing assignment rather than the weak link between
the SCMC tasks and the improvement of grammatical complexity. In their follow-up
qualitative analysis of the post-study writing samples of three students in the experimental group, Coniam and Wong (2004) reported observations that the students appeared to be "more ready to convey more complex ideas by conjoining clauses or by embedding" (p. 329). This result, however, was based only on comparison of the proportion of sentences containing only one simple verb or an auxiliary verb plus another verb in three students' pre- and post-study writing samples. Moreover, the number of t-units is usually considered as a measure of fluency rather than complexity (Wolfe-Quintero, 1998). Thus, the findings from Coniam and Wong (2004) may not provide enough support for either the positive or the negative influence of SCMC on the development of grammatical complexity.

Based on the previous studies on the effects of SCMC on the development of grammatical complexity, therefore, the findings of the current study seem to provide evidence for the concern that the use of SCMC tasks may have negative impact on the students' development of grammatical complexity using the measure of the number of clauses per sentence. However, a few interesting questions are raised in the discussion of the findings of the current study in relation to the previous findings. First, the extent to which SCMC may influence the development of grammatical complexity in a positive or negative way, depends largely on whether or not the nature of a task and learner behavior are conducive or not to the actual use of the possibility of slower processing speed for online planning and monitoring. More specifically, many-to-many tasks (e.g., Sotillo, 2005) may in fact require learners to process information at a higher speed because of multiple threads of discussion and fast scrolling of computer screen; on the other hand, pair interaction may afford more processing time. The focus of a task may also affect the
availability of processing time for language form. Thus the triads in the current study may not have enough processing time to focus on language form as they had to understand each other in order to complete a meaning focused task. More importantly, studies have shown that the effects of SCMC on the development of grammatical complexity hinges on the use of the opportunities for online planning and monitoring (e.g., Sauro and Smith, 2010). Since individual students may act differently when presented with learning opportunities, and some of them may act upon the possibility afforded by SCMC to focus on language form while others may not, it may be more informative to first examine the similarities and differences of learner behavior in the SCMC discourse and then examine their respective development in grammatical complexity. Last but not least, one measure of grammatical complexity may not represent the students' level of grammatical complexity adequately. It would be more informative for future studies to include two or more measures to show learners' abilities in using a wider range of both basic and sophisticated grammatical structures.

4.2.2 Lexical complexity

This section presents the descriptive statistics of the average scores of lexical complexity of the SCMC and control sections in the pre-test and the post-test, explains the inferential statistics concerning the hypothesis tests of the means, and considers the findings in relation to the results from previous research. As explained in Chapter 2, an analysis of lexical complexity in writing is concerned with the range and size of a second language writer's productive vocabulary, or the variation and sophistication of the words that the writer can readily access (Wolfe-Quintero et al., 1998, p. 101). Since the study focused on lexical variation, and that type/token ratio measures have been criticized for
its sensitivity or lack of sensitivity to the length of a text (Carroll, 1967), an adjusted measure was used to assess the lexical complexity of the students' writing samples in the current study: the number of word types divided by the square root of two times the total number of words (WT/√2W). Table 21 below summarizes the means and standard deviations for the lexical complexity scores for the control and treatment groups in both the pre-test and the post-test.

Table 21. Descriptive statistics for lexical complexity scores

<table>
<thead>
<tr>
<th>Condition</th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (n = 23)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>6.66</td>
<td>6.69</td>
<td>.03</td>
</tr>
<tr>
<td>SD</td>
<td>.35</td>
<td>.55</td>
<td>.61</td>
</tr>
<tr>
<td>Treatment (n = 21)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>6.63</td>
<td>6.65</td>
<td>.02</td>
</tr>
<tr>
<td>SD</td>
<td>.52</td>
<td>.58</td>
<td>.47</td>
</tr>
<tr>
<td>Total (N = 44)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>6.65</td>
<td>6.67</td>
<td>.02</td>
</tr>
<tr>
<td>SD</td>
<td>.43</td>
<td>.56</td>
<td>.54</td>
</tr>
</tbody>
</table>

Note. Difference = Post-test – Pre-test

The results indicated that both groups had a slight increase in their average lexical complexity scores from the pre-test to the post-test. The average lexical complexity score of the control group increased from 6.66 to 6.69, and that of the treatment group increased from 6.63 to 6.65. The increase in the control group (.03) and the increase in the treatment group (.02) are quite small in comparison with the numbers reported in Arthur (1979). In his study of the writing samples collected from fourteen low-intermediate level EFL students during a seven-week period, Arthur (1979) used the same measure to assess his students’ improvement of lexical complexity, or what was termed by the author vocabulary size (p. 332). He found that on average, the students’ lexical complexity scores increased from 4.31 to 4.47, and the increase of .16 was found to be significant (p. 334). He also reported an increase of .15 among his Spanish students,
and an increase of .15 among his Arabic students (p. 336). In comparison, although both groups have improved their lexical complexity and that the control group scored higher on average than the treatment group in the post-test, the differences (.03, .02, & .04) were quite small. Interestingly, the standard deviation of the difference scores of the control group (.61) is higher than that of the treatment group (.47). It seems to suggest that the treatment group, after participating in the SCMC tasks, had more homogenous improvement while the control group, after participating in the face-to-face group, showed more discrepancies in improvement.

Based on the descriptive statistics concerning the means of lexical complexity scores, it is worthwhile to further examine whether or not the difference between the control and the treatment groups on the post-test is significant using an independent-samples t-test (Howell, 2010). The distributions of the lexical complexity scores of both groups were also checked against several basic assumptions of hypothesis tests in order to decide if the tests of the differences of means would be meaningful.

In examining whether or not the lexical complexity scores have satisfied the assumptions for the use of confidence intervals and hypothesis tests, some concerns were raised. First, to check whether the shape of the distribution of lexical complexity scores approaches a normal distribution, the statistics for the skewness and kurtosis of the distribution of the lexical complexity scores in the pre-test and the post-test for both groups were obtained. For the control group, the statistics were -2.05 and 6.26 for the pre-test scores, and .07 and -.80 for the post-test scores. For the treatment group, the statistics were -1.27 and 2.16 for the pre-test scores, and -.81 and .08 for the post-test scores. Based on Brown’s (1997) standard for the acceptable level of skewness or
kurtosis that is indicated by skewness or kurtosis statistics that fall within the range of the values of two standard errors of the statistics (pp. 20-21), the distribution of the scores on the post-test for both control and treatment groups can be regarded as approaching a normal distribution. Moreover, for an independent-samples t-test, a Levene’s test for equality of variances between the two groups was carried out and yielded the following statistics: \( F (1,42) = .057, p = .81 \), indicating that the difference between the error variances of the two groups on the post-test scores was not significant. Thus the distribution of the lexical complexity scores of both groups on the post-test has also satisfied the equal variance assumption for the independent-samples t-test. Thus, the test of the difference between the means of the lexical complexity scores of the control and treatment groups on the post-test would yield more reliable results. However, the skewness statistics obtained from the scores on the pre-test for both sections indicated that the distributions of the scores were negatively skewed, suggesting that most scores in both groups on the pre-test were above the class means. The kurtosis statistics obtained based on the pre-test scores from the two groups also suggested that the distributions of the scores were very tall. In other words, a hypothesis test of the difference between the means of the two groups on the pre-test would possibly yield misleading results. Therefore, considering that the two groups were assigned to the control and treatment conditions on a random basis, and assuming the independence of the scores, an independent-samples t-test can still be carried out to examine the difference between the lexical complexity scores of both groups on the post-test. Table 22 below summarizes the results from the independent-samples t-test. The results showed that the difference of the
average lexical complexity scores on the post-test between the control group and the treatment group was not significant (t = -.25, p = .81).

<table>
<thead>
<tr>
<th>Differences</th>
<th>M</th>
<th>SEM</th>
<th>95% CI</th>
<th>t</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment – Control</td>
<td>-.04</td>
<td>.17</td>
<td>[-.39, .30]</td>
<td>-.25</td>
<td>42</td>
<td>.81</td>
</tr>
</tbody>
</table>

Table 22. T-test summary: Lexical complexity scores on the post-test

This was also confirmed by the 95 percent confidence interval that did not exclude zero. According to the 95 percent confidence interval, a population mean difference between the two groups on the post-test could occur in the range of (-.39, .30) ninety-five percent of the time. Therefore, statistically, the researcher is confident that the population mean lexical complexity score on the post-test from the treatment group could be either .30 points higher at most, or .39 points lower at most, than that from the control group, and that the inference could be true ninety-five percent of the time. In other words, the effect of SCMC tasks on changes of lexical complexity is inconclusive. Indeed, the magnitude below zero (.39) and the magnitude above zero (.30) are very similar, indicating that the difference between the scores could take either direction. Therefore, the researcher believes that it is not clear with regard to whether or not SCMC tasks would be more effective than face-to-face tasks in facilitating the development of lexical complexity, or lexical variation, in writing.

The result that SCMC tasks may not offer more benefits in improving lexical complexity than face-to-face tasks is quite surprising considering the number of studies that demonstrate the positive influence of SCMC on the learning of vocabulary (Beauvois, 1997; Blake, 2000; de la Fuente, 2003; Pérez Cañado, 2010; Sahin, 2009) and those that...
provide evidence for the effect of SCMC on the improvement of lexical complexity (Fitze, 2006; Sauro & Smith, 2010; Warschauer, 1996).

Empirical studies based on the Interaction approach to SLA have largely followed the idea that SCMC tasks can trigger the same processes and help create the same conditions that are regarded as conducive for L2 vocabulary learning as face-to-face tasks can. Specifically, research has suggested that SCMC tasks can enhance the noticing of vocabulary items by providing learners the opportunity to interact through texting, to negotiate the meaning of unknown vocabulary, and to reflect upon one's own output. For example, Blake (2000) conducted two experiments among fifty intermediate Spanish students in a university to investigate how pair work in SCMC can facilitate L2 learning through negotiation of meaning following Varonis and Gass' (1985) definition of a negotiation routine. Although the findings indicated that the total number of negotiations constituted only a small percentage of the total number of conversational turns, the negotiations caused by lexical confusion were shown to be the majority of the negotiation routines (pp. 128-129), suggesting the positive influence of SCMC on the learning of vocabulary.

In another study, de la Fuente (2003) examined the effect of SCMC tasks on the improvement of the receptive and productive written and oral L2 lexical knowledge in comparison with that of face-to-face tasks, and examined the SCMC discourse to identify evidence for noticed lexical input, negative feedback and opportunities of self-repair and pushed lexical output. Specifically, the study was conducted among twenty university students of Spanish who were assigned to work in pairs on two information gap tasks carried out either in SCMC or face-to-face. Fourteen target Spanish words were chosen
based on a pre-test that aimed to exclude vocabulary to which the participants may have been exposed. The findings showed that both the SCMC and face-to-face groups had gains in the acquisition of the receptive and productive knowledge of L2 vocabulary. However, the face-to-face group outperformed the SCMC group in the speaking recognition and production tests, while the difference between the two groups in the written recognition and production tests was not significant (p. 65). Although the results from de la Fuente (2003) did not support the hypothesis that SCMC may better facilitate noticing and the learning of vocabulary, they have demonstrated that SCMC tasks can be as effective as face-to-face tasks in promoting vocabulary learning in writing (p. 70). A major limitation of de la Fuente (2003) is that it investigates only the differential effects of SCMC and face-to-face tasks on the learning of the basic meaning of a word using highly structured tasks. It is possible that the differential effects may be dissimilar on other aspects of lexical acquisition and/or with less structured tasks.

There are also studies that have shown the benefits of SCMC in assisting the development of lexical complexity by documenting learners' language use in SCMC and face-to-face and comparing the lexical complexity of both (Fitze, 2006; Sauro & Smith, 2010; Warschauer, 1996). Specifically, Warschauer (1996) examined the differences between the lexical complexity of students' language use in SCMC and that of their interactions face-to-face using type-token ratio, or the total number of different word types divided by the total number of words. His results have shown significant differences between the lexical complexity of students' language use in SCMC and that in face-to-face interactions, with the language use in SCMC characterized by noticeably higher level of variation.
A few studies have found no significant difference between the effect of SCMC tasks and that of face-to-face tasks on the development of lexical complexity. For example, Abrams (2003) examined the effect of SCMC tasks on the development of oral proficiency by comparing the performance of students assigned to one of three conditions: a control group, an SCMC group, and an asynchronous CMC group. The study was conducted among ninety-six intermediate students of German in a university, and compared the average gains of the three groups in terms of the oral discussion scores calculated based on the number of communicative units (c-units), lexical richness, lexical density, and syntactic complexity (p. 161). Specifically, Abrams (2003) operationalized lexical richness as the number of different words divided by the total number of words (p. 162), the same as the measure of lexical complexity used in Warschauer (1996). In addition, Abrams (2003) also calculated lexical density by dividing the number of nouns, verbs, adjectives, and adverbs using a set number of units to assess the lexical sophistication of the three groups (p. 162). The findings showed no significant difference between the three groups in terms of their lexical richness or density (p. 164). It is important to point out, however, unlike de la Fuente (2003), Warschauer (1996) and Abrams (2003) were based completely on the comparison of language use online and that in face-to-face interaction, and they did not include samples of language use in other contexts. Thus, their findings may not provide adequate support for the influence of SCMC, positive or negative, on learners' development of lexical complexity.

A possible explanation for the inconsistent findings of the previous studies and the lack of noticeable benefits of SCMC tasks over face-to-face tasks on the development of lexical complexity in the current study may be found in the ways learners were making
use of the text-based tool while working on the tasks. Some recent studies have suggested that although SCMC affords the opportunities of visual saliency and slower processing speed, they may not be utilized by all learners all the time. In particular, learners' different reaction to the possibility of the slower processing speed afforded by SCMC may account for different levels of lexical complexity of language use online. For example, Sauro and Smith (2010) used screen capture video records to examine twenty-three university learners of German's use of SCMC while working in pairs. Specifically, the researchers first categorized the turns in the SCMC discourse to differentiate those that can show that a learner was making use of the additional time afforded by SCMC for online planning and those that cannot, and calculated the lexical diversity score for each category. In their study, lexical diversity was operationalized using the Index of Guiraud, calculated by the number of lexical types, or unique content and function words, divided by the square root of tokens (p. 565). Higher scores of the Guiraud value indicate greater variety of vocabulary. Sauro and Smith's (2010) results suggested that the lexical diversity of the students' language use in SCMC was significantly higher when there was evidence of planning and monitoring. In other words, learners who act upon the opportunities for slower processing speed in SCMC would benefit from the platform and be able to use a wider range of vocabulary in SCMC, while those who do not act upon such opportunities may not necessarily be able to use a variety of words in SCMC as compared to their language use in face-to-face conversations. Moreover, Sauro and Smith (2010) also showed that the students' texts that had been deleted before sending out had the lowest score of lexical diversity (p. 566), indicating that some students were monitoring their own language production and using the extra processing capacity for
online planning, and by doing so, these students were able to improve their lexical diversity.

Based on the previous studies on the effects of SCMC on the development of lexical complexity, therefore, the findings of the current study seem to provide support for the idea that the impact of SCMC on the development of lexical complexity may be influenced by other factors including task types, learners' proficiency levels, and learners' use of the text-based tool during group work. First, the fact that both the SCMC and face-to-face groups had only minor improvement on lexical complexity throughout the semester may indicate that the tasks had a strong focus on meaning and thus the students gave priority to task completion. If both groups focus on task completion rather than the learning of specific vocabulary, it may follow that both groups may have similar lexical complexity scores on the post-test since their scores on the pre-test were similar. Second, the lack of significant difference between the effect of SCMC tasks and that of face-to-face tasks may also be attributed to the fact that the students in the SCMC group did not make use of slower processing speed to plan and monitor their language production. It could also be possible that the SCMC group did not have more time for slower processing due to the fact that the tasks were meaning-focused and that typing caused the SCMC group more time for task completion. Therefore, it would be more informative to further examine the effect of different types of tasks carried out in SCMC on the development of lexical complexity.

4.2.3 Accuracy

This section presents the descriptive statistics of the average scores of accuracy of the SCMC and control groups in the pre-test and the post-test, explains the inferential
statistics concerning the hypothesis tests of the means, and considers the findings in relation to the results from previous research. As explained in Chapter 2, an analysis of accuracy in writing is concerned with "the ability to be free from errors" when using the language to communicate in writing (Wolfe-Quintero et al., 1998, p. 33). Despite some criticisms against the comparison of interlanguage with a target language, it is arguable that the purpose of the comparison is to measure the deviation of learner language from the target language, or a standard (Wolfe-Quintero et al., 1998). Admittedly, controversies still exist with regard to whether or not there is a target language standard or what linguistic system can act as a standard, and whether or not the comparison would provide appropriate evidence for language development. However, this study focuses on measuring the extent to which learner language conforms to a target language, and thus uses the comparison to measure the level of accuracy. Specifically, the accuracy measure used in this study was the total number of errors divided by the total number of clauses (E/C). Thus, lower accuracy scores indicate fewer average number of errors per clause, and in turn, higher level of accuracy. Table 23 below provides the means and standard deviations for the accuracy scores for the control and treatment groups in both the pre-test and the post-test.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (n = 23)</td>
<td>$M$</td>
<td>.84</td>
<td>1.46</td>
</tr>
<tr>
<td></td>
<td>$SD$</td>
<td>.36</td>
<td>.58</td>
</tr>
<tr>
<td>Treatment (n = 21)</td>
<td>$M$</td>
<td>1.22</td>
<td>.32</td>
</tr>
<tr>
<td></td>
<td>$SD$</td>
<td>.47</td>
<td>.15</td>
</tr>
<tr>
<td>Total (N = 44)</td>
<td>$M$</td>
<td>1.02</td>
<td>.92</td>
</tr>
<tr>
<td></td>
<td>$SD$</td>
<td>.45</td>
<td>.72</td>
</tr>
</tbody>
</table>

*Note. Difference = Post-test – Pre-test*
The results showed that overall the average accuracy scores of both groups decreased from 1.02 to .92, meaning that the average number of errors per clause of the participants went down from 1.02 to .92. The average accuracy score of the control group, however, increased from .84 to 1.46, indicating that the average number of errors per clause went up from .84 to 1.46. The average accuracy scores of the treatment, or SCMC, group, on the other hand, decreased from 1.22 to .32, meaning that the average number of errors per clause went down from 1.22 to .32. The increase in the control section (.62) and the decrease in the treatment section (.90) are quite large in comparison to the numbers reported in Bardovi-Harlig and Bofman (1989). In their cross-sectional study comparing the complexity and accuracy of English writing between two groups of adult EFL learners (one group passed an English placement test and thus did not require additional English instruction while the other group did not), the researchers assessed the accuracy of students’ writing using the same measure of the total number of errors divided by the total number of clauses. Bardovi-Harlig and Bofman (1989) found that the average accuracy score of the pass group was .61 and that for the non-pass group was .81, with a difference of .20. In comparison, the difference between the pre-test and the post-test for the control group (.62) and the treatment group (.90), and the difference between the two groups on the post-test (1.23) in the current study are quite large. The standard deviation of the accuracy scores of the control group had a slight increase, from .36 to .58 while the standard deviation of the accuracy scores of the treatment group decreased from .47 to .15. Thus, it seems that the SCMC tasks have helped improve the accuracy of most of the participants in the treatment group, and as a result, the accuracy scores of the treatment group on the post-test were more homogenous than they were on the pre-test.
Based on the descriptive statistics concerning the means of accuracy scores, it is worthwhile to further examine whether or not the difference between the pre-test and the post-test from both groups was significant, and whether or not the treatment condition is a significant factor that leads to the different patterns of change using a mixed-model ANOVA test (Shannon & Davenport, 2001). The distributions of the accuracy scores of both groups were also checked against several basic assumptions of hypothesis tests in order to decide if the tests of the differences of means would be meaningful.

In examining whether or not the accuracy scores have satisfied the assumptions for the use of confidence intervals and hypothesis tests, some concerns were raised. First, to check whether the shape of the distribution of the data approaches a normal distribution, the statistics for the skewness and kurtosis of the distribution of the accuracy scores in the pre-test and the post-test for both groups were obtained. For the control group, the statistics were .92 and 1.41 for the pre-test scores, and .58 and .05 for the post-test scores. For the treatment section, the statistics were -.22 and -.39 for the pre-test scores, and .35 and -.14 for the post-test scores. Based on Brown’s (1997) standard for the acceptable level of skewness or kurtosis, the distribution of the scores on the pre-test and the post-test for both groups can be regarded as approaching a normal distribution, because their skewness and kurtosis statistics all fall within the range of the values of two standard errors of the statistics (pp. 20-21). Second, the Levene’s test for equality of variances between the two groups on both tests yielded the following statistics: for the pre-test scores, F (1,42) = 1.12, p = .30, and for the post-test, F (1, 42) = 25.66, p = .00. The results indicated that the difference of the error variance between the two groups on the pre-test scores was not significant, thus satisfying the assumption of equal variance;
however, the results indicate that the difference of the error variance between the two groups on the post-test was significant, thus violating the equal variance assumption.

Third, the result from the Mauchly’s test indicated that the equal covariance assumption was violated. However, SPSS provides corrected test statistics for the interaction effects and the main effects of the within-subjects factor “Time”. Also, since the condition was assigned on a random basis and assume the independence of the scores, part of the results from the mixed-ANOVA tests can still be used to examine the interaction effects between the two factors of “Time” and “Condition”, and possibly the main effects of “Time”.

Table 24 below is a summary of the valid results from the mixed-ANOVA tests.

<table>
<thead>
<tr>
<th>Source</th>
<th>F</th>
<th>Sig.</th>
<th>Partial η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>4.38</td>
<td>.04</td>
<td>.09</td>
</tr>
<tr>
<td></td>
<td>4.38</td>
<td>.04</td>
<td>.09</td>
</tr>
<tr>
<td></td>
<td>4.38</td>
<td>.04</td>
<td>.09</td>
</tr>
<tr>
<td>Time * Condition</td>
<td>12.70</td>
<td>.00</td>
<td>.76</td>
</tr>
<tr>
<td></td>
<td>12.70</td>
<td>.00</td>
<td>.76</td>
</tr>
<tr>
<td></td>
<td>12.70</td>
<td>.00</td>
<td>.76</td>
</tr>
</tbody>
</table>

The results showed that the interaction effect between the within-subjects factor of “Time” and the between-subjects factor of “Condition” was significant (F = 12.70, p < .001), indicating that the change of the accuracy scores from the pre-test to the post-test depends on the treatment condition. The partial eta squared estimate for the interaction effect was .76, suggesting that seventy-six percent of the variance excluding those accounted for by the other factors can be explained by the interaction term. According to Cohen (1988), this can be regarded as a large effect size. Figure 4 below illustrates the interaction effect on the change of accuracy scores.
The dotted line in Figure 4 shows that from the pre-test (Time 1) to the post-test (Time 2), the average accuracy score of the control group went up, indicating an increase of the average number of errors per clause. In contrast, the solid line shows that the average accuracy score of the treatment group went down from the pre-test to the post-test, indicating a decrease of the average number of errors per clause. Thus, the patterns of change from the pre-test to the post-test are quite different depending on treatment conditions. According to Bonett (2011), to examine the main effect of a factor when the interaction effect of the factor with another factor is significant could produce misleading results, and thus the results concerning the main effect of “Time” in Table 24 above will
not be further considered. Instead, the simple main effect of one fact at different levels of another fact should be examined.

Due to the violation of the equal variance assumption, the analysis of simple main effect of “Condition” at different levels of "Time" may be misleading using the results from the mixed-model ANOVA tests. Therefore, to fully examine the effect of the two factors in the two by two mixed-model ANOVA design and to obtain more robust results, the confidence intervals for two linear contrasts of means were calculated by hand. First, the definitions of the cell means in the two by two ANOVA design are explained using Figure 5 below.

<table>
<thead>
<tr>
<th>Factor A (Condition)</th>
<th>Factor B (Time)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a₁ (Control)</td>
<td>b₁ (Pre-test)</td>
</tr>
<tr>
<td></td>
<td>μ₁₁</td>
</tr>
<tr>
<td>a₂ (Treatment)</td>
<td>b₂ (Post-test)</td>
</tr>
<tr>
<td></td>
<td>μ₂₁</td>
</tr>
<tr>
<td></td>
<td>μ₂₂</td>
</tr>
</tbody>
</table>

Figure 5. Cell means for accuracy scores

As shown in Figure 5 above, μ₁₁ refers to the mean of the accuracy scores of the control group in the pre-test, and μ₁₂ refers to the mean of the accuracy scores of the control group in the post-test. Similarly, μ₂₁ refers to the mean of the accuracy scores of the treatment group in the pre-test, and μ₂₂ refers to the mean of the accuracy scores of the treatment group in the post-test. Therefore, the examination of the interaction effect and the most important simple main effect can be translated into the calculation of two
linear contrasts of means. Specifically, to examine the interaction effect is to compare the change of the means from the pre-test to the post-test between the two groups; and to examine the simple main effect of "Condition" on the post-test is to compare the means of the two groups in the pre-test and the post-test. Table 25 below summarizes the formulas and the results of the confidence intervals for the linear contrasts of means for the interaction effect and the simple main effect of “Condition” on the post-test.

Table 25. Confidence intervals for linear contrasts of means

<table>
<thead>
<tr>
<th>Effects</th>
<th>Linear Contrast of Means</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interaction</td>
<td>((\mu_{11} - \mu_{12}) - (\mu_{21} - \mu_{22}))</td>
<td>-1.62 -1.41</td>
</tr>
<tr>
<td>Simple main: A at t_{b_2}</td>
<td>(\mu_{12} - \mu_{22})</td>
<td>1.09 1.19</td>
</tr>
</tbody>
</table>

*Note. CI = Confidence interval; LL = Lower limit; UL = Upper limit*

The 95 percent confidence interval for the interaction effect was [-1.62, -1.41], confirming that the interaction effect was significant. Specifically, the 95 percent confidence interval means that the difference in simple main effect of “Time” at different levels of “Condition” could be anywhere between 1.41 and 1.62. In other words, it suggests that the difference in the mean accuracy scores among the study population if they were to participate in the face-to-face tasks would be 1.41 to 1.62 points lower than the difference in the mean accuracy scores in the study population if they were to participate in the SCMC tasks. According to Bonett (2011), in a two-factor mixed-model ANOVA design, if the interaction effect is significant, the simple main effect of the treatment factor at different levels of the other factor should be examined. Since the researcher was interested in how “Condition” may affect the performance differently between the two groups on the post-test, the simple main effect of “Condition” on the post-test (A at t_{b_2}) was examined.
The 95 percent confidence interval for the simple main effect of “Condition” in the post-test was [1.09, 1.19], indicating that the simple main effect of “Condition” was significant. Specifically, the 95 percent confidence interval means that the mean accuracy scores on the post-test from the study population if they were to participate in the face-to-face tasks would be about 1.09 to 1.19 points higher than the average accuracy score obtained after they were to go through the SCMC tasks. In other words, the average number of error per clause after going through SCMC tasks would be 1.09 to 1.19 lower than the average number of error after going through face-to-face tasks.

The results from both the mixed-model ANOVA tests and the linear contrasts of means have suggested that SCMC tasks have benefited the development of L2 written accuracy while face-to-face tasks seem to have negative impact. As explained in Chapter two and three, most studies on SCMC or interactions in general have violated the assumption of independence of observation when performing traditional hypothesis tests. Therefore, in Section 4.2.5, results based on the use of two alternative approaches informed by multilevel analysis are presented and discussed in comparison to the results concerning the impact of SCMC tasks on L2 accuracy reported in this section.

4.2.4 Fluency

This section presents the descriptive statistics of the average scores of fluency of the SCMC and control groups in the pre-test and the post-test, explains the inferential statistics concerning the hypothesis tests of the means, and considers the findings in relation to the results from previous research. As explained in Chapter two, an analysis of fluency in writing is traditionally concerned with how comfortable and fast a second language learner can write in the target language, and how coherent and complex the
production is (Fillmore, 1979). However, some of these views seem to be vague and do not clearly separate the criteria for fluency and those for accuracy and complexity.

Wolfe-Quintero et al. (1998) propose to follow Lennon's (1990) restriction of speaking fluency to the rate and length of output, and argue to focus on assessing how many words or structures a learner can access in a limited time to measure fluency. The researcher takes the same approach and believes that assessing the rate and length of writing can demonstrate a different aspect of learners' ability in using the target language. Therefore, fluency in the current study was measured by the total number of words divided by the total number of minutes allowed for the writing task (W/M). Table 26 below summarizes the means and standard deviations for the fluency scores for the control and treatment groups in both the pre-test and the post-test.

Table 26. Descriptive statistics for fluency scores

<table>
<thead>
<tr>
<th>Condition</th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (n = 23)</td>
<td>M</td>
<td>9.30</td>
<td>12.68</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>2.08</td>
<td>2.89</td>
</tr>
<tr>
<td>Treatment (n = 21)</td>
<td>M</td>
<td>8.16</td>
<td>11.78</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>1.97</td>
<td>2.68</td>
</tr>
<tr>
<td>Total (N = 44)</td>
<td>M</td>
<td>8.76</td>
<td>12.25</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>2.09</td>
<td>2.80</td>
</tr>
</tbody>
</table>

*Note. Difference = Post-test – Pre-test*

The results showed that overall the average number of words written per minute increased from 8.76 in the pre-test to 12.25 in the post-test. The average fluency score for the control group went up from 9.30 to 12.68, with an increase of 3.38. The average fluency score for the treatment group went up from 8.16 in the pre-test to 11.78 in the post-test, with an increase of 3.62. The increase in both the control and treatment groups are larger than the numbers reported in Arthur (1979). In his study, Arthur (1979) assessed writing fluency using the same measure of the average number of words per
minute of writing time, which was also called writing speed (p. 334). He found that the average fluency score of all participants increased from 5.84 to 7.02 (an increase of 1.18), and the average fluency score of his Spanish students and Arabic students increased from 6.21 to 7.50 (an increase of 1.29) and from 5.73 to 6.62 (an increase of .89) respectively. In comparison, the increase of the average fluency scores of the control (3.38) and treatment groups (3.62) seem to be quite large while the difference between the control and treatment groups in terms of their improvement (.24) seems to be small. The standard deviation of both groups increased from the pre-test to the post-test, indicating that the improvement of both groups may not be homogenous.

Based on the descriptive statistics concerning the means of fluency scores, it is worthwhile to further examine whether or not the difference between the pre-test and the post-test from each of the both groups, and the difference between the two groups on the improvement are significant using a mixed-model ANOVA test (Shannon & Davenport, 2001). The distributions of the fluency scores of both groups on the pre-test and the post-test were also checked against several basic assumptions of hypothesis tests in order to decide if the tests of the differences of means would be meaningful.

In examining whether or not the fluency scores have satisfied the assumptions for the use of hypothesis tests, it seems that the fluency scores have satisfied all the assumptions underlying the mixed-model ANOVA test. First, to check whether the shape of the distribution of fluency scores approaches a normal distribution, the statistics for the skewness and kurtosis of the distribution of data in the pre-test and the post-test for both sections were obtained. For the control group, the statistics were .72 and 1.63 for the pre-test scores, and -.31 and -.63 for the post-test scores. For the treatment group, the
statistics were -.38 and .03 for the pre-test scores, and -.51 and 1.19 for the post-test scores. Based on Brown’s (1997) standard for acceptable level of skewness or kurtosis (pp. 20-21), the distribution of the scores on the pre-test and the post-test for both groups can be regarded as approaching a normal distribution, because their skewness and kurtosis statistics all fall within the range of the values of two standard errors of the statistics. Second, the Levene’s test for equality of variances between the two groups on both tests yielded the following statistics: for the pre-test scores, \( F(1,42) = .11, p = .74 \), and for the post-test, \( F(1, 42) = .55, p = .46 \), indicating that the difference of the error variance between the control and treatment groups on the pre-test and that on the post-test were not significant, thus satisfying the assumption of equal variance. Third, the Box’s test of equality of covariance have also yielded insignificant results: \( F(1,44257) = .49, p = .69 \). Also, since the condition was assigned on a random basis and assume the independence of the scores, mixed-model ANOVA tests can be used to examine whether or not the change of the fluency score from the pre-test to the post-test depends on the treatment condition. Table 27 below summarizes the results from the mixed-model ANOVA test.

<table>
<thead>
<tr>
<th>Source</th>
<th>F</th>
<th>Sig.</th>
<th>Partial ( \eta^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time * Condition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greenhouse-Geisser</td>
<td>.31</td>
<td>.11</td>
<td>.003</td>
</tr>
<tr>
<td>Huynh-Feldt</td>
<td>.31</td>
<td>.11</td>
<td>.003</td>
</tr>
<tr>
<td>Lower-bound</td>
<td>.31</td>
<td>.11</td>
<td>.003</td>
</tr>
<tr>
<td>Time</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greenhouse-Geisser</td>
<td>88.31</td>
<td>.00</td>
<td>.68</td>
</tr>
<tr>
<td>Huynh-Feldt</td>
<td>88.31</td>
<td>.00</td>
<td>.68</td>
</tr>
<tr>
<td>Lower-bound</td>
<td>88.31</td>
<td>.00</td>
<td>.68</td>
</tr>
<tr>
<td>Condition</td>
<td>2.55</td>
<td>.12</td>
<td>.06</td>
</tr>
</tbody>
</table>

The results showed that the interaction effect between the within-subjects factor of “Time” and the between-subjects factor of “Condition” was not significant (\( F = .31, p \)
= .11), indicating that the change of scores from the pre-test to the post-test did not depend on the treatment condition. Figure 6 below illustrates the interaction effect.

Figure 6. Interaction effects: Fluency scores

In Figure 6 above, the dotted line shows that from the pre-test (Time 1) to the post-test (Time 2), the average fluency score of the control group went up, and the same pattern was also observed in the change of average fluency scores from the treatment group, as indicated by the solid line. The two lines in Figure 6 seem to be almost parallel to each other, suggesting no significant difference between the two groups in terms of their change of average fluency scores from the pre-test to the post-test. Since the interaction effect is not significant, it is reasonable to look at the main effect of each of the two factors: “Time” and “Condition”. According to Table 27, the effect of “Time”
overall was significant \((F = 88.31, p < .001)\). The partial eta squared estimate for the effect of “Time” was .68, suggesting that 68 percent of the variance excluding those explained by the other factors can be accounted for by the factor of “Time”. According to Cohen (1988), this can be regarded as a large effect size. The effect of “Condition” was not significant \((F = 2.55, p = .12)\). In other words, there would be significant improvement in the average fluency scores overtime, but the difference between the improvement as a result of face-to-face tasks and that of SCMC tasks is not significant.

Although no significant difference between the improvement of the control and the treatment group was detected, the fact that both groups have shown significant improvement from the pre-test to the post-test has provided support for the potential benefits of SCMC tasks for the development of L2 written fluency. Only a few studies have examined the impact of SCMC on L2 fluency. Blake (2009) has examined the effect of SCMC on L2 oral fluency. Examining the changes observed using five different measures of fluency between an SCMC group, a face-to-face group, and a control group involving no student interaction, Blake (2009) found that the SCMC group scored significantly higher on the phonation time ratio and the mean length of run measures than both the control group and the face-to-face group. However, the differences on other measures, including the speaking rate measure that is comparable to the written fluency measure used in the current study, were not significant (p. 235). Thus, it is possible whether or not significant results may be detected depends on the fluency measure used. With the findings on the phonation time ratio and the mean length of run, Blake (2009) concludes that SCMC has great potential for the improvement of oral fluency (p. 237). The research believes that the students in the SCMC group demonstrated significantly
higher gains in oral fluency possibly because SCMC affords more opportunity for learners to participate in the group communication, that SCMC reduces the anxiety associated with face-to-face communication, and that SCMC enables learners to have extended period of time to process the messages and learn from them (pp. 237-238). In comparison, the current study relies only on one fluency measure to examine the differential effect of SCMC between two groups of students. Therefore, using other measures of fluency or adding a third group involving no students' interaction may produce different results.

There are a few reasons that may explain the lack of significant difference between the improvement in L2 written fluency of the SCMC group and the face-to-face group in the current study. First, in the pre-test and the post-test, the students had to write a response to a writing prompt, and thus their familiarity with the topics of the writing prompts may affect their writing speed. In this sense, it seems that the fluency measure used in the study, the number of words per minute, may not necessarily assess precisely the ease and speed with which the students can access a second language. Second, tasks carried out in SCMC may take more time as they are carried out face-to-face (de la Fuente, 2003; Hamano-Bunce, 2010), and therefore, within the same amount of time, the students in the face-to-face groups may be exposed to more ideas on a given discussion topic than the students in the SCMC groups. Exposure to more ideas, in turn, may give advantages to the face-to-face groups in the writing tests. Third, the effect of SCMC on L2 fluency may become more obvious if the students' characteristics such as their language proficiency, working memory capacity, and their actual use of the affordances of SCMC are controlled, considering the number of studies that have observed the
influence of such characteristics on the effect of SCMC on L2 performance (Arslanyilmaz, 2012; Payne & Whitney, 2002; Sauro & Smith, 2010).

4.2.5 CAF: Revisited

The findings concerning the differential effect of SCMC and face-to-face tasks on the development of L2 grammatical and lexical complexity, accuracy, and fluency presented and discussed in Section 4.2.1, 4.2.2, 4.2.3, and 4.2.4 above are based on calculations using traditional hypothesis tests. One problem is that the data structure in the current study may not satisfy the assumption of independence of observations that is fundamental to the traditional hypothesis tests. In other words, for the hypothesis tests to yield accurate results, it is important that no participant in a study should have any influence on how any other participant will score on the dependent variables. This independence assumption is usually satisfied in the design stage of an experiment by preventing participants from communicating with each other during the course of the experiment (Bonett, 2011, p. 8). Therefore, using traditional hypothesis tests to analyze the current data set can be problematic, because the goal of this study was to look at learners' development through communication tasks where they work with each other regularly in triads. Therefore, the dependent variable scores on the post-test from the students in the same triad could very likely be more similar to each other than they are to the scores of those from other triads. Specifically, the potential problem is that the percentage of all possible samples for which a 100*(1 - α) percent confidence interval includes the value of the unknown parameter can be much lower than 100*(1 - α) percent, or that “the reported level of confidence might be misleadingly high” (Bonett, 2011, p. 8). Therefore, this section reports the results based on two alternative approaches informed
by multilevel analysis: 1) the calculation of the corrected t ratio and its corresponding p value for the comparison of means of the dependent variable scores on the post-test based on the partition of the total variance of the dependent variable scores into between-group variance and within-group variance and subsequently the computation of ICC and DEFF; 2) the comparison of a series of general linear models that aims to identify the most effective and parsimonious model in the explanation of the variance in the dependent variable scores taking into account the possibility of the effect of the SCMC tasks being moderated by the assignment of small groups or triads. As the first step, the ICC was calculated for each of the four dependent variables to examine the dependency of scores. Based on the results, the re-analysis was only performed for the accuracy scores that showed high level of dependency. The results from the two alternative approaches are then compared with those based on the traditional hypothesis tests, and the findings from the current study are discussed in relation to the findings of previous studies.

To calculate the ICC for each of the four dependent variables, the first step, as explained in Chapter 3, is to run a series of one-way ANOVA tests to examine the difference between the dependent variable scores within a triad and that between triads in order to help partition the total variance of the dependent variable scores into between-group and within-group variance. Here "group" refers specifically to "triads". Four one-way ANOVA tests were run on SPSS 20.0, for scores of grammatical and lexical complexity, accuracy, and fluency respectively. Table 28 below summarizes the partition of the variances for each of the four dependent variables into between-group variance, within-group variance, and total variance. The ratio of between-group variance over the total variance can give an indication of the dependence of the data set.
Table 28. Partition of variances

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Between-group</th>
<th>Within-group</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grammatical complexity</td>
<td>2.83</td>
<td>5.47</td>
<td>8.30</td>
</tr>
<tr>
<td>Lexical complexity</td>
<td>4.78</td>
<td>8.72</td>
<td>13.50</td>
</tr>
<tr>
<td>Accuracy</td>
<td>17.56</td>
<td>4.65</td>
<td>22.21</td>
</tr>
<tr>
<td>Fluency</td>
<td>140.35</td>
<td>195.52</td>
<td>335.87</td>
</tr>
</tbody>
</table>

Then, based on Equation (1) below, the ICC was calculated for each of the four dependent variable scores on the post-test. Equation (1) has been explained in Chapter three. Briefly, ρ is often used to refer to ICC; \( \sigma^2 \) refers to the variability that is within clusters, or in this case triads; \( \tau_{00} \) refers to the variability that is between clusters or triads; and \( \tau_{00} + \sigma^2 \) refers to the total variability of the dependent variable scores. Therefore, ICC can be obtained using Equation (1): dividing the between triad variability (\( \tau_{00} \)) by the total variability (\( \tau_{00} + \sigma^2 \)).

\[
\rho = \frac{\tau_{00}}{\tau_{00} + \sigma^2} \quad (1)
\]

Table 29 below is a summary of the ICCs for the four dependent variable scores on the post-test. It also shows the F ratio and the corresponding p value for each of the hypothesis tests of whether or not the differences of the dependent variable scores on the post-test between the triads are significant. The ICCs were calculated by hand using Equation (1), and the F ratios and the p values were from the output of the one-way ANOVA tests run on SPSS 20.0.

Table 29. ICC and one-way ANOVAs: Four dependent variables

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>ICC</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grammatical complexity</td>
<td>.34</td>
<td>1.07</td>
<td>.420</td>
</tr>
<tr>
<td>Lexical complexity</td>
<td>.35</td>
<td>1.14</td>
<td>.372</td>
</tr>
<tr>
<td>Accuracy</td>
<td>.79</td>
<td>7.83</td>
<td>.000</td>
</tr>
<tr>
<td>Fluency</td>
<td>.42</td>
<td>1.49</td>
<td>.178</td>
</tr>
</tbody>
</table>
According to the results shown in Table 29, the intraclass correlation coefficient for the accuracy scores on the post-test was .79, and the one-way ANOVA test of the difference of the scores between the triads has confirmed that the difference of the scores between the triads was significant (F = 7.83, p = .000), indicating that the responses from the participants in the same triads did demonstrate a clear tendency to cluster together.

The intraclass correlation coefficients for the other variables indicated that although differences between triads existed, they were not significant. Therefore, the previous results based on the hypothesis tests on the differences of means of scores of grammatical complexity, lexical complexity, and fluency can be regarded as reliable. The results concerning the effect of the SCMC tasks on accuracy, however, need to be re-examined. Table 30 below briefly summarizes the main steps and results from the first approach to the re-examination.

Table 30. Steps and results in calculating the corrected t ratio and p value

<table>
<thead>
<tr>
<th>Step</th>
<th>Goal</th>
<th>Equation</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ICC</td>
<td>$\rho = \frac{\tau_{00}}{\tau_{00} + \delta^2}$</td>
<td>.79</td>
</tr>
<tr>
<td>2</td>
<td>DEFF</td>
<td>$\text{DEFF} = \frac{\text{var(\text{design})}}{\text{var(SRS)}} = 1 + \rho(\bar{n}_j - 1)$</td>
<td>2.60</td>
</tr>
<tr>
<td>3</td>
<td>DEFT</td>
<td>$\text{DEFT} = \sqrt{\text{DEFF}}$</td>
<td>1.61</td>
</tr>
<tr>
<td>4</td>
<td>t-test (single-level)</td>
<td>Mean difference</td>
<td>-1.147</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SE</td>
<td>.125</td>
</tr>
<tr>
<td></td>
<td></td>
<td>t ratio</td>
<td>-9.197</td>
</tr>
<tr>
<td></td>
<td></td>
<td>p value</td>
<td>.000</td>
</tr>
<tr>
<td>5</td>
<td>Corrected SE</td>
<td>Standard error $\times$ DEFT</td>
<td>.201</td>
</tr>
<tr>
<td>6</td>
<td>Corrected t ratio</td>
<td>Mean difference / Corrected SE</td>
<td>-5.71</td>
</tr>
<tr>
<td>7</td>
<td>Corrected p</td>
<td></td>
<td>.000</td>
</tr>
</tbody>
</table>

According to Table 30, to continue to use the first approach to re-examine the effect of SCMC tasks on the development of accuracy, the ICC value can be used to
calculate a design effect (DEFF) for the study using Equation (2) introduced in Chapter three.

\[
DEFF = \frac{\text{var}(\text{design})}{\text{var}(\text{SRS})} = 1 + \rho(\bar{n}_j - 1) \quad (2)
\]

Briefly, in Equation (2), "\(n_j\)" refers to the average sample size within each cluster and "\(\rho\)" is the ICC. If this ratio is equal to 1, then there is no design effect, or clustering effect. However, if DEFF is greater than 1, the research design has violated the assumption of independence of observations, which would lead to bias in traditional tests of significance. According to Equation (2), the DEFF concerning the accuracy scores is 2.60.

Then, the DEFT, or the square root of the DEFF was obtained, and its value was rounded to 1.61. This number means that the researcher should multiply the standard error from the traditional statistical analysis by a factor of 1.61 to get a more realistic estimate of the standard error, given the dependence of data in the current study.

Next, the researcher ran an independent-samples t-test comparing the SCMC group and the face-to-face group on the accuracy scores on the post-test. The initial analysis of the difference between the two groups was statistically significant. The mean difference between the SCMC group and the face-to-face group was -1.147, and the standard error was .125 (\(t = -9.197, p = .000\)). The corrected standard error was \(0.125 \times 1.61 = .201\). This resulted in a corrected \(t\) ratio of \(-1.147/ .201 = -5.71\), corresponding to a \(p\) value of .000. Therefore, the results have shown that the mean difference of the accuracy scores between the SCMC group and the face-to-face group is still statistically significant after taking into account the dependence of scores within the triads.
The second approach follows the general linear regression framework in testing models that specify predictor variables and their relationships that determine the value of the dependent variable. Therefore, in the re-examination of the effect of the SCMC tasks on the development of accuracy, the accuracy scores on the post-test was regarded as the dependent variable, and in turn, several predictor variables were also identified that include: the treatment condition, the accuracy scores on the pre-test, and several small-group level, or triad-related variables. Specifically, five predictor variables at the small-group (macro) level were added: group effectiveness ($X_1$), group language use ($X_2$), group social distance ($X_3$), group language proficiency ($X_4$), and treatment condition ($X_5$), and one predictor variable was specified at the individual (micro) level: the accuracy scores on the pre-test ($X_6$). The values for first four predictor variables were obtained from the participants' ratings on the post-study group evaluation questionnaire (Appendix E) discussed in Chapter three. The values were then aggregated using the means of the ratings from the participants in each small group, or triad. It was the aggregated values that were used in testing models in the subsequent steps. The fifth variable (treatment condition) was a categorical variable with two levels that was modeled as a characteristic of the small groups. The sixth variable was the individuals’ accuracy scores on the pre-test, and it was considered as the individual-level predictor variable. A series of regression models were constructed and tested to examine the effects of the predictor variables on the accuracy scores on the post-test. The framework of general linear modeling provides a second method to take into account of the effect of the variables at the micro learning unit level on the dependent variables and to test the most appropriate
model that explains their relationships. Table 31 below summarizes the model comparisons.

Table 31. Summary of model comparisons

<table>
<thead>
<tr>
<th></th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
<th>M4</th>
<th>M5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>3.438</td>
<td>1.505</td>
<td>.347</td>
<td>.476</td>
<td>-1.040</td>
</tr>
<tr>
<td>X1 Group effectiveness</td>
<td>.015</td>
<td>.053</td>
<td>.068</td>
<td>.056</td>
<td>.072</td>
</tr>
<tr>
<td>t</td>
<td>.302</td>
<td>1.52</td>
<td>2.129</td>
<td>1.828</td>
<td>2.212</td>
</tr>
<tr>
<td>p</td>
<td>.764</td>
<td>.137</td>
<td>&lt; .05</td>
<td>.076</td>
<td>&lt; .05</td>
</tr>
<tr>
<td>X2 Group language use</td>
<td>-.284</td>
<td>-.182</td>
<td>-.173</td>
<td>-.134</td>
<td>.011</td>
</tr>
<tr>
<td>t</td>
<td>-3.515</td>
<td>-3.06</td>
<td>-3.175</td>
<td>-2.450</td>
<td>.097</td>
</tr>
<tr>
<td>p</td>
<td>&lt; .01</td>
<td>&lt; .01</td>
<td>&lt; .01</td>
<td>&lt; .05</td>
<td>.923</td>
</tr>
<tr>
<td>X3 Group social distance</td>
<td>-.197</td>
<td>-.136</td>
<td>-.070</td>
<td>-.070</td>
<td>-.114</td>
</tr>
<tr>
<td>t</td>
<td>-1.424</td>
<td>-1.387</td>
<td>-.759</td>
<td>-.797</td>
<td>-1.237</td>
</tr>
<tr>
<td>p</td>
<td>.163</td>
<td>.174</td>
<td>.453</td>
<td>.431</td>
<td>.224</td>
</tr>
<tr>
<td>X4 Perceived language proficiency</td>
<td>.130</td>
<td>.012</td>
<td>-.025</td>
<td>-.016</td>
<td>-.007</td>
</tr>
<tr>
<td>t</td>
<td>2.091</td>
<td>.258</td>
<td>-.549</td>
<td>-.369</td>
<td>-.165</td>
</tr>
<tr>
<td>p</td>
<td>&lt; .05</td>
<td>.798</td>
<td>.587</td>
<td>.715</td>
<td>.870</td>
</tr>
<tr>
<td>X5 Condition</td>
<td>.890</td>
<td>1.138</td>
<td>.598</td>
<td>.822</td>
<td></td>
</tr>
<tr>
<td>t</td>
<td>6.327</td>
<td>7.385</td>
<td>2.107</td>
<td>2.546</td>
<td></td>
</tr>
<tr>
<td>p</td>
<td>&lt; .01</td>
<td>&lt; .01</td>
<td>&lt; .05</td>
<td>&lt; .05</td>
<td></td>
</tr>
<tr>
<td>X6 Accuracy score on the pre-test</td>
<td>.405</td>
<td>.192</td>
<td>1.689</td>
<td></td>
<td></td>
</tr>
<tr>
<td>t</td>
<td>2.918</td>
<td>1.175</td>
<td>1.557</td>
<td></td>
<td></td>
</tr>
<tr>
<td>p</td>
<td>&lt; .01</td>
<td>.248</td>
<td>.129</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X7 Pre-test × Condition</td>
<td>.582</td>
<td>.281</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>t</td>
<td>2.221</td>
<td>.836</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>p</td>
<td>&lt; .05</td>
<td>.409</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X8 Pre-test × Group language use</td>
<td>-.159</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>t</td>
<td></td>
<td>-1.395</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>p</td>
<td>.172</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>.470</td>
<td>.735</td>
<td>.779</td>
<td>.800</td>
<td>.805</td>
</tr>
</tbody>
</table>

Specifically, as summarized in Table 31 above, the first model (M1) aimed to test the effect of the four small group characteristics (macro-level variables) on the accuracy scores on the post-test. The second model (M2) examined the effect of an additional group-level variable, treatment condition on the accuracy scores on the post-test. The third model (M3) examined the effect of the accuracy score on the pre-test on the accuracy scores on the post-test, in addition to the predictor variables tested in M1 and
M2. In the fourth model (M4) and the fifth model (M5), two cross-level interaction terms, "pre-test × condition" and "pre-test × group language use", were added because "pre-test", "condition", and "group language use" were identified as significant predictor variables in M1, M2, and M3.

In comparing the five models, the adjusted R-squared values are used to interpret the percentage of variance in the accuracy scores on the post-test that can be explained by the predictor variables in each of the five models. Based on the results from Table 31 above, the researcher believes that M4 fits the data the best because from M1 to M4, the value of adjusted R-squared increased considerably from .470 to .800, indicating that M1 can explain only forty-seven percent of the variance in the accuracy score in the post-test while M4 can explain eighty percent of the variance. At the same time, although there was an increase of the value of adjusted R-squared from M4 to M5, but by adding an additional term, the explained variance only increased by zero point five percent. Thus it is believed that M4 was more parsimonious than M5.

Specifically, M4 suggests the following results. First, the effect of "group effectiveness" on the accuracy scores was marginally significant (t = 1.828, p = .076). Second, the effect of "group language use" on the accuracy score was significant (t = -2.45, p < .05). Moreover, the coefficient estimate (-.134) indicated that there was a moderate negative relationship between "group language use" and the accuracy score, or that the more formal the language use in a group, the lower the accuracy score (i.e., the lower the number of errors on the post-test). Third, neither "group social distance" nor "perceived language proficiency" seemed to have any significant influence on the accuracy scores. Fourth, the effect of "condition" was found to be a significant predictor
variable for the accuracy scores on the post-test \( t = 2.107, p < .05 \), indicating that the change of the accuracy scores in the post-test did depend on "condition" even after taking into account of the influence of some possible small-group level variables and the individual level variable of pre-test accuracy scores. Since "condition" was a dummy coded variable (control = 1; treatment = 0), the regression equation for M4 suggested that the control group might have a higher average accuracy score (i.e., more errors) than the treatment group, largely confirming the results from the mixed-model ANOVA analysis in Section 4.2.3 and the results based on the corrected standard error reported above. The accuracy score in the pre-test did not seem to have significant effect in predicting the accuracy score in the post-test \( t = 1.175, p = .248 \). The cross-level interaction between the accuracy score in the pre-test and the treatment condition, however, was found to have significant impact on the accuracy score on the post-test \( t = 2.221, p < .05 \). Again, this confirms the results concerning the interaction effect obtained using single-level approaches reported in Section 4.2.3.

The findings based on both the traditional hypothesis tests and the two alternative approaches informed by multilevel analysis have suggested that the positive effect of SCMC tasks on L2 accuracy is statistically significant. These findings have provided more empirical evidence in support of the positive role of SCMC in L2 development. First, the positive finding lends support to the idea that the alleged benefit of SCMC on noticing and attention to form (Lai & Zhao, 2006; Lee, 2008) can possibly be translated to improved linguistic accuracy in writing (Coniam & Wong, 2004). Most previous research on the effect of SCMC has focused on examining learners’ interaction data (Beauvois, 1992; Kelm, 1992; Kern, 1995; Sauro & Smith, 2010; Shekary & Tahririan,
2006; Warschauer, 1996) to make inference about how SCMC may affect learners' language use in other contexts. However, while a number of studies have produced favorable evidence that certain types of communication tasks carried out in SCMC can lead to negotiation of meaning (Blake, 2000; Pellettieri, 2000; Smith, 2009), noticing (Lai & Zhao, 2006), language-related episodes (Shekary & Tahririan, 2006; Yilmaz & Granena, 2010), and other form-focused exchanges (Lee, 2008), other studies have reported undesirable features of language use in SCMC including short assertions, informal expressions, jokes, flaming, task management or other off-topic discussions (Collentine, 2009; Liang, 2010). Thus, the potential effect of SCMC on L2 development has largely been controversial. The results concerning the significant difference between the change of accuracy scores from the pre-test to the post-test between the SCMC group and the face-to-face group from the current study were based on a pre-study and a post-study writing test, and thus have provided more convincing evidence for how using SCMC tasks may affect learners' language use in other contexts, and have avoided the problem of making inference based only on the characteristics of learners’ language use in SCMC.

Making inferences of how SCMC affects L2 development based only on characteristics of SCMC discourse may not yield accurate results because of two reasons. First, the accuracy level of learners’ language use in SCMC can be affected by their intentional choices and thus does not represent their linguistic competency. According to register theory, people’s language use may vary depending on the topic of a conversation, the relationships between the interlocutors, and the role of the language in that situation (Eggins, 2004). Similarly, the learners engaged in SCMC tasks may choose to have
different levels of accuracy based on their perceptions of the goal of a task, the perceived relationships with their interlocutors, and the perception of the role of the language in the task. Thus, learners' language use in SCMC may not represent their linguistic competence. Second, it is misleading to regard instances of learners’ language use as their perception of the formality of language required by SCMC, and thus believe such language behavior in SCMC may be common among most students and cannot be changed. Although some research has shown that the perception of SCMC as primarily an informal way of communication does exist among some students (Collentine, 2009; Sotillo, 2000), it is possible that the integration of SCMC with course-related activities can reshape learners’ perception of the medium (Luo, 2005) and thus help change their language behavior in SCMC.

At the same time, the results that face-to-face tasks seem to have negative impacts on the participants’ development of linguistic accuracy raised several interesting questions for discussions. First, face-to-face tasks may focus learners’ attention more on meaning than on form because they are more efficient as compared with SCMC tasks, and thus are more effective in facilitating learners’ exchanges of ideas (Hamano-Bunce, 2010). Focusing on meaning thus may lead to inadequate processing capacity for focusing on form. Research has already shown that learners have a tendency to process information for meaning before processing for anything else (VanPatten, 1996). Thus face-to-face tasks with a clear meaning-oriented goal may cause learners to ignore linguistic accuracy, particularly when the processing capacity needed for meaning-oriented tasks is overwhelmingly high. Therefore, further examination of whether the participants in the control group focused more on meaning or form in the face-to-face
discussion tasks may help provide clearer explanation of why face-to-face tasks may encourage learners to focus on meaning rather than form, and thus lead to the decrease of linguistic accuracy.

Second, another possible reason for the negative effect of face-to-face tasks, in comparison with SCMC tasks, is that face-to-face tasks do not result in any additional materials for learners to work on to improve their linguistic accuracy. In the current study, the participants in the treatment section were allowed to access their chat transcripts after class, but the information concerning how many students have accessed the chat transcripts and the frequencies was not obtained. It is likely that some participants in the treatment group used the chat transcripts as additional learning materials to work on improving their linguistic accuracy. While there is evidence for the use of chat transcripts to improve linguistic accuracy (Bower, 2011), there is no equivalent materials for the participants in the control group to use to improve their linguistic accuracy. Although reading the chat transcripts can be daunting for the students, and not too many of the participants might have done this voluntarily, it could be an important factor for some participants’ improvement of their linguistic accuracy.

At the same time, the significant difference between the difference of the change of linguistic accuracy from the pre-test to the post-test between the SCMC and the face-to-face groups should be interpreted with caution because it is unexpected that the face-to-face tasks resulted in the decrease of linguistic accuracy, despite the explanations mentioned above. It would be more informative for similar studies in the future to include a true control group that involves no interactions between the students (Blake, 2009) to examine the effects of SCMC tasks on L2 development.
4.2.6 Summary

Section 4.2.1 to Section 4.2.5 have presented and discussed the results concerning the differential effects of SCMC and face-to-face tasks on L2 grammatical and lexical complexity, accuracy, and fluency. This section provides a brief summary of the results and discussion. Table 32 below is a brief summary of the major findings from the quasi-experiment discussed in the previous sections.

Table 32. The effects of SCMC tasks on CAF: A summary of findings

<table>
<thead>
<tr>
<th>Aspects of L2 Competence</th>
<th>Major Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grammatical complexity</td>
<td>#1 SCMC tasks may result in the decrease of grammatical complexity.</td>
</tr>
<tr>
<td>Lexical complexity</td>
<td>#2 The benefit of SCMC tasks on the improvement of lexical complexity is not statistically significant.</td>
</tr>
<tr>
<td></td>
<td>#3 The differential effects of SCMC tasks and face-to-face tasks on the improvement of lexical complexity are not statistically significant.</td>
</tr>
<tr>
<td>Accuracy</td>
<td>#4 The differential effects of SCMC tasks and face-to-face tasks on the development of accuracy are significant.</td>
</tr>
<tr>
<td>Fluency</td>
<td>#5 The benefit of SCMC tasks on the improvement of accuracy is statistically significant.</td>
</tr>
<tr>
<td></td>
<td>#6 The differential effects of SCMC tasks and face-to-face tasks on the improvement of fluency are not statistically significant.</td>
</tr>
</tbody>
</table>

The first major finding in Table 32 above is about the effect of SCMC tasks on the development of grammatical complexity. Since the researcher uses the average number of clauses per sentence to measure grammatical complexity in the study, the finding indicates that participating in SCMC tasks may cause learners to use simpler sentence structures. Sotillo (2000) suggests that a possible reason for learners to use simpler language in SCMC is because of the rapid scrolling of messages as a result of many-to-many communications enabled by text-based chat programs. She points out that learners may feel stressed to compose short messages in order to avoid possible
intervening messages (p. 97). Therefore, the lack of adjacency and the overwhelming information posted by many other participants may have caused the use of less complicated sentence structures in SCMC. Such language use in SCMC may then affect the language use in other contexts. To further examine the potential reasons that may cause the decrease of grammatical complexity, further research may look at how grammatical complexity of learners' language use in SCMC may be affected by factors such as different groupings (i.e., the number of participants in each small group), the nature of a task (i.e., whether a task focuses on meaning or form), and individual participant's use of the affordances of SCMC. Subsequently, future research can establish connections between characteristics of language use in SCMC and grammatical complexity of language use in other contexts.

The second and third findings are about the effect of SCMC tasks on changes of lexical complexity. No statistically significant result was detected in the improvement of lexical complexity of the SCMC group or the difference of the improvement between the two groups. Studies have shown that SCMC facilitates noticing more than face-to-face communication does (Lai & Zhao, 2006), and that lexical items have been frequently mentioned as triggers of negotiation of meaning (Blake, 2000; Pellettieri, 2000). Thus, there may exist a gap between what a learner may be exposed to in chat and whether or not the learner may be able to integrate what he or she has been exposed to in a subsequent task. Liang (2010) attempted to make a connection between her learners’ interactions in chat and their subsequent revision of writings, and found that clear patterns existed and showed that the learners incorporated ideas emerged in the SCMC discussions into their writings. However, she did not find clear evidence to support the
help of SCMC in improvement of language use. Moreover, Liang (2010) described in
details the differences of the interaction patterns between different groups and suggested
that different interaction patterns in SCMC discussions may have affected the subsequent
learning. Therefore, although the lack of significant difference between the post-test
scores from the control and the treatment groups may indicate that the SCMC tasks may
not provide more benefit as compared with the face-to-face tasks, the fact that the
improvement of lexical complexity in the control group was small may indicate that the
strong focus on meaning of the tasks may have limited the students' ability to focus on
lexical items and to improve lexical complexity.

The fourth finding is about the effect of SCMC tasks on the development of
accuracy. The finding suggests that SCMC tasks have significant positive impact on the
improvement of accuracy. However, the finding should be interpreted with caution
considering the decrease of accuracy in the face-to-face group. Future research may
include a true control group where participants are not involved in any interaction to
examine the effect of SCMC on changes of accuracy. The fifth and sixth findings are
about the effect of SCMC on the development of fluency. Although SCMC tasks have
been shown to have significant positive impact on the improvement of fluency, no
statistical significance was detected in the difference of the improvement between the
SCMC and face-to-face groups. Therefore, the study provides more empirical support for
the positive role of SCMC tasks in the development of accuracy and fluency, while its
influence on the development of complexity merits further research. It may also be more
informative for future studies to look at the development of CAF as well as the change of
their relationships as affected by instructional treatments.
4.3 L2 Learning Opportunities in SCMC Discourse

Section 4.2 presents and discusses the differential effects of SCMC tasks on the development of L2 grammatical and lexical complexity, accuracy, and fluency, and has identified that SCMC tasks have statistically significant positive impact on the development of L2 accuracy. Therefore, this section focuses on the SCMC discourse of three focal students and their triads to examine the L2 learning opportunities emerged in the SCMC interactions, and the similarities and differences between the three triads.

Since the major findings in the quasi-experiment have shown that the differential effect of SCMC and face-to-face tasks is statistically significant on the development of L2 accuracy, the focal students in the multiple case studies in the second phase were selected based on their performance on the dependent variable of "accuracy" on the post-test. Specifically, three focal students from each group were selected to represent different levels of accuracy scores on the post-test. The analysis of the chat transcripts of the focal students in the treatment group also involved their group members, and thus a total of nine participants were involved in the analysis of L2 learning opportunities emerged in the SCMC discourse. Together with the three focal students from the control group, a total of twelve participants were involved in the multiple case studies in the second phase.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Level</th>
<th>Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herman</td>
<td>Treatment</td>
<td>H</td>
</tr>
<tr>
<td>Frederick</td>
<td>M</td>
<td>.30</td>
</tr>
<tr>
<td>Hannah</td>
<td>L</td>
<td>.66</td>
</tr>
<tr>
<td>Charles</td>
<td>Control</td>
<td>H</td>
</tr>
<tr>
<td>Dennis</td>
<td>M</td>
<td>1.32</td>
</tr>
<tr>
<td>Frank</td>
<td>L</td>
<td>2.89</td>
</tr>
</tbody>
</table>

Note. H = high level of improvement; M = average improvement; L = low level of improvement
Table 33 below shows the six focal students, their accuracy scores on the post-test, and the level of accuracy they represent. Specifically, Herman, Frederick, and Hannah were selected from the treatment group to represent high, average, and low levels of accuracy on the post-test respectively. Similarly, Charles, Dennis, and Frank were selected from the control group to represent high, average, and low levels of accuracy on the post-test respectively. Section 4.3 focuses on identifying and analyzing the L2 learning opportunities emerged in the SCMC discourse of the triad of each of the three focal students from the treatment group to answer the second research question: What interactional processes occur in the SCMC discourse of the focal students in the selected triads that may be considered beneficial for L2 development?

As introduced in Chapter two and three, opportunities of L2 learning were operationalized as utterances or interactional sequences that focus on different aspects of the linguistic features of language rather than the conveyance of a message, or meaning. Drawing upon the Interaction approach and sociocultural theory of L2 learning, the researcher believes that the following six categories of instances would create favorable conditions for L2 learning, and therefore examined the SCMC discourse to identify these types of instances: 1) negotiation of meaning (Varonis & Gass, 1985), 2) co-construction of utterances, 3) other correction, 4) self-correction, 5) encouragement to continue or continuer (Foster & Ohta, 2005), and 6) language play (Belz, 2004; Warner, 2004). Unique categories that were considered to be beneficial for L2 learning were identified in some triads and are discussed accordingly in the following sections. Before going into the details of the L2 learning opportunities in the interaction processes of each of the three triads, it is necessary to give an overview of the amount of interaction that was observed
in each of the four selected SCMC work sessions for the three triads. Table 34 below provides a summary of the quantities of the interactions by triad.

<table>
<thead>
<tr>
<th>Triad</th>
<th>Session 2</th>
<th>Session 5</th>
<th>Session 7</th>
<th>Session 11</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 (Herman)</td>
<td>140</td>
<td>242</td>
<td>240</td>
<td>207</td>
<td>207</td>
</tr>
<tr>
<td>5 (Frederick)</td>
<td>123</td>
<td>167</td>
<td>142</td>
<td>154</td>
<td>147</td>
</tr>
<tr>
<td>4 (Hannah)</td>
<td>148</td>
<td>221</td>
<td>191</td>
<td>215</td>
<td>194</td>
</tr>
</tbody>
</table>

Each SCMC session lasted for about an hour, and Table 34 above shows the total number of turns in each of the four selected sessions for each triad. On the average, the quantity of interactions was the highest for Triad two and the lowest for Triad four. However, from Session two to Session eleven over the semester, the total number of turns have, in general, increased from the beginning to the end for all three triads. Additionally, for most of the SCMC sessions, the differences of the total number of turns between triads were not too large.

4.3.1 Triad two: Herman, Lambart, and Finley

This section examines the L2 learning opportunities emerged in the interaction processes of Triad two. In this triad, Herman was the focal student that represented the highest level of accuracy on the post-test. He is a male student whose L1 is Malay. His two group members, Lambart and Finley, are both male students who speak Chinese as their L1. Among the three students, Herman had the highest TOEFL iBT score and the highest frequency of English use outside class. The scores of technology use in learning English for both Herman and Finley were higher than the class average while that for Lambart was below the average. Thus, it seemed that Lambart did not use technology for English learning as much as did the other two. Additionally, although the analysis in this section involved only four SCMC sessions, Herman, Lambart, and Finley had
participated in all the twelve sessions, including the training session, throughout the semester. Table 35 below provides a summary of the categories of instances that were identified as beneficial for L2 learning in the SCMC discourse of Triad Two, the total number of turns for each category, and their corresponding proportion in the total number of turns for each of the four sessions.

Table 35. Summary of L2 learning opportunities: Herman, Lambart, & Finley

<table>
<thead>
<tr>
<th>Common categories</th>
<th>Session 2</th>
<th>Session 5</th>
<th>Session 7</th>
<th>Session 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off-task discussion</td>
<td>3 (2%)</td>
<td>2 (.8%)</td>
<td>9 (4%)</td>
<td>0</td>
</tr>
<tr>
<td>Negotiation of meaning</td>
<td>73 (52%)</td>
<td>15 (6%)</td>
<td>32 (13%)</td>
<td>17 (8%)</td>
</tr>
<tr>
<td>Co-construction of utterances</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other correction</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1 (.5%)</td>
</tr>
<tr>
<td>Encouragement to continue</td>
<td>0</td>
<td>22 (9%)</td>
<td>6 (3%)</td>
<td>5 (2%)</td>
</tr>
<tr>
<td>Self-correction</td>
<td>0</td>
<td>3 (1%)</td>
<td>6 (3%)</td>
<td>3 (1%)</td>
</tr>
<tr>
<td>Language play</td>
<td>3 (2%)</td>
<td>8 (3%)</td>
<td>3 (1%)</td>
<td>2 (1%)</td>
</tr>
</tbody>
</table>

| Unique categories to this group               |           |           |           |            |
| Acknowledgement                               | 0         | 1 (.4%)   | 1 (.4%)   | 0          |
| Capitalizing to emphasize                     | 0         | 0         | 1 (.4%)   | 2 (1%)     |

*Note.* The numbers indicate the number of turns, with the percentage in parenthesis.

Based on the review of the SCMC discourse of the triad and the information shown in Table 35 above, the major impression of the interaction processes in this triad can be summarized by three main observations: 1) all three participants were highly engaged in the discussions focusing on the given topics; 2) there were considerable number of L2 learning opportunities in each of the sessions; 3) the participants became more sophisticated in identifying key linguistic items to express themselves.

First, as shown in the first row of Table 35 above, the proportion of off-task discussion was constantly low for this triad. Off-topic discussion was defined as interaction sequences that were not related to the topics given by the instructor, task or triad management, greetings, or leave-taking. In this triad, the off-task discussions
usually occurred toward the end when the triad was approaching the end of an SCMC session, and most of the off-task utterances were initiated by Finley. For example, in the fifth chat session, Finley shared with the others that he only got a “B+” and that he felt sad about it (Example 1).

Example 1

232 10:49 AM: **Finley**: I only got B+
233 10:49 AM: **Finley**: crying

(Chat 5, Triad 2, p. 7)

These two lines from Finley occurred in the middle of Herman’s summary of their group report at the end of the SCMC session, and thus neither Herman nor Lambart gave any response. What is more interesting is that when the others did respond, they may turn such discussions into learning opportunities and benefit from the exchanges (Example 2).

Example 2

228 10:47 AM: **Finley**: it still shock my ass that Jobs has passed away
229 10:47 AM: **Herman**: who is JOBS
230 10:47 AM: **Finley**: Steve Jobs
231 10:47 AM: **Finley**: ex-CEO of apple
232 10:47 AM: **Herman**: ooo
233 10:48 AM: **Herman**: yeah
234 10:48 AM: **Herman**: no wonder it sounds fimiliar
235 10:48 AM: **Finley**: lol
236 10:48 AM: **Herman**: ok

(Chat 7, Triad 2, p. 7)

Example 2, again, shows that Finley was the one who initiated a short discussion on something that was not related to the tasks given during this session. While Herman was summarizing the group work at the end, he commented that it was surprising to hear that Steve Jobs passed away. This time, Herman was interested in the comment because
he noticed something that he did not know. So he followed up with a question. Finley then gave a simple explanation of who this person is. Herman might have heard about Steve Jobs before, but these few lines of utterances here might have helped him connect some discrete pieces of information he knew before. So although these were identified as off-topic discussion, and not knowing who Jobs is at this point of group work would not interfere with any communicative goals, Herman perceived that he could learn something new and acted upon the opportunity to learn. Sociocultural approaches of SLA have been aware of such phenomenon and emphasize that what becomes a language learning opportunity in interactions depends on what a learner wants and what he/she does (van Lier, 2000).

Second, there were considerable L2 learning opportunities in each of the SCMC sessions of this Triad. Most of the opportunities took the form of negotiation of meaning or encouragement to continue, but there were also instances of self-corrections and language play. The numbers of the instances of other corrections and acknowledgement of understanding, however, were low.

It is necessary to clarify that the negotiation sequences identified in the interaction processes in this triad were quite different from the original meaning of negotiation based on Varonis and Gass (1985), although they did share the surface structure of a negotiation sequence. The aim of most of the negotiation sequences identified in this study was not just to resolve a communication problem caused by an unknown vocabulary or some misunderstanding of a basic grammatical structure. Instead, because the negotiation sequences were embedded in argumentative discourse, their aim was quite often to clarify some subtle perspectives of understanding a word or a phrase (Example 3), or to explore
some abstract concepts (Example 4). Thus, the negotiation sequences were sometimes very long. Example 3 below shows that in an argument about the advantages and disadvantages of standardized tests, Herman and Lambart realized that they had encountered difficulties of reaching an agreement because of their different understanding of what “cheap” meant, and came to a resolution after a long negotiation sequence.

Example 3

26 9:51 AM: **Herman**: we can compare the answer and try to figure out which is the best
27 9:51 AM: **Lambart**: it will be cost more money and time
28 9:51 AM: **Herman**: yup, that is true
29 9:52 AM: **Lambart**: Thus I agree with the standard test
30 9:52 AM: **Lambart**: because it is convenient and cheap
31 9:52 AM: **Herman**: it is cheap?
32 9:53 AM: **Herman**: I dont know about you guys
33 9:53 AM: **Herman**: but in my country
34 9:53 AM: **Herman**: it is quite expensive
35 9:53 AM: **Finley**: it's no cheap
36 9:53 AM: **Finley**: also in our country
37 9:53 AM: **Instructor** (Ins) has entered the room.
38 9:53 AM: **Lambart**: yuo, people just need to input answer in computer
39 9:54 AM: **Herman**: but to take the test
40 9:54 AM: **Herman**: we need to pay
41 9:54 AM: **Instructor** (Ins): ok...
42 9:54 AM: **Lambart**: and computer will analysis the answer
43 9:54 AM: **Instructor** (Ins): how's it going?
44 9:54 AM: **Instructor** (Ins): any problems?
45 9:54 AM: **Lambart**: fine
46 9:54 AM: **Herman**: we are good
47 9:54 AM: **Finley**: We are arguing
48 9:54 AM: **Herman**: haha
49 9:54 AM: **Instructor** (Ins): Good! Just a reminder.
50 9:55 AM: **Finley**: Tofle is about 200 US dollar in China
51 9:55 AM: **Instructor** (Ins): Brainstorm ideas first, and note down the best answer.
52 9:55 AM: **Instructor** (Ins): REally? That's ridiculously expensive. but
what does it have to do with the schools who are using the test? Do they have to consider students' economic situations?

9:56 AM: **Lambart**: But it is the global test. Compare with IELTS' need individual appointment' it is cheaper

9:57 AM: **Finley**: Not sure. Maybe some poor gay can't afford the enrollment fee for TOEFL or SAT

9:57 AM: **Instructor** (Ins): Ok, but the key issue is "should schools use them or not"?

9:57 AM: **Lambart**: If they can not afford SAT and TOEFL how can they afford tuition and fees

9:57 AM: **Instructor** (Ins): All right. I'll leave the discussions to you guys.

9:58 AM: **Instructor** (Ins) has left the room.

9:58 AM: **Finley**: ok.

9:59 AM: **Lambart**: Yes, thus I agree with the standardise test

9:58 AM: **Herman**: I think we were playing the view of student

9:58 AM: **Herman**: and not the college

9:58 AM: **Finley**: Yes..

9:59 AM: **Finley**: let's change one

9:59 AM: **Herman**: so, i guess from a university point of view

9:59 AM: **Herman**: it would be cheaper

9:59 AM: **Herman**: compare if they had to do a interview and etc

10:00 AM: **Finley**: I think there are so many applicants, so they have to use the score of standard test to judge

(Chat 2, Triad 2, pp. 1-2)

In Example 3 above, the misunderstanding started in line 27 and 28. In line 27 when Lambart said: “it will be cost more money and time”, he actually meant that other ways of evaluating an applicant would be more time consuming and expensive because he added in line 29 that he was in favor of using standardized tests. However, Herman misunderstood Lambart right away, and said: “yup, that is true” in line 28, thinking that Lambart meant that the tests were expensive from test-takers' point of view. Thus when Lambart began to elaborate his idea and said “it is convenient and cheap” in line 30, Herman indicated his confusion by rephrasing part of Lambart’s last turn with a question mark: “it is cheap?”. Then, from line 32 to 40, without waiting for explanations from
Lambart, Herman went on and began to support his idea that standardized tests were expensive, from a test-taker’s point of view, which, unfortunately, was not clarified in those lines yet. The instructor logged in at this time and saw the confusion. There was an urge to help the participants clarify the confusion, but the instructor decided to leave it to the participants and only offered some encouragement to continue in line 41. At this time, Lambart probably did not realize where the problem was either, and so in line 42 he attempted to offer some more support to show why he thought standardized tests can be cheaper, rather than pointing out what the problem really was. The instructor could have been more patient, but she decided to offer some help in line 52 and 55 by asking them to consider two additional questions and the original discussion question. As Lambart continued to address Herman’s concerns in line 56 and reiterate his own position in line 60, Herman took sometime to read the messages. There were almost four minutes between Herman’s turn in line 48 and his next turn in line 61. More importantly, in line 61, 62, 65, 66, and 67, Herman clarified that it was their different understandings of “cheap to whom” that resulted in the confusion. This clarification was quite helpful, as Finley was probably confused and not quite active in this part of the conversation, but in his turn in line 68, he offered additional explanation of why standardized tests can be cheaper for the universities, showing that he caught up with the progress of the group discussions.

Therefore, although the participants were not talking about linguistic aspects of a word or a phrase, they were actively engaged in making sense of each other’s language use and meaning. Since the intended meanings of the utterances here were not clearly stated, the participants had to go through and identify where the confusion was. From a
sociocultural perspective, such a process and the verbalization of the problem can be regarded as evidence of language learning occurring in language use (Swain, 2000).

Some negotiation of meaning in this triad aimed to clarify certain abstract concepts that were covered in the previous class and need to be applied in their discussions. Example 4 below shows such an example of negotiation of meaning where Lambart attempted to help Herman understand the organization structure in a cause-and-effect essay.

Example 4

16 9:59 AM: **Herman**: Anyone have an opinion?
17 9:59 AM: **Lambart**: I think these support points are organized by parallell sequence
18 10:00 AM: **Finley**: I did't see any logic connections so far
19 10:00 AM: **Herman**: I think, the author did an excellant job in arranging the 5 factor
20 10:00 AM: **Finley**: let me think a second
21 10:00 AM: **Herman**: what is parallel sequence??
22 10:00 AM: **Herman**: I dont get it
23 10:01 AM: **Lambart**: They are the same important, and support the idea at the same time
24 10:01 AM: **Herman**: Still dont get it
25 10:01 AM: **Herman**: do you mean all factors are important
26 10:01 AM: **Lambart**: Just like list
27 10:01 AM: **Lambart**: Yes
28 10:02 AM: **Herman**: I agree that all factor are important
29 10:02 AM: **Finley**: I think the factors is from indivudual to enviroment, I mean from small to large
30 10:02 AM: **Lambart**: Just like list some factors which can support thesis

(Chat 5, Triad 2, p. 1)

In the class before the SCMC session, the organization structures of cause-and-effect essays were discussed. Before introducing the idea of ordering reasons or effects based on how important they are, the instructor showed an example of comparison
between two different ways of presenting the same set of reasons. In one, the reasons were presented as if they were equally important, and in the other, some linguistic devices were used to indicate the order of importance of the reasons. In explaining the differences to the students, the instructor used the word “parallel” to mean that the reasons in the first example were equally important.

The first task of the SCMC session shown in Example 4 above was to discuss whether an assigned text organized the factors based on a chronological order or their order of importance. Example 4 shows that the negotiation sequences started with Lambart’s response to Herman’s encouragement in soliciting his group members’ contribution. After Lambart mentioned parallel sequence in his response, Herman immediately followed up with an indication of non-understanding in line 21. However, the lack of understanding was probably not caused by not knowing the lexical item of “parallel” or “sequence”. It was the idea behind “parallel sequence” in the context of organization patterns for cause-and-effect essays that caused the problems of understanding. Another possible reason for Herman’s confusion was that “parallel sequence” was not introduced by the instructor in the class as one of the two structures that they were to choose from. Lambart attempted to explain what he meant in line 23 and 26, but the attempts did not seem to be quite successful. Thus in line 25, Herman changed his strategy by phrasing the problem in a yes/no question, hoping to get a clearer answer. Then, after getting a definite answer from Lambart in line 27, he showed his agreement with regard to the part that he understood, but did not acknowledge full understanding of Lambart’s idea. In fact, the researcher believes that Herman still did not quite understand what Lambart meant because Lambart’s idea behind “parallel sequence”
was dropped in the subsequent discussion, which usually did not happen in the exchanges between Lambart and Herman. Even though Lambart did not effectively express himself, he illustrated the concept in line 23 and gave an example in line 26. Thus, this negotiation sequence has provided opportunities for Lambart to use different linguistic devices to express himself and to clarify his ideas, and for Herman to learn to understand others by asking questions.

Third, it seems to the researcher that toward the end of the semester, the participants in Triad 2 became more sophisticated in using linguistic devices to express themselves, although the percentage of negotiation of meaning and self-correction actually dropped. An interesting observation was that toward the end of the semester, the participants began to highlight key words in their text messages to draw others’ attention or to avoid misunderstandings by using capital letters (Example 5).

Example 5

184 10:26 AM: Finley: Then we have to use stupid software and pay for it...!!
185 10:26 AM: Herman: yup
186 10:26 AM: Finley: I hope it includes in our tuition
187 10:26 AM: Herman: it is the decision of the university if they want to use it or not
188 10:27 AM: Lambart: Because you pay for it, it will become smarter and smarter
189 10:27 AM: Herman: however, in terms of using the software..payment is a MUST
190 10:27 AM: Finley: OH..it seems like a chinese university
191 10:27 AM: Finley: u MUST pay
192 10:27 AM: Herman: there are multiply type of software
193 10:28 AM: Finley: PAY for things u do not like
194 10:28 AM: Herman: if you want it for free
195 10:28 AM: Herman: you can try FREEWARE
196 10:28 AM: Finley: good idea
In Example 5 above, the participants were arguing about whether or not writing instructors should use an automated writing evaluation program, Criterion®, to score students' essays and help them identify grammar mistakes. Finley was defending his view that it was unfair for the students to have to pay for using the program in a writing class. This discussion was set up as a role-play discussion, and Finley’s role was that of a student. Lambart was the instructor and Herman was the software developer. Thus in this particular excerpt of the discussion, Herman and Lambart have already convinced Finley that the student need to pay for the cost of using the software, as indicated by Finley’s turn in line 186 where he made a compromise by saying that the cost should be covered by the tuition. After that, Lambart was trying to convince Finley by showing him that it was the payment that would support the growth of such industry. Herman, on the other hand, stood firmly on his ground that paying for services was a basic principle by capitalizing “must” in line 189 and “freeware” in line 195 as a contrast to paid software and services. Finley seemed to have run out of counter arguments, and gave up in line 196 by saying that using freeware was a good idea. Finley also capitalized “must” in line 191 and “pay” in line 193. But his intention was probably quite different. Drawing on her experience in Chinese universities, the researcher believes that Finley highlighted those two words to mock what Herman had said because “must” and “pay” were probably reminiscent of his negative feeling towards how Chinese educational institutions emphasize obedience, and students usually do not have a choice when confronted with schools' profit-driven moves.
Based on Table 35, the proportion of negotiation of meaning decreased from Session 2 to Session 11. However, the decrease does not necessarily mean that the opportunities for L2 learning in this triad were decreasing. It is likely that as the semester went on, the participants have developed better understanding of each other and learned to use the language more effectively to express themselves. Thus, there was less communication breakdown and negotiation of meaning. Meanwhile, the evidence that the participants began to highlight key words using capital letters in their text messages in later SCMC sessions to help convey their ideas further convinced the researcher that the three members of the triad have improved their abilities to communicate with each other by drawing each other's attention to key words to avoid misunderstanding.

4.3.2 Triad five: Frederick, Wynne, and Zach

In this triad, Frederick was the focal student that represented the average level of accuracy on the post-test. He and both of his group members are male Chinese students. Their scores on the TOEFL iBT were all in the range of 70 to 80. Frederick and Wynne reported their frequency of English use outside class as close to the class average while Zach reported that his frequency of English use outside class was much higher than the class average. Similarly, in terms of using technology in learning English, Frederick and Wynne both indicated their frequencies as lower than the class average while Zach’s use of technology in learning English was slightly above the class average. Additionally, Frederick and Zach did not miss any group work throughout the semester, and Wynne only missed one toward the end of the semester. Table 36 below summarizes the categories of L2 learning opportunities identified for Triad 5, the total number of turns in
each category and their corresponding proportion to the total number of turns in each SCMC session.

Table 36. Summary of L2 learning opportunities: Frederick, Wynne & Zach

<table>
<thead>
<tr>
<th>Common categories</th>
<th>Session 2</th>
<th>Session 5</th>
<th>Session 7</th>
<th>Session 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off-task discussion</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Negotiation of meaning</td>
<td>15 (10%)</td>
<td>6 (3%)</td>
<td>12 (6%)</td>
<td>2 (.9%)</td>
</tr>
<tr>
<td>Co-construction of utterances</td>
<td>0</td>
<td>21 (10%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other correction</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Encouragement to continue</td>
<td>3 (2%)</td>
<td>7 (3%)</td>
<td>2 (1%)</td>
<td>4 (2%)</td>
</tr>
<tr>
<td>Self-correction</td>
<td>0</td>
<td>0</td>
<td>1 (.5%)</td>
<td>0</td>
</tr>
<tr>
<td>Language play</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Note. The numbers indicate the number of turns, with the percentage in parenthesis.

In comparison with the characteristics of the interaction processes of Triad 2, the SCMC discourse of this triad did not seem to have any striking features that occurred repeatedly. Thus, no unique category was created in coding the SCMC discourse of this triad. However, the participants in this triad seemed to care more about language form, and that they would spend long time refining a sentence to make it more understandable. Sometimes, the group members would work together to co-construct a sentence to express an idea, and at other times, they would offer suggestions to help others explain or clarify their ideas. On the other hand, although they were engaged in sharing ideas and trying to understand each other throughout the discussions almost all the time, it seemed to me that they had difficulties expressing their own ideas and understanding each other. This may be part of the reason why this triad has focused so much on linguistic forms.

It was quite noticeable that from time to time, the participants in this triad would spend a long time co-constructing a sentence or rephrasing a sentence in order to make its meaning clearer. Example 6 shows how from line 123 to line 154, Zach tried to rephrase Frederick’s first turn into two separate points. The lines of interactions on another topic
were deleted in order to show how Frederick and Zach worked together to rephrase the original point in line 123.

Example 6

123 10:36 AM: Frederick: people who uses english often can talk with the foreigns smoothly and do not feel nevous
124 10:37 AM: Zach: Agree with Frederick's idea.
125 ......
126 ......
127 10:37 AM: Zach: If people use English ofen, they can speak English quickly and don't need to do the translation.
128 ......
129 ......
130 ......
131 ......
132 ......
133 ......
134 10:40 AM: Frederick: maybe use english as much as possible can change our attitude to communicate with others we may be more brave and willing to talk with others
135 ......
136 10:40 AM: Zach: Right, Frederick, I felt the same.
137 10:41 AM: Zach: Sometimes, learning a second launguage can help people to be more confidence
138 10:41 AM: Frederick: so can we say that use english often can improve the ability of communicating
139 10:41 AM: Frederick: confidence at the meanwhile
140 ......
141 ......
142 ......
143 ......
144 ......
145 ......
146 ......
147 ......
148 10:44 AM: Zach: Take me as an example, I was quite shy for speaking Chinese since I was a traditional person.
149 ......
150 10:44 AM: Zach: However, when I trt to speak English, I am kind of outgoing.
151 10:45 AM: Zach: Maybe this diverse was the cause of the
In Example 6 above, the participants were talking about whether or not English learners should speak English as much as possible. Frederick stated his opinion and two reasons in line 123. Zach responded quickly in line 124 that he agreed with Frederick. However, he did not stop sharing ideas on this point. A few lines later, he rephrased one of the reasons and replaced “smoothly” with “quickly” and further explained that speaking more would help prevent students from translating into their native language all the time. Neither Frederick nor Wynne responded to this rephrase explicitly, possibly indicating that they understood Zach’s input as the same point but they probably did not feel it was a better rephrase. In line 134, Frederick rephrased his second point of speaking more makes people feel less nervous, and further illustrated that speaking a foreign language may change people’s attitude toward communicating with others. Zach followed up with an agreement in line 136, and rephrased it as giving people more confidence in line 137. Immediately after that, Frederick rephrased his ideas into two separate parts, with one about improving abilities to communicate and the other one, incorporating Zach’s suggestion, enhancing confidence. A few lines later, Zach began to give specific examples to illustrate those ideas from Frederick, who did not understand Zach’s intention until line 154. Although it is debatable whether or not speaking English actually helps learners be more confident or changes their identity, the point here is that...
Zach intended to provide an example to illustrate Frederick’s ideas, and Frederick got it at the end. Therefore, together, they refined the expression for an idea and found an example to support the idea.

Another impression of the interaction processes of this triad was that there were either some comprehension problems or that the participants had difficulties coming up with appropriate expressions to integrate others’ points into a counter-argument, thus making some responses not as effective. Example 7 below is such an example.

Example 7

58 10:14 AM: **Zach:** Facebook is widely used in the school among teenagers, many people find friends from the Facebook.
59 10:15 AM: **Zach:** However, some of people blame on the using of Facebook.
60 10:15 AM: **Zach:** They mention it will extract the study, what's your view?
61 10:16 AM: **Wynne:** As a IT person, I would say facebook is a web can share many things online with your friends
62 10:16 AM: **Frederick:** From my point of view, to some degree, facebook is helpful to students in making new friends and so on. By contract, it will occupied you a lot of time.
63 10:17 AM: **Zach:** Right, it's the purpose of Facebook. We provide a space for people all around the world to communication.
64 10:17 AM: **Frederick:** so I think Facebook will influence our stud.
65 10:17 AM: **Frederick:** study
66 10:18 AM: **Zach:** However, this reason seems right but it can't bear the insight analysis.
67 10:19 AM: **Zach:** Everything has its drawbacks.
68 10:19 AM: **Wynne:** but the benefit is far more than the only influence a little people's study
69 10:19 AM: **Zach:** However, the program was designed to have the communication.

(Chat 7, Triad 5, p. 2)
In Example 7 above, the participants were talking about whether or not students should be encouraged to use Facebook. In line 58, 59, and 60, Zach briefly summarized two different perspectives and asked his group members for opinions. After Wynne and Frederick clarified their opinions 61, 62, 64, and 65, Zach seemed to have noticed that Frederick’s opinion was opposite to his. However, in his turn in line 66 and 67, he did not specifically discuss why Frederick’s opinions or reasons were problematic. Instead, he only offered a weak counter-argument by vaguely arguing for the use of Facebook. Again, even when he came back and attempted to add some more reasons in line 69, it was more like a repetition of his original point, rather than responding to Frederick’s doubts. The researcher felt it was more likely that Zach may be struggling to find appropriate expressions to respond to Frederick’s questions directly.

4.3.3 Triad four: Hannah, Patricia, and Sarah

In this triad, Hannah was the focal student that represented the lowest level of accuracy on the post-test. She is a female student whose L1 is Chinese. Her two group members, Patricia and Sarah, are both female students, but Patricia speaks Vietnamese as L1 and Sarah speaks Chinese as L1. The three participants were similar in their English proficiency level as shown on the TOEFL iBT and TOFEL PBT tests. Hannah and Sarah reported that their frequencies of English use outside class were close to the class average while Patricia indicated that her use of English outside class was very rare. In terms of using technology in learning English, Hannah and Sarah both indicated that their frequencies of using technology in English learning were above the class average while Patricia’s frequency of using technology was below the class average. Additionally, Hannah and Patricia did not miss any group work throughout the semester, but Sarah
missed three SCMC sessions. Table 37 below summarizes the categories of L2 learning opportunities of Triad 4, the total number of turns for each category and their corresponding proportion to the total number of turns in each SCMC session.

Table 37. Summary of L2 learning opportunities: Hannah, Patricia & Sarah

<table>
<thead>
<tr>
<th>Common categories</th>
<th>Session 2</th>
<th>Session 5</th>
<th>Session 7</th>
<th>Session 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off-task discussion</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>23 (15%)</td>
</tr>
<tr>
<td>Negotiation of meaning</td>
<td>51 (41%)</td>
<td>24 (14%)</td>
<td>30 (21%)</td>
<td>24 (16%)</td>
</tr>
<tr>
<td>Co-construction of utterances</td>
<td>0</td>
<td>6 (4%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other correction</td>
<td>0</td>
<td>7 (4%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Encouragement to continue</td>
<td>3 (2%)</td>
<td>6 (4%)</td>
<td>2 (1%)</td>
<td>3 (2%)</td>
</tr>
<tr>
<td>Self-correction</td>
<td>1 (.8%)</td>
<td>2 (1%)</td>
<td>2 (1%)</td>
<td>4 (3%)</td>
</tr>
<tr>
<td>Language play</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Unique categories to this group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Informal use &amp; symbols</td>
<td>26 (21%)</td>
<td>32 (19%)</td>
<td>26 (18%)</td>
<td>33 (21%)</td>
</tr>
<tr>
<td>Group/task management</td>
<td>0</td>
<td>0</td>
<td>32 (15%)</td>
<td>22 (14%)</td>
</tr>
</tbody>
</table>

Note. The numbers indicate the number of turns, with the percentage in parenthesis.

The major impression of the interaction processes in this triad can be summarized as three main observations: 1) the SCMC discourse was characterized by informal language use, chat acronyms, and text message shorthand; 2) a significant part of the interaction processes was devoted to conversations about the triad or task management issues; 3) negotiation sequences usually did not get resolved very satisfactorily and the group members who raised questions rarely followed up by asking for more information or clarifications.

The most noticeable feature of the SCMC discourse in this group was the use of informal language, chat acronyms, and text message shorthand. In each of the four SCMC sessions, the proportion of turns involving some kind of informal usage was around twenty percent. Also, such use of informal expressions was quite spread out. On any single page of the chat transcripts, there were at least four turns containing such
Example 8

181 10:23 AM: **Patricia**: so, I do not want it score my essays, I only want it to help me with writing
182 10:23 AM: **Patricia**: yep
183 10:24 AM: **Sarah**: yep
184 10:24 AM: **Hannah**: ok
185 10:24 AM: **Patricia**: And one more point, when writing essays, I suppose someone will read it, not write for the computer read it
186 10:24 AM: **Patricia**: lol
187 10:24 AM: **Hannah**: crition 28 we tell us the reason
188 10:25 AM: **Hannah**: it can find the mistake, but we should revise by our self

(Chat 11, Triad 4, p. 5)

In Example 8, there were only eight turns, but there were already two instances of “yep” (line 182 and 183), and one instance of “lol” (meaning “laughing out loud”), and another instance where Hannah used numbers in place of words. Informal expressions like these were quite common in this group, particularly between Hannah and Sarah. Unfortunately, probably under their influence, Patricia began to use those informal expressions more often in later SCMC sessions. For example, in the first few sessions, when Patricia wanted to express agreement, she usually used relatively formal expressions such as “I agree with Hannah” (Chat 2, Triad 4, p. 1). However, later on, she decided to use a simpler “yep” (line 182, Example 8) instead when expressing agreement and support. Sarah’s language use in chat became shockingly simpler later on. For example, she would constantly use “y” to mean “yep” (e.g., Chat 11, Group 4, p. 1), and “k” to mean “ok” (e.g., Chat 5, Group 4, p. 2). The fact that her lines were usually short
seemed to indicate that she may not be fully engaged in the SCMC discussions, rather than just an indication of her preference to informal language use online.

At the same time, the members in this triad seemed to be intentionally using different emoticons to compensate for the lack of animation and fun features of the chat program embedded in WebCT. They frequently used “><” (e.g., Chat 2, Triad 4, p. 3) to mean being frustrated or embarrassed, “: d” (Chat 7, Triad 4, p. 1) to mean “a big smile”, and repetition of some symbols or letters to make some noise (“~~~~~~”, “^^^^^^^^”, or “!!!!!!!!!!!!!”). Hannah and Sarah also used quite a few onomatopoetic words to mimic laughter (e.g., “haha”, “heihei”, and “enene”). The members in this triad also had informal address terms for each other. For example, Hannah called her group members “sisters” during their group work sessions (e.g., Chat 4, Triad 4, p. 1).

Second, the triad seemed to have some problems coordinating tasks among themselves during the fifth and eleventh SCMC sessions. Both of the two SCMC sessions had role-play discussion topics, and thus required the participants to be familiar with the assigned readings before the group work sessions started. However, during those two sessions, a long stretch of turns at the beginning was devoted to a discussion about who-takes-what-role. Sometimes, the discussion was prolonged because one group member did not understand the requirement or the expectations for a specific role. In comparison to the efficient coordination of the tasks between members in Triad 2 and 5, Triad 4 seemed to be ineffective, with around fifteen percent of the turns used in task coordination in Session 7 and Session 11.

Third, although there was a considerably large proportion of negotiation of meaning in each of the SCMC sessions, the comprehension problems did not usually get
resolved very satisfactorily. Rarely did group members insist on solving the problems before moving on to other topics. In this triad, the negotiation sequences were mostly caused by confusions of basic vocabulary and/or grammatical points, and were seldom caused by misunderstanding or non-understanding of some abstract concepts in someone’s ideas. Example 9 below is illustrates the kind of negotiation that was going on in the interactions of this triad.

Example 9

37 10:07 AM: **Hannah**: promotion
38 10:07 AM: **Sarah**: colleagues
39 10:07 AM: **Hannah**: individual personality
40 10:07 AM: **Patricia**: GOOD colleague
41 10:07 AM: **Patricia**: What is promotion
42 10:07 AM: **Hannah**: colleagues can be contained in the condition
43 10:08 AM: **Sarah**: what's about promotion
44 10:08 AM: **Hannah**: en ,the definition?
45 10:08 AM: **Hannah**: high level of the work
46 10:08 AM: **Patricia**: in this article, "promotion" are not mention
47 10:09 AM: **Sarah**: yep
48 10:09 AM: **Hannah**: you sure?
49 10:09 AM: **Sarah**: I agree with Patricia
50 10:09 AM: **Patricia**: It is in Euitable Rewards
51 10:09 AM: **Hannah**: yes ,but it is a important statement for the staff
52 10:10 AM: **Hannah**: OK,let us conclusion

(Chat 5, Triad 4, pp. 1-2)

In Example 9 above, Patricia first indicated that she did not understand the word “promotion” in line 41. Then Sarah responded by asking Patricia to be more specific about her question, and Hannah rephrased the question by asking if Patricia’s problem was the meaning of the word. Then, without waiting for a response from Patricia, Hannah
went ahead and provided a definition for “promotion” in line 45. For that, Patricia did not offer any explicit response about whether or not she understood the word. Instead, she offered an observation in line 46, saying that if that was what the word meant, it should not be included as a point because this idea was not discussed in the assigned article. This indicated that Hannah’s explanation was not clear to Patricia, because the idea of promotion is indeed discussed in the article. Sarah’s turn in line 47 and 49 also indicated that she probably did not understand the word either. Then, Patricia came back in line 50 and changed her opinion and said that it was included in the section entitled “Equitable Rewards”. At this point, Sarah did not seem to understand the word yet. However, she did not raise any questions, and Hannah did not want wait any longer and jumped to conclusion in line 52. Patricia, on the other hand, understood the ideas but did not offer more explicit explanation to Sarah either.

Additionally, there were a limited number of turns involving co-construction of utterances, other correction, and self-correction. The proportion of corrections felt quite inadequate in comparison to the high frequencies of misspellings, wrong forms of verbs, and other linguistic problems in the chat transcripts. Therefore, Hannah, Patricia, and Sarah seemed to be mostly engaged in meaning-oriented discussions. Even in meaning-focused discussions, the group members seemed to have problems in expressing themselves effectively. Although there were not many instances of off-task discussions, the chat transcripts did not show much evidence of L2 learning either. Several factors may be at play. First, the language proficiency level of the participants in this group seemed to be inadequate for them to focus on both meaning and form in the SCMC tasks. Thus, when the participants were still struggling to express meaning, they may not have
additional processing capacity to focus on form. Second, the frequent use of informal expressions was very noticeable, and to some extent, the researcher felt that the SCMC discourse in this group was very similar to typical casual online chatting. The participants may have opted for the informal expressions intentionally because they may know these better than the accurate English expressions or that they wanted to establish rapport with their group members by using some insider language. They may also be influenced by each other in choosing to use informal expressions, particularly in the case of Patricia. This characteristic of their language use in the SCMC tasks may have affected the participants in different ways. Hannah had the lowest accuracy level on the post-test, and during the SCMC tasks throughout the semester, she had been using informal expressions frequently. Therefore, Hannah was focusing primarily on meaning in the SCMC tasks, and even if she did focus on form, the overall interaction did not provide many positive examples, and thus it is unlikely that Hannah has benefited from the SCMC tasks in terms of linguistic accuracy.

The SCMC discourse of the three triads was quite different in terms of the potential for L2 learning. In Herman’s triad, a considerable number of opportunities were evidenced by negotiation of meaning that focused on minor details of words and expressions, or abstract concepts, and by the fact that most of the problems causing the negotiations were solved satisfactorily. Moreover, there were evidences of other L2 learning opportunities such as self-corrections, and practices of drawing each other’s attention by highlighting keywords. In comparison, the interaction processes in Frederick’s triad did not seem to have many negotiation sequences that were resolved adequately. However, both Herman’s triad and Frederick’s triad kept using relatively
formal expressions in their discussions. In contrast, the language use in Hannah’s triad was characterized by frequent use of informal expressions. It was quite likely that such frequent use of informal expressions have negatively affected Hannah’s level of linguistic accuracy in the post-test.

4.4 SCMC and the Development of L2 Academic Literacy

The previous section examined the chat transcripts to identify potential L2 learning opportunities for each of the three selected triads, and discussed the similarities and differences between them. Although it was found that L2 learning opportunities did exist in some instances of negotiation of meaning, co-construction of a phrase or a sentence, other correction, self-correction, and encouragement to continue, as well as a very small number of language play, the proportion of these utterances did not account for the majority of the SCMC discourse in any of the three groups. However, the results also showed that most of the remaining utterances were not off-topic discussions either. Therefore, the chat transcripts were examined again in order to analyze the students' use of argumentative moves in the SCMC discourse, and their development in doing so throughout the semester. As explained in Chapter two, the ability to construct effective arguments has been considered as a key element in academic literacy. Therefore, this section reports and discusses the findings on how the students were developing their abilities to use argumentative moves effectively to learn to construct effective arguments. Specifically, this section seeks to answer the following two research questions concerning the effects of the SCMC tasks on the development of L2 academic literacy: 1) How does the SCMC discourse of the focal students reflect their development in using argument moves to construct effective arguments? What patterns of change can be observed
concerning the argumentative moves of the timed writing samples of the same students? What connections, if any, are there between the characteristics of the use of argumentative moves in the SCMC discourse and the patterns of change in the writing samples? 2) How do the focal students learn to use meta-discourse resources in the SCMC discourse? What patterns of change can be observed concerning the use of meta-discourse resources in the timed writing samples? What connections, if any, are there between the use of meta-discourse resources in the SCMC discourse and the patterns of change in the writing samples?

The analysis of this part focused on Herman, Frederick, and Hannah from the treatment group, and Charles, Dennis, and Frank from the control group. For the participants in the treatment group, their turns in the chat transcripts were analyzed in terms of the argumentative moves and the use of meta-discourse devices using the coding schemes introduced in Chapter three. The patterns identified in the chat transcripts were then compared to the patterns of argumentative moves and the use of meta-discourse devices in their parallel writing samples. For the participants in the control group, their writing samples were analyzed in terms of the argumentative moves and the use of meta-discourse devices. The development patterns in the timed writing between the SCMC group and the face-to-face group were then compared and discussed.

4.4.1 Herman

Throughout the four SCMC work sessions, Herman has showed a high level of engagement consistently. His engagement was not only shown in the total number of turns he had for each session, but also in the larger proportion of the turns that were devoted to responses to others’ comments instead of advancing his own arguments.
without listening to others. Table 38 below summarizes the classification of his turns into different argumentative moves in SCMC.

Table 38. Argumentative moves in SCMC: Herman

<table>
<thead>
<tr>
<th>Constructing arguments</th>
<th>Session 2</th>
<th>Session 5</th>
<th>Session 7</th>
<th>Session 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Thesis</td>
<td>1 (2%)</td>
<td>4 (3%)</td>
<td>7 (5%)</td>
<td>0</td>
</tr>
<tr>
<td>Definition</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4 (5%)</td>
</tr>
<tr>
<td>Support</td>
<td>5 (8%)</td>
<td>1 (.8%)</td>
<td>24 (18%)</td>
<td>0</td>
</tr>
<tr>
<td>Opposing views</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Summary</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Responding to arguments</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Questioning</td>
<td>16 (26%)</td>
<td>38 (31%)</td>
<td>19 (14%)</td>
<td>5 (7%)</td>
</tr>
<tr>
<td>Showing agreement</td>
<td>4 (6%)</td>
<td>10 (8%)</td>
<td>7 (5%)</td>
<td>3 (4%)</td>
</tr>
<tr>
<td>Showing disagreement</td>
<td>3 (5%)</td>
<td>1 (.8%)</td>
<td>11 (8%)</td>
<td>2 (3%)</td>
</tr>
<tr>
<td>Further support or</td>
<td>14 (23%)</td>
<td>30 (25%)</td>
<td>43 (32%)</td>
<td>39 (53%)</td>
</tr>
<tr>
<td>clarification</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As shown in Table 38 above, in most of his turns in all the four SCMC work sessions, Herman focused on responding to others in one way or another. The total percentage of the turns in the second main category of “responding to arguments” added up to over fifty percent in all four sessions, while the percentage of turns used to solely advance his own arguments was consistently below twenty percent. Thus, it is clear that Herman was making use of the opportunities of interactions to engage in exchanging ideas with his group members, and not just to make assertions or claims of his views. Moreover, the percentage in the second main category increased from Session 2 to Session 11, indicating that Herman developed some awareness of the importance of understanding and responding to others’ views in making his own arguments more effective. More specifically within the second main category of "responding to arguments", most of his responses were either questioning or further support or clarifications, suggesting that when responding to others' views, Herman was sincerely
trying to understand others' views rather than merely showing agreement or disagreement.

More importantly, Herman would not easily give up his own position on an issue. When there was no comprehension problem, Herman would defend his opinion by providing supporting points for his own views or by challenging the opposing views.

Example 10

80 10:17 AM: **Lambart**: People cannot surfing facebook in classroom
81 10:17 AM: **Herman**: However
82 10:17 AM: **Herman**: u cannot block student privilege

......
103 10:22 AM: **Herman**: But people still continues to smoke regardless of these rules
104 10:23 AM: **Herman**: if we just block it on computer lab
105 10:23 AM: **Herman**: how about when there is no class
106 10:23 AM: **Herman**: do other people need to suffer as well

......
109 10:24 AM: **Herman**: how about the student who want to use the computer during leisure time

......
111 10:25 AM: **Herman**: even if you block it during class, student will still continue to be absent minded

......
117 10:27 AM: **Herman**: However, to control more than 200000 student activity
118 10:27 AM: **Herman**: would be expensive n hard

......
132 10:29 AM: **Herman**: how about
133 10:29 AM: **Herman**: meeting with new friend
134 10:29 AM: **Herman**: student will want
135 10:30 AM: **Herman**: to investigate about their new friend on campus
136 10:30 AM: **Herman**: n see what are the similarities

......
154 10:34 AM: **Herman**: How about
155 10:34 AM: **Lambart**: When people have class or lecture they cannot use the facebook
156 10:34 AM: **Herman**: phones
157 10:34 AM: **Herman**: people could still log in
10:34 AM: **Herman**: through phone

10:34 AM: **Herman**: phone

10:34 AM: **Herman**: as all phone have WISP

10:35 AM: **Herman**: WISP is a individual thing

10:35 AM: **Herman**: u buy the data plan

10:36 AM: **Herman**: and the WISP gave u unlimited acces

10:36 AM: **Herman**: to internet

10:37 AM: **Herman**: student will find a way

10:37 AM: **Herman**: to hack it

10:37 AM: **Herman**: or get past through the firewall

10:41 AM: **Herman**: U cannot give special attention towards certain people

10:41 AM: **Herman**: that would be bias

10:42 AM: **Herman**: it gives out special treatment to these genius

10:42 AM: **Herman**: if we do that

10:43 AM: **Herman**: that would be unfair

10:43 AM: **Lambart**: Only IT genius can break the block

10:43 AM: **Herman**: we dont want to start a monarchy here

10:43 AM: **Lambart**: Otherwise you need to obey the rule

10:43 AM: **Herman**: but still

10:43 AM: **Herman**: it would be bias

10:44 AM: **Herman**: is just block in class

10:45 AM: **Herman**: and allow student to access facebook when they are not in class

10:45 AM: **Herman**: I am still against blocking the facebook

10:46 AM: **Herman**: However, to help student flourish and understand lectures better in class

10:46 AM: **Herman**: in would be better that way

10:46 AM: **Herman**: rather blocking the access of facebook in the entire campus

(Chat 7, Triad 2, pp. 2-7)
Example 10 below is a good illustration of Herman's efforts in defending his opinion with regard to the use of social network applications on the computers in classrooms. In this long stretch of discussions above, Herman was arguing with Lambart about whether or not Facebook should be blocked on campus. Although Herman agreed before line 80 that Facebook was distracting, he immediately presented his counter arguments when Lambart suggested blocking Facebook on campus. Herman’s counter arguments first focused on the feasibility of this solution, as shown between line 80 and 167 where he explained that basically it was impossible because students have phones and data plans and it is impossible to block their access to Facebook. He then focused on the consequences of this solution that some people would be able to get there no matter what while others would not be able to, and that would be unfair and cause problems among students. It is clear from this example that Herman's argumentative moves are contingent upon Lambart's counter arguments. In other words, Herman's criticisms have specific targets. It is in this sense that the researcher believes that Herman has been learning to construct effective arguments in SCMC by learning to understand others’ views and to incorporate these views in the construction of his own arguments. As a result, the conclusion of this segment of interaction was that Herman made a compromise that he agreed to have a policy to have Facebook blocked in computer labs for classes because he acknowledged that it would help students concentrate on lectures. However, he also emphasized that this should not be a campus-wide policy.

Example 10 further illustrates how Herman engaged in the SCMC discussions to understand his group members and to exchange ideas with them. His questions and counter arguments were very important not only for himself, but also for the whole group,
because they built on the group members’ responses and to some extent forced the others
to continue building on each others’ comments, thus helping tie the group discussions
into a more cohesive piece. The most noticeable benefit of the SCMC sessions for
Herman is probably the exposure to different opinions. Since he has demonstrated serious
engagement with different opinions in all the chat sessions, it is possible that he has
learned the importance of taking into account of different opinions in constructing one’s
own arguments. However, the current study does not differentiate different levels of
engagement with others' views, and thus the specific patterns of development in learning
to integrate others' views were not clear. Future research could examine more specifically
the development of different aspects of the ability to construct effective arguments, such
as how learners become more aware of the importance of others' views and more skillful
in integrating these views in building their own arguments. Communication studies on
argumentative moves in conversations may provide a framework to focus on the
development of specific moves in the SCMC discourse of L2 learners. The development
patterns of Herman shown in the SCMC discourse were also compared with the
development patterns shown in his samples of academic writing (Table 39).

<table>
<thead>
<tr>
<th>Argument moves</th>
<th>Writing 1</th>
<th>Writing 2</th>
<th>Writing 3</th>
<th>Writing 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation</td>
<td></td>
<td></td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td>Thesis</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Definition</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Opposing views</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Summary</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. Y = Yes, and it indicates the presence of an argumentative move.*
Table 39 above summarizes the development patterns identified in Herman's four writing samples collected in the timed writing tests. According to Table 39, from the first writing to the fourth writing, Herman learned to incorporate more moves in academic writing, first “orientation” and “summary” starting in the second writing sample, and then “definition” finally in the last writing sample. Although the integration of “definition” could be due to other factors such as the topic of the writing prompt, it is arguable that Herman added the definition because he was made aware of the need to do so because of his constant engagement in presenting counter arguments and clarifications. In fact, during the eleventh SCMC session right before the fourth writing test, Herman had to clearly define the purpose of an automated writing evaluation system before he could persuade Finley that the system was useful. Thus, experiences like these may have helped Herman understand the concept of audience, and thus be able to predict possible confusions of the potential audience of his writing. Thus the use of definition in the last writing sample may be a result of such awareness.

Another interesting pattern that could not be summarized by Table 39 is Herman’s increasingly skillful discussion of opposing views. Table 39 only provides information to show that the discussion of opposing views is present in all four writing samples, but it cannot demonstrate the difference between the discussions. Based on a review of the discussions in the four writing samples, it is clear that Herman has become more competent in the discussion of opposing views. In the first writing sample, the discussion of opposing views was presented in a rather formulaic or mechanic manner, with opposing views mentioned right after his own views and no further discussion of how the opposing views could or could not affect his own arguments. Starting in the second
writing, it was clear that Herman began to put more thoughts in the discussion of opposing views. They were not just juxtaposed with his own view. Instead, relevant opposing views were discussed in relation to his counter arguments, and that the development of his counter arguments would go hand-in-hand with the rebuttal of the opposing views. The researcher believes that the development of Herman’s abilities to connect relevant opposing views to his counter arguments could also be a positive result of the development of his awareness of the potential audience that has been fostered by the engagement in the SCMC discussions.

Learning to incorporate others' views is one aspect of the ability to construct effective arguments. Another aspect that the study aimed to examine is the development in using meta-discourse devices in presenting one's arguments. Table 40 below summarizes the total number of turns that involve the use of the five categories of meta-discourse devices for Herman, and their corresponding proportion in the total number of turns for each session.

Table 40. The use of meta-discourse devices in SCMC: Herman

<table>
<thead>
<tr>
<th>Meta-discourse devices</th>
<th>Session 2</th>
<th>Session 5</th>
<th>Session 7</th>
<th>Session 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hedges</td>
<td>8 (13%)</td>
<td>13 (11%)</td>
<td>17 (13%)</td>
<td>14 (19%)</td>
</tr>
<tr>
<td>Boosters</td>
<td>0</td>
<td>4 (3%)</td>
<td>22 (16%)</td>
<td>35 (48%)</td>
</tr>
<tr>
<td>Attitude markers</td>
<td>4 (6%)</td>
<td>13 (11%)</td>
<td>4 (3%)</td>
<td>3 (4%)</td>
</tr>
<tr>
<td>Self mention</td>
<td>6 (10%)</td>
<td>8 (7%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Engagement markers</td>
<td>1 (2%)</td>
<td>0</td>
<td>6 (4%)</td>
<td>13 (18%)</td>
</tr>
</tbody>
</table>

With regard to Herman’s use of meta-discourse devices in the SCMC sessions, it seems that Herman constantly used hedges in around twenty percent of his turns in all the SCMC work sessions, but the proportion of his turns involving the use of boosters increased from zero percent in the first SCMC session to forty-eight percent in the last
session, possibly indicating that throughout the semester, he became more confident in his own opinions or that he began to realize the importance of using certain linguistic devices to emphasize the certainty he had in a statement, and has learned to use them to project the confidence he had in his own statements. Another interesting change shown in Table 40 above is that the frequency of self-mention dropped while the frequency of engagement markers increased. This change has shown, from a different perspective, Herman’s shift of attention from himself to his audience. This might have indicated his growing awareness of the importance of the listeners or readers in projecting himself as a credible and persuasive speaker.

The raw counts of the occurrence of the meta-discourse devices in the writing samples were normed to counts per 10,000 words to facilitate a comparison with Hyland’s (2005) study of the use of meta-discourse devices in postgraduate dissertations in different disciplines. Table 41 below is a summary of the normed frequencies of the use of the five categories of meta-discourse devices in the four writing samples in comparison to the numbers reported in Hyland (2005).

Table 41. The use of meta-discourse devices in writing: Herman

<table>
<thead>
<tr>
<th>Meta-discourse</th>
<th>Hyland (2005)</th>
<th>Writing 1</th>
<th>Writing 2</th>
<th>Writing 3</th>
<th>Writing 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hedges</td>
<td>111.4</td>
<td>9 (445.5)</td>
<td>8 (333.3)</td>
<td>6 (185.8)</td>
<td>6 (170.0)</td>
</tr>
<tr>
<td>Boosters</td>
<td>37.9</td>
<td>0</td>
<td>2 (83.3)</td>
<td>4 (123.8)</td>
<td>4 (113.3)</td>
</tr>
<tr>
<td>Attitude markers</td>
<td>20.3</td>
<td>1 (49.5)</td>
<td>1 (41.7)</td>
<td>1 (31.0)</td>
<td>1 (28.3)</td>
</tr>
<tr>
<td>Self mention</td>
<td>66.1</td>
<td>1 (49.5)</td>
<td>9 (375.0)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Engagement markers</td>
<td>50.0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*Note.* Normed counts are in parentheses.

From Table 41 above, it seems that from the first writing to the fourth writing, Herman was in a development to learn to balance the use of hedges and boosters in
academic writing. The frequency of hedges in his writing decreased gradually while he learned to incorporate more boosters. The frequency of attitude markers also dropped toward the level indicated in Hyland (2005). However, no engagement marker was identified in the writing samples, and the occurrence of self-mention quickly dropped to zero since the third writing sample. However, it is important to note that the selected reference numbers are from Hyland’s (2005) study of dissertations in applied linguistics, and they are different from the numbers identified from dissertations in biology in which the frequency of self-mention and engagement markers is 5.7 and 15.4 per 10,000 words respectively (p. 57). Despite the disciplinary differences, however, it is still clear that there are weaknesses in Herman’s writing in terms of the use of self-mention and engagement markers, and that the SCMC sessions did not seem to lend much support in the development of Herman's competence in using meta-discourse devices. Therefore, future research could focus specifically on one or two meta-discourse devices and track their use and intended meaning more specifically in order to reveal the details of the learning process and the problems in the learning process. It is also important to note, pedagogically, to help students learn to use meta-discourse devices may need more structured support from the instructor, in addition to the incidental noticing and the collaborative learning among the students.

4.4.2 Frederick

Throughout the four SCMC work sessions, Frederick also showed a relatively high level of engagement. Although his total number of turns in each of the four sessions was smaller, as compared to that of Herman, he participated actively in providing further support or clarification in the SCMC discussions. Table 42 below summarizes the
number of turns in the different categories of argumentative moves for Frederick in each of the SCMC sessions, and their corresponding proportion in the total number of turns for each SCMC session.

Table 42. Argumentative moves in SCMC: Frederick

<table>
<thead>
<tr>
<th>Constructing arguments</th>
<th>Session 2</th>
<th>Session 5</th>
<th>Session 7</th>
<th>Session 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Thesis</td>
<td>1 (3%)</td>
<td>2 (4%)</td>
<td>2 (8%)</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>Definition</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Support</td>
<td>8 (21%)</td>
<td>3 (7%)</td>
<td>2 (8%)</td>
<td>3 (7%)</td>
</tr>
<tr>
<td>Opposing views</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Summary</td>
<td>0</td>
<td>1 (2%)</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Responding to arguments</th>
<th>Session 2</th>
<th>Session 5</th>
<th>Session 7</th>
<th>Session 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questioning</td>
<td>0</td>
<td>6 (13%)</td>
<td>2 (8%)</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>Showing agreement</td>
<td>7 (18%)</td>
<td>8 (18%)</td>
<td>1 (4%)</td>
<td>4 (10%)</td>
</tr>
<tr>
<td>Showing disagreement</td>
<td>1 (3%)</td>
<td>2 (4%)</td>
<td>1 (4%)</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>Further support or clarification</td>
<td>7 (18%)</td>
<td>15 (33%)</td>
<td>10 (40%)</td>
<td>24 (59%)</td>
</tr>
</tbody>
</table>

As shown in Table 42 above, in most of his turns in all the four SCMC sessions, Frederick also focused on responding to others in one way or another. The total percentage of the turns in the second main category of “responding to arguments” added up to over forty percent in all four sessions, while the percentage of turns used to solely advance his arguments was consistently below twenty-five percent. Thus, Frederick was also making use of the opportunities of interactions to engage in the exchange of ideas with his group members, and not just to make assertions or claims of his views. However, a major difference between Frederick and Herman was that Frederick seemed to be more willing to show agreement and less willing to question. However, Frederick usually did not stop with a mere indication of agreement. By providing further support or by helping his group members to clarify their views on certain issues in their statements, Frederick was also helping the group to understand the issue at hand and each other’s opinions.
Example 11 below is an excerpt from the chat transcripts that can show how Frederick was helping the group members rephrase their ideas in order to clarify their meanings.

Example 11

8 10:01 AM: Frederick: the author has five factors. as far as i am concerned, the author talked about the objective condition about the work, then he talked about the subjective condition

9 10:01 AM: Frederick: this is my opinion.

10 10:02 AM: Zach: Great.

11 10:03 AM: Zach: In my own opinion, I think the writer list 5 factors from people's internal to external part.

......

16 10:05 AM: Frederick: i support Zach's opinion but maybe from internal to external, than final to internal again

......

20 10:09 AM: Frederick: the first is mental challenge, people want to make effort to solve problem. the next is rewards, after giving efforts, it is reasonable to get proper reward. And the effort can not live without support condition and colleagues, there are external, the effort also need personality, this is internal.

......

22 10:09 AM: Zach: Oh, that's excellent.

......

24 10:10 AM: Zach: I think I got the idea after read your idea.

......

29 10:13 AM: Frederick: yes i agree with Zach. the writer first definite the real job means. than use the 5 factors to illustrate the demand of the real satisfaction job.

......

34 10:15 AM: Frederick: anything else to say?

......

49 10:19 AM: Frederick: 3 and 4 are talked about external balance

66 10:24 AM: Frederick: all in all the 5 factors are logic and from internal to external, than at last to internal

(Chat 5, Triad 5, pp. 1-3)
In the discussions shown in Example 11 above, Frederick was talking with his group members about the logic relation between different factors of *Job Satisfaction*, a text assigned before the SCMC work session. Frederick offered his idea at the beginning of the example in line 8 that the author went from objective reasons to subjective reasons. Then Zach offered his idea that the author went from internal factors to external factors in line 11. Frederick responded quickly to Zach’s idea in line 16 with an indication of agreement and a slight clarification that the author went back to internal factors at the end. Frederick followed up with an elaborated explanation of this view in line 20. Zach indicated that he agreed with Frederick on his elaboration in line 22 and 24, but Frederick continued to provide more explanation, mostly to Wynne, until finally they reached a common understanding in line 66 where Frederick summarized the triad's answer to this question.

Example 11 illustrates that although Frederick did not “speak” as frequently as Herman did during the SCMC discussions, his lines indicated that he was also focusing on exchanging ideas with the others, and possibly he was more willing to accept others’ opinions and to build upon their ideas. This is quite different from Herman's insistence on his own opinions. Frederick's participation was also quite helpful for his group members to understand each other and develop new ideas. Another possible reason for the smaller number of turns from Frederick is that he might have to spend more time reading and understanding the text messages from his group members, or that he spend more time planning and monitoring his text messages and as a result the total number of turns was smaller. It is also quite striking to see the different dynamics between Frederick's triad and Herman's triad. Quite possibly, these different dynamics may affect how a learner
would behave in the SCMC work sessions, and in turn, become an indispensable factor influencing what learners learn and how they learn in and through SCMC discourse.

The development patterns of Frederick shown in the SCMC discourse are also compared with the development patterns shown in his samples of academic writing. Table 43 below summarizes the development patterns of the use of argumentative moves identified in Frederick's four writing samples collected in the timed writing tests.

Table 43. Argumentative moves in academic writing: Frederick

<table>
<thead>
<tr>
<th>Argument moves</th>
<th>Writing 1</th>
<th>Writing 2</th>
<th>Writing 3</th>
<th>Writing 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation</td>
<td></td>
<td>Y</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Thesis</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Definition</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Opposing views</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summary</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. Y = Yes, and it indicates the presence of a move.*

The summary in Table 43 does not seem to give any clear indication of the development patterns in using the argumentative moves in the writing samples. It suggests that from the first writing to the fourth writing, Frederick only learned to add orientation, starting from the third writing sample. No definition or summary was used in any of the writing samples. The absence of definition might be due to the lack of awareness, but the missing of summary reminded the researcher that it may be a result of the lack of enough time to complete the writing task since all the writing samples were produced within twenty-five minutes. Consistent with the impression that this triad may be less proficient than Herman's triad and thus need more time to understand each other and to clarify their own opinions, it is possible that members in this triad could have some problems in completing the writing tasks on time. The fact that there were
discussions of opposing views in the first three writing samples, but not the last one provides further evidence of this explanation.

A closer look at the discussion of opposing views in the first three writing samples showed that there was not much improvement in integrating opposing views with counter arguments in any of them. The researcher believes several factors may be at play here. First, the fact that there were not many questions from Frederick in SCMC could possibly indicate the group’s lack of exploration of alternative perspectives. Second, without questions, the participants also lost opportunities to answer questions. Exploring alternative perspectives and experiences of answering questions could both be potentially helpful for Frederick to learn to discuss opposing views more effectively. Third, the researcher believes that Frederick's tendency to accommodate his group member's views, rather than challenging them, may have potentially affected the learning environment of this triad and reduces the opportunities to explore alternative perspectives and to practice the use of argumentative moves in the back-and-forth rhetoric. With regard to Frederick’s use of meta-discourse devices in the SCMC sessions, there does not seem to have any particular pattern of development.

Table 44. The use of meta-discourse devices in SCMC: Frederick

<table>
<thead>
<tr>
<th>Meta-discourse devices</th>
<th>Session 2</th>
<th>Session 5</th>
<th>Session 7</th>
<th>Session 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hedges</td>
<td>11 (29%)</td>
<td>24 (53%)</td>
<td>11 (44%)</td>
<td>16 (39%)</td>
</tr>
<tr>
<td>Boosters</td>
<td>18 (47%)</td>
<td>18 (40%)</td>
<td>12 (48%)</td>
<td>14 (34%)</td>
</tr>
<tr>
<td>Attitude markers</td>
<td>3 (8%)</td>
<td>11 (24%)</td>
<td>5 (20%)</td>
<td>7 (17%)</td>
</tr>
<tr>
<td>Self mention</td>
<td>3 (8%)</td>
<td>11 (24%)</td>
<td>0</td>
<td>9 (22%)</td>
</tr>
<tr>
<td>Engagement markers</td>
<td>1 (3%)</td>
<td>2 (4%)</td>
<td>2 (8%)</td>
<td>13 (32%)</td>
</tr>
</tbody>
</table>

Table 44 above summarizes the total number of turns that involve the use of the five categories of meta-discourse devices for Frederick, and their corresponding
proportion in the total number of turns for each session. It seems that the frequency of hedges increased, particularly from Session 2 to Session 5 and 7. The last session saw a decrease in the use of hedges, but the frequency is still higher than that of the session at the beginning. On the other hand, the frequency of boosters was constantly throughout all the chat sessions (i.e., the frequency of the use of boosters was at around thirty-five percent for all four sessions). This may indicate that although Frederick's tendency to use boosters did not change much throughout the semester while his increasing use of hedges might be a result of the interactions in the SCMC sessions. It is possible that Frederick gradually learned that it is necessary to use hedges in order to make his own opinions more acceptable to his group members. Additionally, Table 44 above also shows that Frederick also demonstrated an increasing use of engagement markers. This may also result from the participation of the SCMC discussions where Frederick learned to become more aware of the importance of how to project himself to the listeners or readers, and thus began to learn to use hedges and engagement markers to help build effective arguments by influencing how his group members perceive him as a speaker in the group discussions in SCMC.

The raw counts of the occurrence of the meta-discourse devices in the writing samples were normed to counts per 10,000 words to facilitate a comparison with Hyland’s (2005) study of the use of meta-discourse devices in postgraduate dissertations in different disciplines. Table 45 below is a summary of the normed frequencies of the use of the five categories of meta-discourse devices in the four writing samples in comparison to the normed frequencies of the use of meta-discourse devices in dissertations reported in Hyland (2005).
Table 45. The Use of Meta-Discourse Devices in Writing: Frederick

<table>
<thead>
<tr>
<th>Meta-discourse</th>
<th>Hyland (2005)</th>
<th>Writing 1</th>
<th>Writing 2</th>
<th>Writing 3</th>
<th>Writing 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hedges</td>
<td>111.4</td>
<td>3 (163.9)</td>
<td>3 (103.1)</td>
<td>2 (78.4)</td>
<td>5 (195.3)</td>
</tr>
<tr>
<td>Boosters</td>
<td>37.9</td>
<td>4 (218.6)</td>
<td>13 (446.7)</td>
<td>12 (470.6)</td>
<td>14 (546.9)</td>
</tr>
<tr>
<td>Attitude markers</td>
<td>20.3</td>
<td>2 (109.3)</td>
<td>2 (68.7)</td>
<td>1 (39.2)</td>
<td>1 (39.1)</td>
</tr>
<tr>
<td>Self mention</td>
<td>66.1</td>
<td>0</td>
<td>0</td>
<td>11 (431.4)</td>
<td>1 (39.1)</td>
</tr>
<tr>
<td>Engagement markers</td>
<td>50.0</td>
<td>0</td>
<td>2 (78.4)</td>
<td>1 (39.2)</td>
<td>4 (156.3)</td>
</tr>
</tbody>
</table>

*Note. Normed counts are in parentheses.*

Again, using Hyland’s (2005) numbers as references, Table 45 above shows that from the first writing to the fourth writing, Frederick seemed to developed awareness of using more hedges. However, the frequency of boosters was constantly high. The researcher believes that if Frederick had more opportunities to construct his own arguments and modify his arguments based on his group members’ responses rather than accepting and helping clarify or develop others’ opinions, he might have become more aware of the need to balance the use of hedges and boosters rather than relying mostly on boosters to make assertions. The frequency of self-mention dropped while that of engagement markers increased. Interestingly, the increasing use of engagement markers may also point to Frederick’s lack of reasoning. Most often, he would use references to shared knowledge to make a point rather than presenting specific supporting points. In other words, the lack of question-and-answer in the SCMC discourse in this group may be linked to Frederick’s lack of sophistication in discussing opposing views and characteristics of using meta-discourse devices. However, the idea that Frederick may not have learned much in terms of the use of meta-discourse devices from the SCMC tasks should be interpreted with caution. As mentioned above, there exist disciplinary
differences with regard to the desirable levels of hedges and boosters, and that incidental learning in the SCMC tasks alone may not enough for the learners to learn to use metadiscourse devices.

4.4.3 Hannah

The classification of Hannah’s turns in the SCMC discussions into different argument moves showed that her participation was different from that of Herman and Frederick in two main ways. First, the majority of her participation focused on constructing her own arguments rather than responding to others’ ideas. This is shown not only in the majority of turns devoted to the presentation and elaboration of her own arguments rather than responding to others' views, but also in the fact that Hannah ignored most of the questions to her arguments either purposefully or unconsciously. Second, even when she responded to others' views, her responses were overwhelmingly characterized by showing brief agreement or providing some further support rather than indicating disagreement or questioning.

Table 46. Argumentative moves in SCMC: Hannah

<table>
<thead>
<tr>
<th>Constructing arguments</th>
<th>Session 2</th>
<th>Session 5</th>
<th>Session 7</th>
<th>Session 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Thesis</td>
<td>2 (3%)</td>
<td>5 (5%)</td>
<td>5 (7%)</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>Definition</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Support</td>
<td>4 (7%)</td>
<td>36 (35%)</td>
<td>16 (23%)</td>
<td>35 (49%)</td>
</tr>
<tr>
<td>Opposing views</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Summary</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Responding to arguments</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Questioning</td>
<td>4 (7%)</td>
<td>6 (6%)</td>
<td>4 (6%)</td>
<td>2 (3%)</td>
</tr>
<tr>
<td>Showing agreement</td>
<td>6 (10%)</td>
<td>6 (6%)</td>
<td>4 (6%)</td>
<td>4 (6%)</td>
</tr>
<tr>
<td>Showing disagreement</td>
<td>0</td>
<td>0</td>
<td>1 (1%)</td>
<td>0</td>
</tr>
<tr>
<td>Further support or clarification</td>
<td>12 (21%)</td>
<td>9 (9%)</td>
<td>18 (25%)</td>
<td>9 (13%)</td>
</tr>
</tbody>
</table>
Table 46 above summarizes the total number of turns involving the use of the different categories of argumentative moves for Hannah in each of the four SCMC sessions, and their corresponding proportion to the total number of turns in each session. As shown in Table 46, in most of her turns, particularly in those in the last three SCMC sessions, Hannah focused on building her own arguments by providing supporting points and examples for her own point, rather than responding to others’ comments. The percentage of the turns in “constructing arguments” is at least equal to, or even larger than that in the second category of “responding to arguments”. In particular, in Session 5 and Session 11, the percentage of turns used in constructing her own arguments added up to forty percent and fifty percent respectively. Thus, the impression is that Hannah was making use of the opportunities of interactions to practice expressing her opinions, illustrating her points, and using examples to support her opinions. This is a major difference between Hannah on one hand, and Herman and Frederick on the other. It may not be fair to say that constructing one’s own arguments does not constitute learning opportunities, but without meaningful engagement with others’ opinions and ideas, it is clear that Hannah did not see the SCMC interaction as opportunities for exploring different perspectives and presenting serious and effective arguments. Example 12 below shows how Hannah cared more about expressing her views rather than about how others may understand it or whether or not others would accept it.

Example 12

100  10:22 AM: **Hannah**: I state that they should use the goal language
101  10:22 AM: **Patricia**: they should use as much as they can
102  10:22 AM: **Hannah**: yes
103  10:23 AM: **Hannah**: I have some experiences to say
In Example 12 above, Hannah and her group members were expected to discuss their views on how frequent English learners should use English. Hannah’s view was that English learners should speak English as much as possible. In this segment, it is clear that this triad gave her quite an ideal environment to focus only on building her own argument because her group members would usually play along. When Hannah got used to such an interaction pattern, it was probably easy for her to have a tendency to ignore questions when there were, as shown more clearly in Example 13 below where Hannah and Patricia continued with their discussions on whether or not English learners should use English as much as possible.

Example 13

104 10:23 AM: Patricia: So do you hav any supportint points
105 10:23 AM: Patricia: ok
106 10:23 AM: Patricia: tell your experiences
107 10:23 AM: Hannah: I had learn French when I am in high school
108 10:23 AM: Sarah: en
109 10:23 AM: Hannah: I had learned the French for 6 months
110 10:24 AM: Hannah: But I still don't know how to make sentences
111 10:24 AM: Instructor (Ins) has entered the room.
112 10:24 AM: Hannah: Becasue my teacher always use the Chinese in the class
113 10:24 AM: Hannah: For the classmates, we never communicated with each other by the French
114 10:25 AM: Instructor (Ins): Would you rather communicate with them using French then?
115 10:25 AM: Hannah: We just use the Chinese in the class ,so I do not have any progress

(Chat 5, Triad 4, p. 3)
In Example 13 above, Hannah intended to describe her experience of learning Spanish as an example to illustrate her point that speaking English as much as possible would be helpful. She started to narrate her Spanish learning experience in line 151.

However, Patricia raised a question about speaking English with friends who were reluctant to use English in line 153. This question was legitimate in a discussion about the
benefits and drawbacks of English use among English learners. However, Hannah did not notice this concern at all as she continued with her narration of her Spanish learning experience in line 154, 156, 159, and 161. In line 168, Hannah finally seemed to have noticed that there was a question, and was addressing this concern, but based on her comments, it is clear that she misunderstood Patricia’s question. But she did not double check with Patricia. Instead, she continued with her own experience that people would still understand each other even when they did not speak English very well. Patricia immediately responded in line 170 by saying, yes as long as they were willing to speak English. Unfortunately, this emphasis was not picked up and Hannah continued with her own claim based on the idea of adequate practice. Patricia made one more attempt to draw Hannah’s attention in line 173, and another indirect attempt in line 179 by phrasing it as an open question. Either of those was successful. Hannah went on with her second example of traveling to Korea but not knowing any Korean language.

Therefore, Example 12 shows that the group dynamics might be one of an important factor underlying the patterns of Hannah’s argument moves in the SCMC discourse. Example 13, however, clearly shows that Hannah’s own agenda for the SCMC discussions is probably to have plenty of practice of communication in order to learn to be able to fully express herself, and thus she may not have enough processing capacity for or just did not care about others’ comments. As shown in Example 13, she misunderstood Patricia’s question and ignored her repeated attempts to draw her attention to the questions. If Hannah could ignore questions to her opinions, she may also have ignored other L2 learning opportunities such as the spelling correction suggested by Patricia in line 174 in Example 13, either purposefully or not. Indeed, further exploration
of Patricia’s question about the practicality of using English all the time among English learners would help Hannah build more effective arguments. Thus, by closing down a conversation about others’ comments, Hannah also lost opportunities to learn to argue in the SCMC discussions.

Based on the examination of Hannah’s argumentative moves in the SCMC discourse, it was expected that Hannah may not demonstrate a clear development pattern in constructing effective arguments in academic writing. Table 47 below is a summary of Hannah’s use of the argumentative moves in the writing samples.

Table 47. Argumentative moves in academic writing: Hannah

<table>
<thead>
<tr>
<th>Argument moves</th>
<th>Writing 1</th>
<th>Writing 2</th>
<th>Writing 3</th>
<th>Writing 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Thesis</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Definition</td>
<td></td>
<td></td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td>Support</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Opposing views</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Summary</td>
<td>Y</td>
<td></td>
<td></td>
<td>Y</td>
</tr>
</tbody>
</table>

*Note. Y = Yes, and it indicates the presence of a move.*

Table 47 above suggests that Hannah’s weakness at the beginning was the lack of definition and summary. As I mentioned above, the absence of definition could be the writing prompt, and the absence of summary could due to inadequate time. Thus, the addition of definition and summary in the last writing sample may not present convincing evidence for development. Such an interpretation may also be affected by the results from the analysis of the chat transcripts from Triad 5 and the turns of Hannah. Since all her writing samples contain a section of discussions of opposing views, I examined these discussions more closely. The examination has confirmed the lack of development in advancing effective arguments in Hannah’s writing samples. First of all, the discussions
of opposing views all seemed to have followed some template where an opposing view is laid out at the beginning and followed by the author’s view and support. The template may well serve the purpose of building an effective argument if Hannah followed up with convincing rebuttals by connecting the opposing views with relevant discussions. However, the opposing views seem to be planted there only for the purpose of being there and most of the time had little to do with the rest of the paper. The last paper saw an increase in the number of words devoted to opposing views, but talking more about the opposing views without offering effective counter arguments would only weaken one’s own argument. Therefore, the researcher believes that the lack of awareness of the importance of others' views or the need to respond to others while constructing one's own arguments shown in Hannah’s argumentative moves in the SCMC discourse may be one of the reasons to explain the lack of development in her ability to build effective arguments, and particularly to handle opposing views in writing. Her general inattention to others’ comments and focus on expressing meaning in the SCMC work sessions might also have contributed to the low level of linguistic accuracy in her language use on the post-test.

Table 48. The use of meta-discourse devices in SCMC: Hannah

<table>
<thead>
<tr>
<th>Meta-discourse devices</th>
<th>Session 2</th>
<th>Session 5</th>
<th>Session 7</th>
<th>Session 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hedges</td>
<td>13 (22%)</td>
<td>7 (7%)</td>
<td>8 (11%)</td>
<td>18 (25%)</td>
</tr>
<tr>
<td>Boosters</td>
<td>6 (10%)</td>
<td>13 (13%)</td>
<td>16 (23%)</td>
<td>8 (11%)</td>
</tr>
<tr>
<td>Attitude markers</td>
<td>3 (5%)</td>
<td>6 (6%)</td>
<td>5 (7%)</td>
<td>5 (7%)</td>
</tr>
<tr>
<td>Self mention</td>
<td>0</td>
<td>10 (10%)</td>
<td>11 (15%)</td>
<td>21 (30%)</td>
</tr>
<tr>
<td>Engagement markers</td>
<td>1 (2%)</td>
<td>0</td>
<td>0</td>
<td>1 (1%)</td>
</tr>
</tbody>
</table>

With regard to Hannah’s use of meta-discourse devices in the SCMC work sessions, the most noticeable feature was her frequent mention of herself. Table 48
summarizes the total number of turns involving the use of the five categories of meta-discourse devices for Hannah in each of the four SCMC sessions and their corresponding proportion in the total number of turns in each session.

The high frequency of self-mention and low frequency of engagement markers could be regarded as additional evidence of Hannah’s engagement patterns in the SCMC work sessions. The lack of engagement markers may also suggest that Hannah might not even invite her group members to consider her views, which seemed to indicate that she did not think her goal in SCMC was to seriously persuade her group members. Instead, her goal was to communicate, or rather, to express her own ideas. Sociocultural theory of L2 learning has suggested that learners working on the same task may interpret the goals of the task set by the instructor in vastly different ways and work toward their interpretation of the goals. It becomes more obvious in the analysis of Hannah's reflections of the tasks that her perception of the goals of the SCMC tasks was indeed to learn to practice expressing one's own opinions rather than to present convincing arguments. It is obvious that this perception has greatly affected Hannah's language behavior online and possibly the dynamics in Triad 5.

The raw counts of the occurrence of the five categories of meta-discourse devices in the writing samples were normed to counts per 10,000 words to facilitate a comparison with Hyland’s (2005) study of the use of meta-discourse devices in postgraduate dissertations in different disciplines. Table 49 below is a summary of the raw frequencies and normed frequencies of the use of the five categories of meta-discourse devices in the four writing samples. It also provides the normed frequencies reported in Hyland (2005) as a comparison.
Table 49. The use of meta-discourse devices in writing: Hannah

<table>
<thead>
<tr>
<th>Meta-discourse</th>
<th>Hyland (2005)</th>
<th>Writing 1</th>
<th>Writing 2</th>
<th>Writing 3</th>
<th>Writing 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hedges</td>
<td>111.4</td>
<td>7 (260.2)</td>
<td>7 (201.7)</td>
<td>4 (115.3)</td>
<td>7 (212.8)</td>
</tr>
<tr>
<td>Boosters</td>
<td>37.9</td>
<td>6 (223.0)</td>
<td>3 (86.5)</td>
<td>4 (115.3)</td>
<td>18 (547.1)</td>
</tr>
<tr>
<td>Attitude markers</td>
<td>20.3</td>
<td>1 (37.2)</td>
<td>5 (144.1)</td>
<td>5 (144.1)</td>
<td>2 (60.8)</td>
</tr>
<tr>
<td>Self mention</td>
<td>66.1</td>
<td>0</td>
<td>17 (489.9)</td>
<td>21 (605.2)</td>
<td>25 (759.9)</td>
</tr>
<tr>
<td>Engagement markers</td>
<td>50.0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*Note. Normed counts are in parentheses.*

Again, using Hyland's (2005) numbers as references, Table 49 above shows that Hannah did not seem to have developed in her competence in using meta-discourse devices in projecting her arguments more effectively in writing. She seemed to be over using both hedges and boosters, but to a greater extent, boosters, particularly in the last writing. The over use of boosters, together with her tendency to focus overwhelmingly on building her own arguments, have demonstrated that the goal of having Hannah work on the SCMC tasks to practice using argumentative moves and building effective arguments was not quite successful. Additionally, such a tendency has also been confirmed by the observation that she inclined to over use self-mention but had few instances of engagement markers. Again, as mentioned above, it could be that Hannah has interpreted the goal of the SCMC tasks as to practice expressing herself, and thus she focused on doing that in the SCMC tasks. As a result, the learning of integrating others' perspectives in the SCMC tasks was minimal and thus did not benefit her academic writing.

Another observation from her use of the meta-discourse devices in the writing samples is her over use of attitude markers. As analyzed in Section 4.3.3, the SCMC discourse of Triad four was characterized by the use of informal language and emoticons. Therefore, it is possible that Hannah decides that the interactions in the SCMC tasks
should be more animated and thus she used more attitude markers to try to strengthen the emotional ties between her group members. This provides some more evidence for the sociocultural theory of L2 learning because it suggests that learners' perception of the priorities in a give task can also affect their language behavior and subsequent learning. Therefore, the researcher believes that the lack of attention to others’ views, the possible different interpretations of the goals and priorities of the SCMC tasks, and the fact that the other two group members were quite agreeable may have contributed to Hannah’s lack of development in advancing effective arguments and the use of meta-discourse devices in the SCMC discourse, and may have affected her development of the ability to construct effective arguments in academic writing.

4.4.4 Charles, Dennis, and Frank

Section 4.4.1, 4.4.2, and 4.4.3 have presented and discussed the findings on the three focal students in the SCMC group about their development of the ability to construct effective arguments in SCMC discourse and academic writing. In this section, the writing samples from the three focal students in the face-to-face group, or Charles, Dennis, and Frank, are examined in comparison with the writing samples from Herman, Frederick, and Hannah. It is expected that the comparison of the development patterns shown in the writing samples of the three focal students in the face-to-face group would provide additional evidence for the benefits of the SCMC tasks on the development of L2 academic literacy. Table 50 below summarizes the three focal students' use of the six argumentative moves in the each of the four writing samples. In the face-to-face group, Charles, Dennis, and Frank represented the highest, average, and the lowest levels of accuracy on the post-test.
Table 50. Argumentative moves in writing: Charles, Dennis, & Frank

<table>
<thead>
<tr>
<th></th>
<th>Writing 1</th>
<th>Writing 2</th>
<th>Writing 3</th>
<th>Writing 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charles</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orientation</td>
<td></td>
<td></td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td>Thesis</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Definition</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Opposing views</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summary</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dennis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orientation</td>
<td></td>
<td></td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td>Thesis</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Definition</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Opposing views</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summary</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frank</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orientation</td>
<td></td>
<td></td>
<td></td>
<td>Y</td>
</tr>
<tr>
<td>Thesis</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Definition</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Opposing views</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summary</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. Y = Yes, and it indicates that an argument move is present.*

Based on Table 50 above, the researcher has the following observations and interpretations. First, in terms of learning to incorporate the six argumentative moves in academic writing throughout the semester, the outcomes did not seem to be satisfactory. Charles and Frank seemed to be making efforts to incorporate more argumentative moves in their writing, for example, an orientation move in the third writing for Charles and the second writing for Frank, but their use of the orientation move was not consistent. In fact, Charles did not use the orientation move in the fourth writing, and Frank left it out from his third and fourth writing. All the writing samples from Dennis contained the orientation move, and thus it is not clear whether or not he learned to integrate such a move from the face-to-face discussions. Moreover, no one has learned to integrate the
definition move in any of the writing samples, indicating that the participants may not have been aware of the importance of clarification in constructing an effective argument in their face-to-face discussions. Subsequently, they may not fully understand the concept of audience and the importance of predicting potential confusion and providing definition in writing.

Second, a review of the discussions of opposing views in the writing samples of Charles, Dennis, and Frank has revealed some problems too. Most of the time, the participants did not even acknowledge the existence of an opposing view in their writing. This has raised some doubts of the benefit of using face-to-face discussions or even debates in a writing class. It could be that the participants had tried to avoid face-to-face confrontations during their discussions and thus did not take the discussions very seriously, thus limiting the learning experience from discussions to a somewhat superficial level (Newell et al., 2011). After all, it was difficult to imagine how Herman could ask so many questions repeatedly in a similar discussion session with Lambart face-to-face. It may also be possible that since face-to-face interactions are ephemeral, in comparison with the SCMC discourse, they do not lend themselves to the careful examination of different perspectives, particularly among L2 learners who may have to spare their processing capacities for language-related issues from time to time. In short, the SCMC tasks seem to have noticeable advantages in raising learners' awareness of the concept of the audience, and the importance of responding to and integrating others' views in the construction of one's own arguments, particularly for learners who have acted upon the affordances of SCMC tasks and are motivated in completing the tasks.
The raw counts of the occurrence of the five categories of meta-discourse devices in the writing samples of Charles, Dennis, and Frank were normed to counts per 10,000 words to facilitate a comparison with Hyland’s (2005) study of the use of meta-discourse devices in postgraduate dissertations in different disciplines. Table 51 below is a summary of the raw frequencies and normed frequencies of the use of the five categories of meta-discourse devices in the four writing samples. It also provides the normed frequencies reported in Hyland (2005) as a comparison.

Table 51. The use of meta-discourse devices in writing: Charles, Dennis, & Frank

<table>
<thead>
<tr>
<th></th>
<th>Hyland (2005)</th>
<th>Writing 1</th>
<th>Writing 2</th>
<th>Writing 3</th>
<th>Writing 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charles</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hedges</td>
<td>111.4</td>
<td>7 (292.9)</td>
<td>9 (223.3)</td>
<td>8 (282.7)</td>
<td>8 (305.3)</td>
</tr>
<tr>
<td>Boosters</td>
<td>37.9</td>
<td>16 (669.5)</td>
<td>14 (347.4)</td>
<td>13 (459.4)</td>
<td>22 (839.7)</td>
</tr>
<tr>
<td>Attitude markers</td>
<td>20.3</td>
<td>5 (209.2)</td>
<td>4 (99.3)</td>
<td>6 (212.0)</td>
<td>1 (38.2)</td>
</tr>
<tr>
<td>Self mention</td>
<td>66.1</td>
<td>3 (125.5)</td>
<td>17 (421.8)</td>
<td>7 (247.3)</td>
<td>7 (267.2)</td>
</tr>
<tr>
<td>Engagement markers</td>
<td>50.0</td>
<td>0 (0.0)</td>
<td>8 (198.5)</td>
<td>7 (247.3)</td>
<td>11 (419.8)</td>
</tr>
<tr>
<td>Dennis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hedges</td>
<td>111.4</td>
<td>5 (192.3)</td>
<td>9 (291.3)</td>
<td>6 (204.1)</td>
<td>7 (247.3)</td>
</tr>
<tr>
<td>Boosters</td>
<td>37.9</td>
<td>12 (461.5)</td>
<td>17 (550.2)</td>
<td>13 (442.2)</td>
<td>19 (671.4)</td>
</tr>
<tr>
<td>Attitude markers</td>
<td>20.3</td>
<td>3 (115.4)</td>
<td>3 (97.1)</td>
<td>3 (102.0)</td>
<td>1 (35.3)</td>
</tr>
<tr>
<td>Self mention</td>
<td>66.1</td>
<td>6 (230.8)</td>
<td>13 (420.7)</td>
<td>9 (306.1)</td>
<td>7 (247.3)</td>
</tr>
<tr>
<td>Engagement markers</td>
<td>50.0</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Frank</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hedges</td>
<td>111.4</td>
<td>8 (583.9)</td>
<td>5 (342.5)</td>
<td>11 (468.1)</td>
<td>7 (437.5)</td>
</tr>
<tr>
<td>Boosters</td>
<td>37.9</td>
<td>8 (583.9)</td>
<td>10 (684.9)</td>
<td>7 (297.9)</td>
<td>6 (375.0)</td>
</tr>
<tr>
<td>Attitude markers</td>
<td>20.3</td>
<td>8 (583.9)</td>
<td>10 (684.9)</td>
<td>7 (297.9)</td>
<td>6 (375.0)</td>
</tr>
<tr>
<td>Self mention</td>
<td>66.1</td>
<td>1 (73.0)</td>
<td>0 (0.0)</td>
<td>8 (340.4)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Engagement markers</td>
<td>50.0</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>8 (340.4)</td>
<td>7 (437.5)</td>
</tr>
</tbody>
</table>

The use of meta-discourse devices in the writing samples of Charles, Dennis, and Frank did not show any particular striking feature that was different from those observed in the writing samples of Herman, Frederick, and Hannah. All three participants from the face-to-face group had consistently over used hedges and boosters, similar to the patterns of usage observed from the writing samples from Frederick and Hannah. They also had...
demonstrated a strong tendency to overuse self-mention, similar to what have been observed from Hannah’s writing samples. The use of engagement markers was different between the three participants. Dennis did not seem to have used any engagement markers in his writings, while Charles and Frank did. But when they did, they also overused the devices. Admittedly, it is arguable that the SCMC may have more advantages than the face-to-face tasks in creating favorable conditions for learners to learn to use meta-discourse devices because some of the participants in the SCMC group, such as Frederick, Wynne, and Zach, were able to use the opportunity of SCMC to focus on form, to intentionally integrate some meta-discourse devices in their turns in the SCMC discourse, and to constantly monitor their language use online. However, the analysis of the patterns in using the meta-discourse devices in SCMC and in the writing samples has demonstrated that incidental learning in SCMC may be inadequate for the successful learning of the use of the meta-discourse devices. To learn to use meta-discourse devices effectively in building one's arguments may need more structured help from the instructor, in addition to the opportunity to practice, the incidental learning online, and the collaborative learning among students themselves.

4.5 The Participants’ Perspectives

Section 4.2 examined the effect of SCMC tasks on the development of L2 grammatical and lexical complexity, accuracy, and fluency using a quasi-experiment. Section 4.3 and 4.4 followed up with the selected focal students and examined the process of L2 learning in the SCMC discourse from two perspectives: L2 learning and the development of L2 academic literacy. Section 4.3 examined the L2 learning opportunities emerged from three triads selected from the SCMC group based on both the Interaction
approach and sociocultural theory of L2 learning. Section 4.4 looked specifically at the development of two aspects of L2 academic literacy: the ability to construct effective arguments by incorporating others' views, and the ability to use meta-discourse devices to strengthen one's arguments. In Section 4.3 and 4.4, patterns of learning were identified in the SCMC discourse, and were linked the patterns to the development shown in the writing samples of the corresponding participants. It was clear that between the three triads from the SCMC group, there were considerable differences in terms of how they perceived the SCMC tasks, the group, and took advantage of the tasks to develop their ability to learn to use English and to practice presenting and defending arguments. Therefore, in this section, the experiences and perspectives of the focal students in the three triads from the SCMC group are explored.

Table 52. Reflections used in the analysis

<table>
<thead>
<tr>
<th>Group</th>
<th>Total Number</th>
<th>Total Number of Words</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Herman</td>
<td>9</td>
<td>2,313</td>
</tr>
<tr>
<td>Lambart</td>
<td>9</td>
<td>1,541</td>
</tr>
<tr>
<td>Finley</td>
<td>9</td>
<td>1,571</td>
</tr>
<tr>
<td>Group 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frederick</td>
<td>8</td>
<td>1,815</td>
</tr>
<tr>
<td>Wynne</td>
<td>9</td>
<td>1,470</td>
</tr>
<tr>
<td>Zach</td>
<td>9</td>
<td>2,434</td>
</tr>
<tr>
<td>Group 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hannah</td>
<td>9</td>
<td>2,425</td>
</tr>
<tr>
<td>Patricia</td>
<td>7</td>
<td>1,214</td>
</tr>
<tr>
<td>Sarah</td>
<td>5</td>
<td>972</td>
</tr>
<tr>
<td>Total</td>
<td>74</td>
<td>15,755</td>
</tr>
</tbody>
</table>

Nine reflections from each of the participants were analyzed, and recurring themes in each participant were identified. Then, the themes identified within each triad were compared and discussed to show the perspectives of each group on the SCMC tasks, the triad, and their relationships with the group members, as well as how these factors
may have affected their language use and learning online. Specifically, this section seeks to answer the last research question: What are the focal students' perceptions of the group tasks, their groups, and their learning in the group work? Table 52 provides a summary of the number of reflections included in the analysis, and the total number of words of the reflections from each of the participants. A total of seventy-four reflections, or a total number of 15,755 words were used to examine the participants' perspectives.

4.5.1 Serious members and engaging discussions: Triad two

Overall, the reflections from this triad showed that Herman, Lambart, and Finley have perceived themselves as being quite engaged in the SCMC discussions, and that they felt they took the group work seriously and they had benefited from the SCMC discussions. Specifically, Herman’s reflections seem to have focused on describing his thoughts on five recurring themes: the tasks, the group dynamics, himself, learning occurred in the SCMC tasks, and the instructor’s suggestions.

Herman's overall reaction to the SCMC tasks was quite positive. Herman enjoyed the tasks, and he “… look forward for every Thursday as it is one of the most enjoying time for me of the week” (Reflection 5, Herman, p. 2). Based on his observation, everyone in his group enjoyed sharing ideas with each other, as indicated by the following quote: “Everyone will have different opinion on how we look at the article and would love to share it” (Reflection 7, Herman, p. 4). At the same time, Herman mentioned that time constraint was quite annoying because it kept them from fully exploring different perspectives before reaching an agreement. In his reflection on the balance between time management and examining an issue thoroughly, he gave priority to the later, as shown in the quote below.
I think being persuasive is a good thing. We should not easily give up on our idea. Every idea that is spurt out should be taken serious consideration. It would definitely cost us so much time trying to persuade one another. However, to achieve a great education these steps are necessary. (Reflection 7, Herman, p. 4)

Herman was aware that it took time to explore different perspectives from each of the group members, but he thought every single idea should be taken seriously and that to explore different perspectives was necessary for effective education, and thus although his group always spent a long time on one topic, he thought it was worthwhile. However, this can be regarded as evidence for the concern that the priority of the goal of the SCMC tasks on meaning may keep the participants' attention away from language form in the SCMC discourse. Although Herman did not explicitly mention this, it is possible that with time constraints, the triad would focus first on completing the SCMC tasks.

Herman’s serious attitude was also shown in his reflections on the instructions of some group tasks. In sharp contrast to the majority of the students in the class who focused on following the instructions of the SCMC tasks, Herman put more thoughts into the process of understanding the instructions, and thus sometimes came up with valid questions that no one else in his triad had thought about. In the following quote, Herman shared his reasons of why he came up with a third answer, in addition to the two choices provided by the instruction.

During the discussion, it took me some time to really understand the requirement of the task. At first, it was quite hard for me to understand what is needed for task 1 as I think that the task does not have any specific direction for the question. … In my opinion, I could not decide which is the most accurate clustering structure presentation because it depends on the question itself. Therefore, I pick neither sample A nor sample B … (Reflection 2, Herman, p. 1)
In the task mentioned by Herman, the triad was expected to choose between two visual representations of the organization patterns of an essay based on their understanding of the essay. The triad started working on this task before any class discussions of the thesis or other aspects of the essay. Thus, clearly, before choosing an organization structure, they had to decide the thesis or the main purpose of the essay. But Herman was the only one who raised this question in this triad, and in fact, Lambart shared his surprise when he noticed how different Herman was in approaching a task, and talked about how he learned from Herman's way of thinking and subsequently found potential problems in Herman's opinions.

… a Malaysian boy in our group, always can raise some ideas which are different from mine. For example, today when we decide which charts can reflect the essay structure better, He points out neither can reflect the structure of article. I am very surprised about his statement, for the reason that I just compare these two chart, and ignore the step that consider whether these two are suit for the article. However, after he expresses his idea, I find that his statement also has flaw. (Reflection 2, Lambart, p. 1)

The quote from Lambart above showed that he was surprised by Herman’s idea, not only because it was different from his, but also because it reminded him of something that was lacking in him – being critical of the instructions. The last sentence from Lambart, however, indicated that he was willing to explore different ideas, but would not give up on his own easily.

Such an image of Lambart was created very vividly by Herman’s frequent comments on the group dynamics, and in particular, his interactions with Lambart. Herman began to feel that Lambart was a “persistent” group member in Reflection two, and commented that he would not change his mind very easily. In Reflection four,
Herman wrote that Lambart would always hold on to a very different idea, and that arguing with him made the tasks “more exciting and enjoyable.” In Reflection five when the students were asked to make comments on the most persuasive person in their triads, Herman selected Lambart, and described him with the following quote.

In my opinion, the most persuasive person would be Lambart, once he has an opinion he will stick to his opinion and try to persuade others to share the same opinion as he does. He is a very determine person when he tries to persuade others and he will also came prepare for any counter arguments. (Reflection 5, Herman, p. 3)

Herman continued to be surprised by Lambart’s persistence throughout the semester, but in his description, this was an important reason for the discussions in his triad to be effective and fun. In Reflection seven when he shared his overall impression of the triad's performance in the previous weeks, he commented again on Lambart’s persuasiveness and its influence on him.

Of course, Lambart would indeed came up with a counter argument and I think that made us a strong group. I would try and persuade Lambart to change sides by giving facts and logic based on the article. However, Lambart is one tough cookie. He is persistent with his ideas and will try to persuade us to understand from his point of view. Sometimes, when he gives out his ideas while comparing with the article, it would definitely shake my standing. I think that Bohan gave a reasonable explanation and cause me to became hesitant in what I believe in at first. (Reflection 7, Herman, pp. 3-4)

Clearly, Herman and Lambart were both important members of this triad. Because they were sensitive to the learning opportunities and took the group work in SCMC seriously, the discussions of this group were always engaging. It is also important that both Herman and Lambart have interpreted the main goal of the SCMC tasks as practicing presenting and defending one's opinions. These perspectives and interpretations are probably important reasons why all three members of this triad felt
that their language use in the SCMC discourse was quite formal. In the last reflection where the participants were asked to rate the level of formality of their language use in their SCMC discussions using a scale of 1-5 (5 being the most formal), Finley rated the level of formality as “5”, and both Herman and Lambart gave a “4”. Herman believed that the most important factor in determining the level of formality of language use was the content of discussion.

The language, grammar, spelling and many more tend to became less and less informal when people are passionate in giving their ideas … It is the same as a face-to-face classroom discussion. We can call it a formal conversation where everyone talk fluent English to discuss their ideas and opinion … While comparing it to an online chatting with friends. Online chatting does not have a specific goal or idea that the person wants to accomplish. Therefore, people will tend to be more laid back and do not care about their language, grammar, spelling and etc. Online discussion have its own goal and student have to discuss the topic to achieve that goal. It is just that sometimes people became off guard and tend to talk informally.

(Reflection 9, Herman, p. 4)

Herman thought that the language use in his group was mostly formal because they were always focusing on a discussion topic. He noticed that occasionally there would be some informal language when people were “off guard”, or not paying attention to the topic. He also noticed that there are both informal and formal language use in face-to-face conversations and online discussion, indicating that his perception of what kind of language to use in SCMC was not determined solely by the communication mode.

Instead, he would take into account of the topics and probably also the context of a conversation. Similarly, Lambart’s comments on the level of formality of the group’s language use online also showed that the topic and purpose of discussions were important factors.
Different from the important occasion like business conference or political debate, in-class-online discussion is just a kind of class task. Nevertheless, it also has distinguishes between casual communication. What we are saying should be professional … The most obvious difference is that it does not contain body language. In our face-to-face discussion, if we cannot explain by language, we can use body language to help us to express our idea. While in online discussion, we have to try our best to use language to depict what we want to say.

(Reflection 9, Lambart, p. 3)

In his reflection, Lambart considered classroom discussion as more formal than casual communication, but less formal than political debate. It seems that his decision of the level of formality of language use did not depend solely on the communication mode either. Interestingly, he also felt that SCMC almost forced him to rely completely on language to express himself, instead of using gestures or other body language. The same idea was echoed by Finley in his reflection.

I think it’s very formal, when comparing them with online chatting with friends. First, when chatting with my friends online, I do not have to focus on our discussion, and I can do some other things as well as chatting … However, in group discussion, we have to focus on others’ opinion to catch up with the conversation. Second, when chatting with friends online, there’s always no certain topic and we just talk about everything we thought of. Besides, since it’s not formal at all, we do not have to worry about typing mistakes or spelling mistakes because even we made a mistake, we can just revise it. But in group discussion, we should be careful about these mistakes …

(Reflection 9, Finley, p. 3)

Finley felt their language use in the SCMC discussion was quite formal because group discussions had a focus while chatting with friends online does not usually have any focus. Also, because group discussions were class work, he worried more about language accuracy. Again, Finley also felt that the triad had consistently used formal language in the SCMC discussion, and that there was a difference between informal online chat with friends and the group discussions in SCMC. Therefore, although some
students’ first impression of online communication may be influenced by their experiences of informal chatting with friends online and thus perceive SCMC as mostly an informal way of communication (Collentine, 2009; Liang, 2010), it is possible to re-orient them to a different purpose of using the same communication mode and to help foster their use of formal language in SCMC discussions.

4.5.2 Focusing on meaning or form: Triad five

Triad Five had three male Chinese students. Overall, they all felt that they have benefited considerably from the SCMC tasks, although their emphasis of learning was sharing ideas rather than language learning. On the other hand, they all seemed to be very conscious of their language use in the SCMC discussions. Their struggle between the focus on meaning and the focus on form might have two reasons. First, they felt time was limited. The members in this triad all felt that they had to rush to complete the tasks. It seems that they were simultaneously dealing with three issues: to complete a task, to understand each other, and to focus on language use in SCMC. Sometimes they did not have enough time to focus on language form during the discussions because they had to complete a task. Other times, they need to spend more time trying to understand each other. When they felt time was limited, their would give priority to reaching an agreement and completing a task.

Based on their reflections, the top priority of the SCMC tasks for Frederick, Wynne, and Zach was clearly to complete the tasks on time, rather than to fully explore different perspectives before reaching an agreement or to focus on language form in their SCMC discussions. They have made repeated comments in their reflections that negotiation of meaning seemed to take too much precious time away from the real task.
I can’t use proper English to express my opinions and let the group members know the real ideas. So others often took a lot of time to understand the meaning, as a result of which, we wasted much time on this and our effective is low. This problem needs a long time and my patience to be solved.  
(Reflection 4, Frederick, pp. 1-2)

In Frederick’s reflection above, he mentioned that he was struggling with finding appropriate expressions to express his ideas, and he felt it was frustrating that there had to be a lot of back-and-forth clarification for others to understand him. Also, he mentioned that such clarifications were a waste of time. He apparently did not see the process of finding appropriate expressions an important goal of the SCMC tasks or worthwhile learning experiences. Wynne shared similar perspectives on instances of negotiation of meaning in their SCMC discussions.

The biggest problem is that I couldn’t understand the meaning that my group mate wanted to express or I misunderstand the sentence. It was really embarrassed when my answer was far away from my friends’ questions. Furthermore, the group mate could misunderstand my reply again, and then he will get confused. During this situation, we might explain the meaning time after time. No one likes to repeat the same thing many times, so we all got bored after the discussion. And another issue is that we would waste much time in explanation which was not helpful for our tasks.  
(Reflection 4, Wynne, p. 2)

Wynne’s problem was the build-up of misunderstanding between him and his group members. He shared his frustration about how his attempts to clarify would further confuse his group members and that would lead to an even longer negotiation sequence that he considered a waste of time. He also commented that after several turns of back-and-forth negotiation of meaning, he would feel bored. Such reactions have confirmed that from students’ perspectives, negotiation of meaning may be frustrating or de-motivating (Foster & Ohta, 2005).
Interestingly, the participants in this triad all commented that the SCMC tasks had helped them in terms of language use in one way or another, and that they were all very conscious of their language use in the SCMC discussions. For example, in his second reflection, Wynne commented on how he learned from his own experience of reading and accepting others’ disagreement to express disagreements more appropriately.

During the two times of group discussions, I learned a lot of communication skills. If someone wants to express disagrees, he will think about a good way to say it. For example, after I showed the thesis statement, supporting ideas and examples about my first paper, my group mate gave me some advices to help me improve the organization. At first, he agreed with my outline is logic and clear because he could know what I would write from the outline. Subsequently, he debated the examples which were not detail enough to emphasize the thesis statement. I think it is a useful method to express disagrees. As we all know, if you deny all the working, no one will be pleasure to listen to you. So the agreement is necessary before your advice. It can also make other person involved feels happiness with his working, then your advice will be workable at the same time. (Reflection 2, Wynne, p. 1)

In this reflection, Wynne shared his experience of how he began to feel others’ disagreement was constructive and when he felt that different opinions were acceptable. Although this is not about a particular linguistic expression, it is fairly important to notice that acknowledging reasonable components in an argument will help build a more effective counter argument and will also be perceived more persuasive by others. Similarly, Zach has shared his experience of learning to use expressions of uncertainty from the SCMC tasks.

… I will use the sentence ‘I afraid not.’ I think it’s a nice way to start an argument and it gives enough respect to the person you are arguing with. In addition, no people’s idea is always perfect, that’s why we need the discussion. I think this kind of expression makes our group together and sets up good relationships. If people in our group are too aggressive, it’s hard to make the same statement. No one will listen to the person who doesn’t have respect to others. Trying to use polite way to express certainty and uncertainty can let
other’s accept your idea and show your patient. I think it’s important to respect others. Sometimes, even if you appoint same ideas but different expression will make the different results. (Reflection 7, Zach, pp. 3-4)

In the reflection above, Zach commented on how he felt using an expression of uncertainty may help when one was stating his or her opinion. He noticed that using expressions of uncertainty helped him communicate with his audience because it would leave room for mutual communication, or what he referred to as showing respect. He also noticed that the same opinion stated in different ways would have different results. This is an important reason why L2 learners need to learn to use meta-discourse devices to refine their arguments.

Meanwhile, the participants in this triad all felt that they have made efforts to use formal and accurate language in the SCMC discussion because they knew that the goal of such tasks was to “enhance the writing abilities” (Reflection 9, Frederick, p. 4). They all reported that they would try to edit their messages before sending if time was available, because they thought editing their messages “reduced many mistakes” and avoid confusion and misunderstandings (Reflection 8, Frederick, p. 3). When commenting on their occasional informal language use online, Frederick mentioned that it was not intentional. For example, he said he would leave the beginning of a sentence not capitalized because he was used to using Microsoft Word and it will “make the capital letter in the front of the sentence automatically” (Reflection 8, Frederick, p. 3). Therefore, it seems that the focus of this group was primarily on meaning, and if time allows, they would focus on language form. However, the major challenge for this triad is that they would give priority to task completion when time is limited. Since the time constraint has
constantly been an issue for this triad, the choice of priority may have affected the participants' learning in the SCMC tasks.

4.5.3 Creating friendly environment: Triad four

Triad four had two female Chinese students (Hannah and Sarah) and one female Vietnamese student (Patricia). Overall, they all felt that they had a supportive group and that they have benefited from the SCMC tasks, although their perception of the most important thing in the SCMC tasks was to complete the tasks on time and to create a supportive group environment, rather than to achieve full understanding of each other before reaching agreement by asking each other questions and responding to these questions.

The most noticeable theme in the reflections of the participants in this triad was that the group members were all very agreeable. They can always reach an agreement very quickly in their SCMC discussions. Therefore, instead of inviting everyone to share ideas and to try to understand each other before moving toward an agreement, most of the times, they would figure out who was good at what and then divide the tasks among themselves. For example, in most of Hannah’s reflections, the beginning part was comments about how easy it was for them to reach an agreement or how well they got along with each other, and in the following example, she described how the three of them collaborated with each other by using their own strengths.

The constellation of mine is Libra. It was hard for me that to balanced the answer of the task. However, Patricia and Sarah, they must been my master of my group work. Sarah liked a good judge who stated the powerful supporting sentence to support our points. Patricia did the work that concluded our ideas and orders it logically.
(Reflection 7, Hannah, p. 4)
In Hannah’s comments above, she reflected upon the triad's experience in completing a task by dividing the tasks according to each other's strengths. She talked about her strengths in generating new ideas immediately before this excerpt from her seventh reflection, and then she went on to talk about her weaknesses, and then the other group members’ strengths and how they contributed their strengths in the process of completing the SCMC tasks. This was not uncommon in the reflections of Patricia and Sarah. They both, too, strongly confirmed that their group members were friendly and supportive. To some extent, the researcher felt that to Hannah, Patricia, and Sarah, it was more important to keep the supportive environment than to learn from the back-and-forth rhetoric and the necessary confrontations with each other that could help them explore each other's ideas thoroughly. It was clear to see their priority in maintaining an encouraging environment in the following example where Patricia reflected upon the differences between commenting on each other’s work and on the work from an unknown author.

This week, we talked about the other thesis statement, written by people we don't know. We are quite happy with our discussion this time … This time, we were more willing to discuss and went through the topic deeply. Unlike last week, we hesitated to comment on the other drawbacks, or go details about our friends’ work, especially when we demonstrated our disagreements or criticism of others. As a result, our argument this week is much better than last week because we can dig the problem deeper. The main reason, I think, is that when we comment on the work of the others whom we don’t know, we are more objective. Naturally, we tend to be more effusive when we talk about other works than comment on each others' work in group. In addition, it is likely that if we criticize someone, we are afraid that they might be hurt. And that is what we don’t want to see.

(Reflection 3, Patricia, pp. 1-2)

Clearly, Patricia was aware that sometimes their discussion was not thorough enough, but she chose not to dig deeper because she did not want any of her group
members to get “hurt”. Both Hannah and Patricia went fairly far in order to maintain a friendly and supportive environment in the SCMC discussions, even though they were frustrated with Sarah.

However, group work of this week that allowed me a little bit mad with Sarah. She does not say anything in the group work … In the task2, Patricia and I sustained some issue, which difficult to expressed. We have three people in our team, as a result, I asked the third person Sarah to help us. However, she still kept silence or say something not linked to the discussion. I had inquired her why she ignored our group work. Ultimately, she told me the trues that she had a bad cough for three days and still had a headache in the class … I regret that I angry with Sarah too arbitrary. Our group is a whole and I could not to mad with others randomly. I should observe her abnormal in that time. She is an outgoing person and she does not say anything in the chatting room, so I should aware that she might uncomfortable.
(Reflection 4, Hannah, pp. 2-3)

In the reflection above, Hannah commented on how she became mad at Sarah because of her absent-mindedness during the SCMC discussions. However, she then mentioned that Sarah told her that she was sick and did not feel comfortable. Then, Hannah began to feel guilty of blaming her for not participating. She went on and emphasized that the triad was a “whole” and it is more important to keep the "whole" rather than to blame anyone in the triad. Patricia, too, seemed to be very uncomfortable of giving negative remarks to Sarah even though she thought that was true.

… Actually, we try to convince each other. In this case, this people are least evidence than others, but in other case, she demonstrates so well. And we are modifying each others. So, it is hard for me to tell who the least persuasive person in groups is. However, if I was asked who is the most persuasive person. Probably, Hannah is the most persuasive person in my group. She usually gives the obvious evidences for her ideas. Moreover, she is willing to talk and respond in time. Moreover, Hannah usually prepares the topic very well before discussion. Sarah sometimes does not very active. I think she will be more persuasive if she gives her own opinions more often and if she concentrates more in the topic and brainstorms more to get the evidences for her own ideas.
(Reflection 5, Patricia, p. 2)
In the reflection above, Patricia made comments on the most and the least persuasive person in her group. At the beginning, she provided an overall positive comment on her group members’ performance by clarifying that everybody in her group did pretty well, and that they were persuasive in different times. Then, after she suggested that Hannah was the most persuasive, she turned quite unwillingly to say that Sarah was not persuasive. Notice that she did not say this explicitly. Instead, she phrased her negative comment in a positive frame by saying that Sarah could be “more persuasive if she …”. Also, the proportion of negative comments was minor in comparison to that of the positive comments in the reflection. Although both Hannah and Patricia have expressed their frustration with Sarah indirectly, it was quite clear that both have felt the negative impact of Sarah’s passive behavior in the SCMC discussions on the triad.

Sarah might have also influenced her group members in terms of her views of the SCMC tasks and her frequent use of informal expressions during the discussions. In a reflection on the SCMC tasks, she revealed her perception of the SCMC discourse as informal.

In my opinion, I think that sometimes we need to chat informal, and sometimes we don’t need. It depends on different situations … compare and contrast features of online discussion vs. face-to-face classroom discussion I’ve had, I think that the latter maybe more formal, because if we talk with others face-to-face, we need to see other’s expression in their face. It may be nervous. When we chat with others online, we cannot see other’s face, so it has a relaxed atmosphere for us to chat. Therefore, I think my group online discussion stand 2.
(Reflection 9, Sarah, pp. 2-3)

From the example above, it is clear that Sarah believed that SCMC was more informal than face-to-face discussions, although the level of formality may change depending on contexts. The main reason why she felt so was because there was no stress
of seeing others’ reactions to what she said, which made her feel more relaxed. She apparently linked the feeling of relaxation to the use of informal speech, which coincided with Herman’s feeling that when people use informal language only when they were off-guard. From this perspective, having students feel certain amount of stress would be beneficial because they would then care more about proper ways of using language. The difference between Herman and Sarah, however, is that Herman made use of the extra processing capacity for meaning-focused interactions while Sarah did not. Hannah had apparently welcomed Sarah’s frequent use of informal expressions, but due to a different reason.

Moreover, I love our model that one day in the classroom and one day in the computer lab. Students and the instructors do not need to face to face every time. We can try something new that would be more interesting. Our English class needs more creativity to enhance our class atmosphere. (Reflection 9, Hannah, p. 5)

Hannah obviously regarded the SCMC tasks as fun activities in an otherwise boring English class. Although not explicitly stated, the intention of using chat acronyms, text message shorthand, or repetition of letters and punctuations was clearly to show her creativity and to make the group discussions more cheerful. Therefore, when students’ goals in SCMC tasks are to relax or to have fun, or when they are still struggling to express meanings within limited amount of time or under the stress to complete a task, they may not benefit from SCMC tasks as much as those who have higher language proficiency and are more motivated. Meanwhile, although some participants have provided positive comments on the SCMC tasks and their learning experiences in the tasks, it is obvious that focus on meaning and form at the same time can be challenging for L2 learners, particularly in a meaning-oriented task. More importantly, SCMC tasks
may have positive impact on L2 learning and the development of academic literacy. However, the examination of the participants' reflections further confirmed that the processes of learning in different triads were different. Therefore, different dynamics in pairs, triads, or small groups working on the same tasks, or even differences between the individual students working on the same SCMC task in the same triad or small group deserve more attention and further research.

4.6 Summary

This chapter has reported and discussed the major findings with regard to the potential effects of SCMC tasks on L2 learning and the development of abilities to construct effective arguments and use appropriate meta-discourse, and the students' experiences in and perspectives of the SCMC tasks and their learning in the tasks. In Section 4.2, the effects of SCMC tasks on L2 grammatical and lexical complexity, accuracy, and fluency in academic writing were tested using a quasi-experiment. Traditional hypothesis tests and confidence intervals of linear contrasts of means were first used to test the differential effects of SCMC and face-to-face tasks on L2 grammatical and lexical complexity, accuracy, and fluency. Then, drawing upon the framework of multilevel analysis, the researcher calculated the ICC for the four dependent variable scores on the post-test to examine the extent to which dependence existed in the current data set. Since the traditional hypothesis tests have shown that SCMC tasks had significant positive impact on the development of L2 accuracy, and that the dependence in the accuracy scores on the post-test was significant, two alternative approaches were used to test the effect of SCMC tasks on the development of L2 accuracy. The first approach is based on the calculation of corrected t ratio and its
corresponding p value for the comparison of the means of the two groups on the post-test, and the second approach is based on the framework of comparisons of general linear regression models. The findings from both approaches have confirmed the findings from the traditional hypothesis tests. Briefly, the findings from the quasi-experiment have shown that the potential effect of SCMC tasks was negative on grammatical complexity, inconclusive with regard to the influence on lexical complexity, positive on accuracy and fluency. Moreover, while the SCMC tasks have helped improve L2 accuracy, the face-to-face tasks seemed to have resulted in a decrease of L2 accuracy. With regard to L2 fluency, the SCMC tasks seemed to be as helpful as the face-to-face tasks. Based on the findings, three focal students were selected from the treatment and the control group to represent different levels of accuracy on the post-test. In section 4.3, the chat transcripts of four SCMC sessions of the three focal students from the treatment group and their group members in the triads were analyzed to identify L2 learning opportunities based on both the Interaction approach to second language acquisition and the sociocultural theory of L2 learning. Thus, instances of negotiation of meaning, co-construction of expressions, other correction, self-correction, encouragement to continue, language play, and other idiosyncratic features that the researcher believes to be helpful for L2 learning were identified. The results have suggested that overall the percentage of negotiation of meaning and other language-related episodes was quite low, but different kinds of L2 learning opportunities emerged in the SCMC discourse of the three triads. Moreover, the SCMC discourse of the three triads was characterized by different features. The SCMC discourse of Herman's triad was characterized by long stretches of texts focusing on negotiation of meaning that can usually be resolved successfully; the SCMC discourse of
Frederick's triad also contained some negotiation of meaning, but they were mostly unresolved; the SCMC discourse of Hannah’s triad can indeed be characterized by “chatty”, with various Internet acronyms, emoticons, and text message shorthand. The potential opportunities and problems in the SCMC discourse of the three triads were discussed. In Section 4.4, first, the chat transcripts were analyzed again to examine how the participants were making use of the SCMC tasks to practice constructing effective arguments and using appropriate meta-discourse devices. The results indicated that Herman’s group had the most engaging discussions. While Frederick’s group had also demonstrated moderate amount of engagement, Hannah’s group showed very limited engagement. Then, the engagement patterns were linked to the patterns of development shown in the parallel writing samples of the three focal students. Some connections between the level of engagement in the SCMC tasks and the level of sophistication in advancing argument moves in the writing samples were identified and discussed. Further evidence was examined and discussed based on the examination of the writing samples from the three focal students from the control group. In Section 4.5, the reflections from the nine participants from the SCMC group were examined to understand the participants’ perceptions of the learning opportunities offered by the SCMC tasks. The results have largely provided additional confirmation for the interpretations of how the SCMC tasks might have influenced their learning of language and development of writing in the previous three sections. Herman, Lambart, and Finley all regarded the SCMC tasks as serious learning opportunities and have felt that they benefited considerably from the genuine exchanges of ideas. Frederick, Wynne, and Zach emphasized the benefit of the SCMC tasks on learning from each other’s ideas, and thus regarded negotiation of
meaning caused by language problems as a waste of time, although they have reported
that they wanted to pay attention to both language and form in the SCMC discussion. The
reflections from Hannah, Patricia, and Sarah, however, showed that the triad had yet
another emphasis in their SCMC sessions: to create a friendly and supportive
environment.
CHAPTER FIVE. CONCLUSION

5.1 Introduction

In this study, the potential effects of synchronous text-based computer-mediated communication tasks on second language learning have been explored from multiple theoretical perspectives using mixed methods research. Using the participant selection model within the two-phase explanatory mixed methods research design, the researcher first tested the differential effects of SCMC and face-to-face tasks on the development of L2 grammatical and lexical complexity, accuracy, and fluency in academic writing in the quasi-experiment, and then explored the processes of learning in SCMC in details in the multiple case studies that focused on examining the learning of L2 and the development of L2 academic literacy in and through SCMC discourse. The L2 learning opportunities in SCMC discourse were identified and examined based on both the Interaction approach to second language acquisition and sociocultural theory of L2 learning. The potential role of SCMC tasks in facilitating the development of L2 academic literacy has been explored based on functional perspectives of language and language learning. Through mixed research methodology, the researcher was able to draw up multiple theoretical perspectives and analytical techniques in addressing the following five research questions to understand the role of SCMC tasks in L2 writing classrooms.

1. How do average scores of grammatical and lexical complexity, accuracy, and fluency change from a pre-test to a post-test, respectively, and compare for treatment and control groups?
2. What interactional processes occur in the SCMC discourse of the focal students in the selected triads that may be considered beneficial for L2 learning?

3. How does the SCMC discourse of the focal students reflect their development in using argumentative moves to construct effective arguments? What patterns of change can be observed concerning the use of argumentative moves in the timed writing samples of the same students? What connections, if any, are there between the characteristics of the use of argumentative moves in the SCMC discourse and the patterns of change in using argumentative moves in the writing samples?

4. How do the focal students learn to use meta-discourse devices in the SCMC discourse? What patterns of change can be observed concerning the use of meta-discourse devices in the timed writing samples? What connections, if any, are there between the use of meta-discourse devices in the SCMC discourse and the patterns of change in using meta-discourse devices in the writing samples?

5. What are the focal students' perceptions of the SCMC tasks, their triads, and their learning in the SCMC tasks?

Chapter 4 has presented and discussed the major findings with regard to each of the five research questions. This chapter provides a summary of the major findings for each of the research questions, and a discussion of theoretical and practical implications concerning the role of SCMC tasks in the learning of L2 and the development of L2
academic literacy. Limitations and future directions for research on SCMC tasks and L2 learning and teaching are discussed at the end.

5.2 Summary of Research Findings

This study on the potential effects of SCMC tasks was conducted in two sections of an ESL academic writing course. Situated in a naturalistic environment, the study documented the students’ participation in the SCMC tasks and examined how the SCMC tasks may benefit the students’ learning of L2 and the development of their abilities to construct effective arguments and to use appropriate meta-discourse resources in SCMC discourse and academic writing. The mixed research methodology allowed a thorough and systematic examination of issues related to each of the five research questions, and helped tie different components of the study together to bring a better understanding of the potential role of SCMC tasks in L2 academic writing classrooms. Table 53 below briefly summarizes the major findings for the first research question concerning the differential effects of SCMC and face-to-face tasks on the development of L2 complexity, accuracy, and fluency in academic writing.

Table 53. SCMC tasks and the development of L2 CAF: A summary of findings

<table>
<thead>
<tr>
<th></th>
<th>SCMC Tasks</th>
<th>Face-to-face Tasks</th>
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<tbody>
<tr>
<td>Grammatical complexity</td>
<td>Negative</td>
<td>Inconclusive</td>
</tr>
<tr>
<td>Lexical complexity</td>
<td>Inconclusive</td>
<td>Inconclusive</td>
</tr>
<tr>
<td>Accuracy</td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Fluency</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>Other observations</td>
<td>#1 Positive</td>
<td>Positive</td>
</tr>
<tr>
<td></td>
<td>#2 Informal language use in the SCMC discourse may not affect the accuracy of language use in other contexts.</td>
<td>Positive</td>
</tr>
<tr>
<td></td>
<td>#3 The SCMC discourse of different triads was quite different in terms of their level of CAF.</td>
<td>Positive</td>
</tr>
</tbody>
</table>
The first research question on the effect of SCMC on the development of L2 grammatical and lexical complexity, accuracy, and fluency in academic writing was addressed by a quasi-experiment. By using constructs of linguistic competence from the structural linguistic view of language, the researcher was able to obtain evidence of the students' language use in academic writing to demonstrate the effect of SCMC tasks on language use in contexts other than the SCMC discourse.

As shown in Table 53 above, the results showed that SCMC tasks had negative impact on the development of L2 grammatical complexity, indicating that learners' preference in using shorter sentences and simpler sentence structures in SCMC discourse may have had negative impact on their language use in academic writing. The preference for simplicity can be caused by different reasons including their priority to task completion or focus-on-meaning, or the lack of processing time and capacity to focus on form. Learners’ focus on task completion and meaning communication is probably the major reason for the preference of the participants for simpler sentence structures in this study. First of all, the SCMC tasks all have a clear communicative goal that the members in the triads need to reach an agreement with regard to their group position on a controversial issue after sharing perspectives. As discussed in Chapter four, when the participants were seriously engaged in sharing ideas and negotiating perspectives, they would be struggling with time management almost all the time. Thus, in order to express one’s ideas in an efficient way, grammatical complexity was probably compromised, or even viewed as an unnecessary waste of time. For example, Herman commented on a “system” that he used to help with the communication with his group members in SCMC.
In my group discussion, I already have a system where I break the message into several parts. I will continuously give out my message without checking or editing it first. When I look back and think about it, I did this because I do not want my chain of ideas to break. In other words, when I am giving out an idea or opinion, I will just let it out without checking its grammar or spelling. I do not want to forget what I was thinking during that time and I want my group member to understand what I am trying to say. (Reflection 8, Herman, p. 4)

In this case, it is clear that Herman opted for shorter sentences to help convey his ideas while helping his group members to read and understand his messages faster. What he meant by “break the message into several parts” is that instead of producing a long and complete sentence which may contain several coordinating or subordinating clauses, he would intentionally stop at the end of each clause and just send the message and then continue from where it was left in a new turn, thus producing more shorter turns. What is interesting here is that Herman did this not only because he thought the SCMC tasks promote informal chat. Instead, he did this to help convey his message and at the same time to help his group members understand the message. The idea that shorter sentences may be easier for others to understand was confirmed by analysis of the SCMC discourse and the reflections of the participants in Frederick’s triad. The participants in this group were probably the ones that had the highest level of awareness of language form during the SCMC tasks. For one thing, their turns in the SCMC tasks seemed to be considerably longer than those in the other two triads. However, a recurring theme in the reflections from Frederick, Wynne, and Zach was that the messages composed by their group members were quite often long and difficult to read, and as a result, they had to waste much time negotiating meanings. What was shown from Hannah’s group seemed to show more evidence for the concern that some learners would view SCMC as an informal
channel of communication and would thus prefer to use simpler or informal expressions. However, Hannah actually thought their SCMC discussion was quite formal, and that she used many animated expressions in SCMC mostly to strengthen her relationships with her group members. It is very likely that Hannah may demonstrate similar preferences in face-to-face communication. Therefore, the potential benefit of SCMC on grammatical complexity is probably contingent upon the availability of extra time for online planning and monitoring, and individual students' use of such affordances (Sauro & Smith, 2010).

No significant differences were found with regard to the change of scores on lexical complexity between the two groups, indicating that neither the SCMC tasks nor the face-to-face tasks had any statistically significant effect on the change of lexical complexity. Considering the large number of studies showing the benefit of SCMC on attention to lexical items, this result is particularly surprising. A possible reason is that there may be a gap between the noticing and the productive knowledge and language use in writing. The fact that SCMC helps draw learners’ attention to lexical items through different processes may be regarded as evidence of the supportive L2 learning environment that SCMC can afford, but it does not necessarily mean that learners can successfully learn to use what they have noticed in SCMC in order to improve their lexical complexity in subsequent writing.

The results concerning the change of accuracy scores were partly encouraging and partly disconcerting. The fact that the increase of accuracy in the SCMC group was statistically significantly and the decrease of accuracy in the face-to-face group was statistically significant demonstrated that SCMC may be more effective in drawing learners’ attention to form and thus increasing their awareness of linguistic accuracy in
their language use in other contexts. In both the SCMC tasks and the face-to-face tasks, the students’ attention was focused on meaning because they all had to achieve a communicative goal. However, with its visual saliency, SCMC helped amplify the linguistic details such as spelling mistakes and punctuation issues. These issues stand out more in SCMC as compared to face-to-face interactions because of several reasons. First, interlocutors in SCMC rely completed on the text messages to communicate meanings and thus may be more aware of the linguistic input. Second, unlike face-to-face discussions, SCMC is not ephemeral, and thus interlocutors in SCMC could pause and review past exchanges if necessary. Third, the slower processing speed allows interlocutors more time for online planning and monitoring of their own language production. There were occasions that the participants in SCMC noticed their own spelling errors and made self-corrections. Thus, if the processing time allows more time to focus on form, SCMC may help learners to notice more complex problems with verb tenses and sentence structures. The fact that many of the accuracy problems in the face-to-face groups were spelling errors and punctuation problems further confirmed the advantage of SCMC in drawing learners’ attention to form in comparison with face-to-face interactions.

The decrease of linguistic accuracy in the face-to-face group posed some serious questions for the use of such tasks in a writing class. Since the interaction process was not recorded or strictly monitored, it was not completely clear with regard to whether the decrease of accuracy was a result of students’ focus on meaning in the discussions or their lack of attention to the group work all together. The requirement for a written summary at the end of each discussion session did not seem to help draw the students’
attention back to form and since face-to-face discussions do not offer any effective mechanism for students to monitor their own participation or to review after the discussion, they may encourage a result-oriented mentality, which reinforces the focus on meaning. Thus the students may not want to or may not have enough processing capacity to focus on form. Therefore, it seems that the combination of meaning-focused tasks and face-to-face discussion may not be beneficial for the improvement of L2 accuracy.

The results on the change of fluency scores showed that both the SCMC and the face-to-face groups had significant improvement on fluency from the pre-test to the post-test, but there was no significant difference in the improvement between the two groups. The results were, to some degree, expected because the tasks, whether carried out in SCMC or face-to-face, are meaning-focused tasks, and therefore aim to encourage the students to express their own ideas and explore others' perspectives. As a result, the tasks would help the students generate ideas and encode the ideas using L2. SCMC did not seem to have any more advantage probably because the opportunities that the participants had in SCMC to actually type written messages came at the expense of the opportunities of exposure to more ideas. Research has shown that face-to-face interactions are more efficient because learners do not need to worry about typing and can understand each other more easily or exchange more ideas within limited amount of time (Hamano-Bunce, 2010), thus offering more opportunities for learners to explore different ideas.

Using the pre-test and post-test quasi-experiment, the researcher was able to test the differential effects of the SCMC and face-to-face tasks on the development of L2 complexity, accuracy, and fluency in writing. The results showed that SCMC tasks had statistically significant benefits for the development of L2 accuracy, and they were as
effective as face-to-face tasks in facilitating the development of L2 fluency. In addition, the results from the quasi-experiment also helped with the purposeful selection of the focal students for the multiple case studies.

The second, third, and fourth research questions on the potential role of SCMC in facilitating the development of L2 and abilities to construct effective arguments were examined in the multiple case studies of the focal students selected based on the results from the quasi-experiment. Specifically, the focal students were selected to represent different levels of accuracy on the post-test, because accuracy was identified as the dependent variable on which SCMC tasks had significant benefits. Thus, the second, third, and fourth research questions aimed to follow up on the focal students to examine the learning processes shown in their SCMC discourse. Specifically, in addressing the second question about L2 learning opportunities emerged in SCMC, the researcher used the Interaction approach and the sociocultural theory of L2 learning as theoretical lenses to examine the SCMC discourse. The third research question aimed to examine the SCMC discourse of the focal students to see how they develop their ability to construct effective arguments by incorporating others' perspectives and using meta-discourse devices. In answering the third research question, the research used functional perspectives on language use. Table 54 below summarizes the major findings for the three research questions.

The findings showed some connections between the learning processes and the learning outcomes. To illustrate, the SCMC discourse of Herman's triad showed a large proportion of turns involving opportunities for L2 learning and the development of the ability to incorporate others' views in building one's own arguments. The measures on the
writing samples also demonstrated that Herman had the highest level of accuracy on the post-test, and that there were clear patterns of development in using argumentative moves in academic writing.

Table 54. Learning processes in the SCMC discourse: A summary of findings

<table>
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<tr>
<th></th>
<th>Herman/Triad 2</th>
<th>Frederick/Triad 5</th>
<th>Hannah/Triad 4</th>
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<tbody>
<tr>
<td><strong>Accuracy</strong></td>
<td>High</td>
<td>Mid</td>
<td>Low</td>
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<tr>
<td><strong>L2 learning opportunities in SCMC</strong></td>
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<tr>
<td><strong>Argumentative moves in SCMC</strong></td>
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<tr>
<td><strong>Argumentative moves in writing</strong></td>
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<tr>
<td><strong>Use of meta-discourse devices in SCMC</strong></td>
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<tr>
<td><strong>Use of meta-discourse devices in writing</strong></td>
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</table>

In Frederick's triad, the SCMC discourse showed that this triad did not have enough time exploring different perspectives or that the group members were hesitant in challenging each other's views, and as a result, Frederick's writing samples did not demonstrate clear patterns of development in integrating others' perspectives in building his own arguments in writing. Moreover, the lack of attention to form due to the
meaning-oriented nature of the tasks and the struggle of the triad between task completion and language form may have contributed to the lack of improvement in linguistic accuracy.

Hannah's triad was selected because Hannah had the lowest accuracy score on the post-test. After reviewing the chat transcripts of this triad, it seemed to the researcher that Hannah's lowest accuracy score on the post-test was quite understandable. The SCMC discourse of this triad was characterized by high frequencies of informal language use and the lack of L2 learning opportunities. Moreover, the members in this triad seemed to focus more on learning to express themselves rather than learning to present and defend their arguments. Therefore, not many opportunities for L2 learning and the development of academic literacy were identified in the SCMC discourse of this triad. Hannah's last writing sample received the lowest accuracy score, and her writing samples, expectedly, did not show any clear pattern of development in using argumentative moves.

Therefore, overall, the more engaged the participants were in responding to each other’s views through back-and-forth question and answers in SCMC tasks, the more likely they would develop awareness of the need to anticipate different opinions, and the skills to integrate them into counter arguments. On the other hand, the development of argument moves in the samples of academic writing from the focal students in the control group did not show any substantial improvement, suggesting that the students may not be seriously engaged in exchanges of ideas in face-to-face discussions because of various reasons. First, the students may feel less comfortable to confront their group members and challenge their point of views frequently. Second, face-to-face discussion, together with the requirement of a written summary at the end, encourages the students to focus on
the result rather than the process. Since learners need to be able to experience the consequences of the effectiveness of their arguments to learn to construct effective argument (Newell et al., 2011), SCMC seems to be a better tool to facilitate learners’ development of abilities to construct effective arguments.

The students, however, did not seem to benefit much from the discussions in SCMC in terms of the use of meta-discourse devices. There were changes in terms of the relative proportions of the different types of meta-discourse devices in different SCMC sessions and writing samples. However, no clear pattern of improvement over time was identified. It seemed that the balance of using different types of meta-discourse resources might not be effectively learned just by incidental noticing or collaborative work in SCMC. Another potential issue is that the reference for the relative proportion of the different types of meta-discourse devices was from Hyland’s (2005) study of the use of meta-discourse in dissertations in applied linguistics. The disciplinary differences in the use of meta-discourse resources and the question of whether or not the use of meta-discourse resources in dissertations should be set as the reference point open up possibilities for future research.

The fifth research question about how the participants experienced and viewed their learning experiences in the SCMC tasks was addressed by the analysis of the participants' reflections. Table 55 below summarizes the major findings for the fifth research question.

According to Table 55, the three triads are quite different in terms of their experiences and perceptions of the SCMC tasks, their relationships within the triads, and their learning experiences. Clearly, Herman's triad felt they had the most positive
reflections which showed that their interpretation of the goals of the tasks matched the goal set by the instructor, and that they were motivated in working on the tasks and benefited greatly from the tasks. On the other hand, Frederick's triad and Hannah's triad encountered different problems. Frederick's triad did not have enough time to try to fully understand each other and to complete the tasks while Hannah's triad interpreted the goal of the tasks in a different way. Frederick's triad commented that negotiation of meaning was frustrating and demotivating and Hannah's triad commented that their priority was to create and maintain a friendly environment in their triad.

Table 55. Learner perspectives: A summary of findings

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Recurring Themes</th>
</tr>
</thead>
</table>
| Herman/Triad 2  | Engaging discussions | #1 The SCMC tasks aimed to help us learn to present and defend our own arguments.  
|                 |                   | #2 The group discussions were engaging and beneficial.  |
| Frederick/Triad 5 | Meaning vs. form  | #1 There was not enough time to complete the tasks.  
|                  |                   | #2 Negotiation of meaning was a waste of time.  |
| Hannah/Triad 4  | Misinterpretations | #1 The SCMC tasks aimed to help us learn to express ourselves.  
|                 |                   | #2 The most important thing in group work was to create and maintain a friendly environment.  |

The three triads were also asked to comment on their language use in SCMC, and most of the comments demonstrated that the participants' perceptions of the level of formality of the language use in SCMC might change depending on the topics of discussion, and the relationships in a group. Characteristics of the dynamics in the triads were summarized and discussed, and the participants’ views of their language use in SCMC were discussed in light of the dynamics of their triad. It is clear that there were
connections between the dynamics of the triads, the triads' language use in SCMC, and the group members' perceptions of and learning experiences in the SCMC tasks. What is also clear is that the participants' perceptions of language use in the discourse may be shaped and re-shaped by the participants’ evolving understanding of their language choice due to the influence from their group members. Therefore, findings about characteristics or features of SCMC discourse should probably be more accurately interpreted in the context of tasks and group dynamics.

5.3 Implications

Theoretical implications of this study include the use of multiple theoretical perspectives in exploring the potential of SCMC for the development of L2 and academic literacy and the use of mixed research methodology to provide both context and details to understand how SCMC may affect learning outcomes and processes.

By using different theoretical perspectives in the investigation of the potential of SCMC, the study shows that different perspectives can help bring a more complete picture of the effect of SCMC on L2 development in academic writing. Specifically, the Interaction approach and the sociocultural theory are shown to be concerned about different processes in interactions that are beneficial for L2 development (Foster & Ohta, 2005). While the Interaction approach focuses on negotiation sequences that are triggered by communication breakdown, the sociocultural theory focuses on collaborative dialogues where learners are engaged in co-construction of linguistic knowledge. Therefore, these are essentially different processes, but are both beneficial for L2 learning. Thus, by using both the Interaction approach and the sociocultural theory to examine the
SCMC discourse, the researcher was able to see a more complete picture of the various opportunities for L2 development emerged in SCMC discourse.

More importantly, the use of functional approaches have helped examine learners’ perceptions of the factors that have affected their choice of language use in SCMC, and the potential of SCMC for the development of academic literacy. Functional views of language and language learning have added valuable perspectives in thinking about the use of SCMC because the emphasis is switched from the learning of language form to the learning of linguistic resources in order to express meaning. At the same time, L2 writing research has shown that a constant challenge in teaching academic writing is to help students learn to construct effective arguments. Therefore, functional approaches have provided a framework and tools in examining the use of SCMC for the development of academic literacy. It is shown from the findings that since SCMC tend to orient learners’ attention to the interaction process and can mediate learners’ perceptions of confrontational questioning, it may better assist learners in their development of abilities to construct effective arguments. Therefore, different theoretical frameworks have helped to understand the role of SCMC from different perspectives.

The use of mixed research methods has brought both generalizable results in terms of learning outcomes and details of learning processes. More importantly, the mixed methods research design allows the researcher to connect the two main components in a systematic manner. Therefore, the learning outcomes were followed up with detailed learning processes, and the learning processes were contextualized by learning outcomes. The use of mixed methods research design is particularly relevant in
educational settings where researchers are concerned about the effect of an instructional method on both learning outcomes and learning processes.

Additionally, the results on the participants’ use of meta-discourse resources in SCMC and in the writing samples indicated that the learning of complex systems of form-meaning mappings such as meta-discourse devices very likely requires more than incidental noticing. First, in a task focusing on meaning, learners may not even have extra processing time to notice form. Second, noticing and understanding the basic meaning of meta-discourse resources may offer very limited help for learners to develop sophistication in using a combination of different types of meta-discourse resources to maintain a balanced tone in academic writing, because such a task involves a thorough understanding of the dynamic form-meaning mappings with regard to the meta-discourse resources and their functions, the awareness of audiences and purposes, and a perceptive judgment of the audiences’ possible responses.

The most important pedagogical implication is probably the purpose of using SCMC. Although the finding suggested that SCMC had positive effect on linguistic accuracy, it does not necessarily mean that it is an effective environment for learners to acquire language form. The effective use of SCMC for the participants to exchange ideas and learn to construct effective arguments as opposed to the relatively unsuccessful use of it for the development of the use of meta-discourse devices further suggest that if the purpose of an SCMC task is to help learners acquire a certain linguistic form, or a complex system of form-meaning mappings, the meaning focus of such a task should probably be replaced by a stronger focus on form. In other words, the fact that SCMC draws learners’ attention to the interaction processes could benefit L2 learning, provided
that the SCMC task does not have a meaning focus that competes for processing capacity with the form focus. Second, the differences between groups were quite noticeable. Therefore, SCMC may provide valuable information for the instructor to see how different groups of students interpret a task and work toward the completion of the task. These may be helpful for understanding different expectations and experiences of different students. Third, in comparison to face-to-face tasks, it seems quite clear that SCMC tasks are more effective in drawing learners’ attention to the learning processes. To orient learners to the learning processes is essential in the teaching of writing, and thus it seems SCMC tasks are more relevant and helpful than face-to-face discussion tasks in a writing classroom.

5.4 Limitations and Future Research

A major limitation of this study is that the interactions in the face-to-face section were not recorded, and thus the interpretation of the lack of development patterns concerning the use of argument moves in the writing samples of the focal students in the face-to-face group did not have strong evidence. The decision to not include recordings of interactions from the face-to-face section in this study is a response to both the focus of the study and to the practicality of recording small group interactions in the same classroom simultaneously. At the beginning of the study, it was decided that the learning processes of the SCMC section would be the focus of this study, and that the recordings of the face-to-face interactions may not be necessary. Analysis of the SCMC discourse and the participants’ parallel writing samples has shown possible links between the interaction patterns in the SCMC and the development of skills in framing arguments in
academic writing. It is thus interesting for future research to examine how interaction patterns in similar tasks in face-to-face situations would be different, and how such interaction patterns can be linked to the evolving abilities to construct effective arguments in academic writing.

It is also clear from the findings of the study that in interaction studies, differences between small groups are inevitable. The differences could mean different group dynamics, interaction patterns, group’s interpretation of learning goals, and others. Some of these small group characteristics can then be linked to positive or negative learning outcomes. For example, this study showed how the engaging discussions in Herman’s group seemed to have facilitated his development of abilities in constructing effective arguments in academic writing, while Hannah’s lack of development in academic writing could be linked to her group members’ agreeable personalities and her group’s priority in maintaining a friendly environment. Therefore, to disentangle the effect of the instructional method from the effect of grouping in interaction studies will open up opportunities of research in the future.
APPENDIX A

Pre-study Questionnaire: English Use and Technology in Learning English

<table>
<thead>
<tr>
<th>Name</th>
<th>Remove</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research code</td>
<td>Remove</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender</th>
<th>Native Language(s)</th>
<th>TOEFL/IELTS score</th>
</tr>
</thead>
</table>

Instructions: Circle the one that best describes your situation.

**Part I. English learning**

1. For how many years have you studied English?
   - less than 1 year
   - 1-2 years
   - 2-3 years
   - 3-4 years
   - over 4 years

2. How long have you stayed in the United States?
   - less than 1 year
   - 1-2 years
   - 2-3 years
   - 3-4 years
   - over 4 years

3. Besides this class, how many other English classes are you taking now?
   - 0
   - 1
   - 2
   - 3
   - 4 or more

4. How many hours per week do you spend using English outside class to …

<table>
<thead>
<tr>
<th></th>
<th>Do homework</th>
<th>Prepare for quizzes and exams</th>
<th>Listen to language tapes</th>
<th>Read for fun</th>
<th>Listen to music</th>
<th>Watch TV, video, and movies</th>
<th>Talk to friends</th>
<th>Talk to tourists</th>
<th>Talk to family members</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>1-2</td>
<td>3-4</td>
<td>5-6</td>
<td>7 or more</td>
<td>0</td>
<td>1-2</td>
<td>3-4</td>
<td>5-6</td>
</tr>
</tbody>
</table>

**Part II Technology use in English**

5. How many hours per day do you spend using the Internet and other computer technology to go about your normal communication, work, and entertainment in English?

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1-2</th>
<th>3-4</th>
<th>5-6</th>
<th>7 or more</th>
</tr>
</thead>
</table>

6. If you are writing a paper in English and need help finding or spelling a word, how often would you use the language help in the word processing program or on the Internet?

<table>
<thead>
<tr>
<th>Never</th>
<th>Seldom</th>
<th>Sometimes</th>
<th>Frequently</th>
<th>Always</th>
</tr>
</thead>
</table>

7. How often do you search on the Web for information that you need when writing a paper for class or for your job?

<table>
<thead>
<tr>
<th>Never</th>
<th>Seldom</th>
<th>Sometimes</th>
<th>Frequently</th>
<th>Always</th>
</tr>
</thead>
</table>

8. How often do you shop for things like books, clothes, music, DVDs and other things on the Internet using English?

<table>
<thead>
<tr>
<th>Never</th>
<th>Seldom</th>
<th>Sometimes</th>
<th>Frequently</th>
<th>Always</th>
</tr>
</thead>
</table>

9. How often do you use the Internet to get access to news and other information in English?

<table>
<thead>
<tr>
<th>Never</th>
<th>Seldom</th>
<th>Sometimes</th>
<th>Frequently</th>
<th>Always</th>
</tr>
</thead>
</table>

10. How often do you use email, instant messenger, or an Internet voice communication tool such as Skype to communicate with friends and relatives in English?

<table>
<thead>
<tr>
<th>Never</th>
<th>Seldom</th>
<th>Sometimes</th>
<th>Frequently</th>
<th>Always</th>
</tr>
</thead>
</table>

11. How many hours per day do you use English to surf the Web for fun to find interesting blogs to read, images to look at, videos to watch and music to listen to?

<table>
<thead>
<tr>
<th>0</th>
<th>1-2</th>
<th>3-4</th>
<th>5-6</th>
<th>7 or more</th>
</tr>
</thead>
</table>

12. How many hours per day do you participate using English in chat rooms and contribute to discussion groups and Wikis on the Web?

<table>
<thead>
<tr>
<th>0</th>
<th>1-2</th>
<th>3-4</th>
<th>5-6</th>
<th>7 or more</th>
</tr>
</thead>
</table>

13. How often do you keep a blog to communicate in English with anyone who wants to know what you are doing or what you are writing about?

<table>
<thead>
<tr>
<th>Never</th>
<th>Seldom</th>
<th>Sometimes</th>
<th>Frequently</th>
<th>Always</th>
</tr>
</thead>
</table>

14. How often do you use English to participate in Second Life?

<table>
<thead>
<tr>
<th>Never</th>
<th>Seldom</th>
<th>Sometimes</th>
<th>Frequently</th>
<th>Always</th>
</tr>
</thead>
</table>

15. How often do you work on computers in order to improve grammar now?

<table>
<thead>
<tr>
<th>Never</th>
<th>Seldom</th>
<th>Sometimes</th>
<th>Frequently</th>
<th>Always</th>
</tr>
</thead>
</table>

16. How often do you notice language problems when you talk to someone through chat now?

<table>
<thead>
<tr>
<th>Never</th>
<th>Seldom</th>
<th>Sometimes</th>
<th>Frequently</th>
<th>Always</th>
</tr>
</thead>
</table>
## APPENDIX B

### Topics and Materials for the Twelve Group Work Sessions

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>• To identify problems in formatting an academic essay based on the instructor’s requirements and make corrections</td>
<td>• Guidelines for formatting academic papers (Textbook, p. 16)</td>
</tr>
</tbody>
</table>
| 2    | • Should colleges and universities rely on standardized tests to determine whether a student will be admitted or not?  
• Based on your understanding, which of the two introductions contain a more effective thesis statement? Why? | • Reading: The essays on the first topic submitted by the students  
• Reading: Two students’ essays that contain the two introductions in the second question (provided by the instructor) |
| 3    | • Which of the following two charts better represent the structure of *The All American Slurp*?  
• Students’ outlines for paper 1 |
| 4    | • What is the focus of *The Profiler*? Do you think the introduction of the essay contains only the first paragraph or the first two? Why?  
• Which of the following 4 thesis statements is the most effective for a personal essay? Why?  
• Grammar consciousness raising | • Reading: *The Profiler* (provided by the instructor)  
• 4 students’ essays that contain the 4 thesis statements  
• 3 pairs of correct and incorrect sentences (provided by the instructor) |
| 5    | • Based on your understanding of the organization patterns of a cause-and-effect essay, which of the two patterns do you think the author used in *Job Satisfaction*? Why?  
• Should English learners use English as much as possible in classes and among friends? | • Reading: *Job Satisfaction* (Textbook, pp. 134-137)  
• Reading: The essays on the second topic submitted by the students |
<p>| 6    | • How many reasons have been mentioned in <em>Why We Crave Horror Movies</em> | • Reading: <em>Why We Crave Horror Movies</em> (provided by the instructor) |</p>
<table>
<thead>
<tr>
<th></th>
<th>Horror Movies? What are they?</th>
<th></th>
<th>A short video clip about benefits of online lectures (provided by the instructor)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Should students be encouraged to use Facebook or other social network websites on campus?</td>
<td></td>
<td>Readings: Excerpts from essays for the role of a student, a teacher, and an IT staff (provided by the instructor)</td>
</tr>
</tbody>
</table>
| 8 | What is the key question the essay Absent-Minded Students wanted to answer?  
What do you think was the purpose for each? Was it successful? |   | Reading: A student’s cause-and-effect essay (provided by the instructor) |
| 9 | What is the purpose of the essay? How can you tell?  
The last paragraph on “space” is missing some specific details. Can you brainstorm ideas to fill in those three spots? |   | Reading: Nonverbal Communication (provided by the instructor) |
| 10 | Can you find a matching expression for each of the following two pictures? Explain why. |   | Reading: Cultural Identity vs. Ethnic Fashions (Textbook, pp. 63-65) |
| 11 | Should writing instructors use Criterion to score students’ essays and help identify grammar mistakes? |   | Readings: Excerpts for the role of a student, a writing instructor, and a software developer (provided by the instructor) |
| 12 | Does technology shrink or enlarge the distance between people? Why? |   | Reading: Remote Control (provided by the instructor) |
APPENDIX C

Four Writing Prompts

Topic 1 (Pre-test)

After many years in school, you probably have taken many tests, including standardized tests. Should colleges and universities rely on standardized tests (college entrance examination, TOEFL, SAT and etc.) to determine whether a student will be admitted or not? In arguing for your position, consider both the advantages and disadvantages of such a requirement for college admission.

Topic 2

You have all learned English for a while and probably have experienced different ways of learning. One of the problems in English learning is about the use of English and your native language. Should learners of English use as much English as possible whenever they can (in classes and among friends)? In arguing for your position, consider both the advantages and disadvantages of such a suggestion for English language learners in different situations.

Topic 3

As a student, you must be familiar with the various kinds of social network such as Facebook, Myspace, RenRen, and etc. The use of such social network websites among college students, however, has become a controversial issue. Should college students be discouraged from using such social networks or not? In arguing for your position, consider both the advantages and disadvantages of the suggestion on the use of social network websites.

Topic 4 (Post-test)

You have all used Criterion a while. Sometimes, your essays may get a score and sometimes not. But you can always get some feedback on grammar and organization structure. Some students feel the feedback is helpful while others do not. So the question is: Should students of English 101C classes be required to use Criterion? In arguing for your position, consider both the advantages and disadvantages of using Criterion to help improve writing.
APPENDIX D

Nine Reflection Prompts

Reflection 1

Think about your group work today. What went well, and what didn't go so well? What difficulties have you encountered? How did you solve them? You can type the journal in a word file and upload it here or type it directly into the submission box given below.

Reflection 2

Most of you have observed that it takes some courage and strategies to express agreement and disagreement. Reflect upon the process of the discussion. How did you and your group members express agreement and disagreement? What kind of language was used? How did you feel when someone disagreed with you?

Reflection 3

You were asked to comment on each other’s work last week, and this week, you were asked to comment on thesis statements written by people you don't know. Did you observe any differences in the ways that you and your group members talk in those two situations? What are the differences? Why are there such differences?

Reflection 4

Describe something annoying in your group work so far.

Reflection 5

You have worked in group discussions for quite a few weeks. Who do you think is the most persuasive person in your group? What makes you think so? Who is the least persuasive person in your group? What do you think can help him or her to become a more convincing group member?

Reflection 6

Treatment: You may have used chat programs such as MSN, Skype, QQ, or others to “chat” with your friends online before. Basically, we are using a similar program in class discussions. What do you think are some major differences?
Control: We have had quite a few classroom discussions since the beginning of the semester. What do you think are some major differences between classroom discussions and talking with your friends?

Reflection 7

Treatment: For this journal, you will need to go over the discussion scripts of your group and answer the following questions. First, what is your overall impression of how you sound in the group discussion (are you persuasive/confident/aggressive/hesitant/ or else)? Second, did you or other people use any certain expressions of certainty or uncertainty? Now that you are reading this script again, do you think those expressions make a difference or not? Why?

Control: For this journal, you will need to recall your group discussion in class, and answer the following questions. First, what is your overall impression of how you sound in the group discussion (are you persuasive/confident/aggressive/hesitant/ or else)? Second, did you or other people use any certain expressions of certainty or uncertainty? Now that you are thinking about your own language use in the discussions, do you think those expressions make a difference or not? Why?

Reflection 8

Treatment: In the group online discussions, did you ever edit your messages before sending them out? Why or why not? Look back at your discussion script, what aspects of language use do you think you could have done better?

Control: In group discussions, did you ever plan out what to say carefully before you present your ideas in your group? Why or why not? Think about your discussion in the previous weeks, were you aware of some of your problems of language use in discussions? What are they? What did you do to deal with them?

Reflection 9

Treatment: Some say that online discussion seems to be informal, but others disagree and believe it depends on different situations. So on a scale of 1-5 where 1 represents the least formal and 5 represents the most formal, where do you think your group online discussion stand (1, 2, 3, 4, or 5)? Compare and contrast features of online discussion vs. face-to-face classroom discussion you’ve had, or online group discussion vs. online chatting with friends to explain and discuss about your views.

Control: Some say that group discussion seems to be informal, but others disagree and believe it depends on different situations. So on a scale of 1-5 where 1
represents the least formal and 5 represents the most formal, where do you think your group discussion stand (1, 2, 3, 4, or 5)? Compare and contrast features of classroom group discussion vs. chatting with friends to explain and discuss your views.
APPENDIX E

Group Evaluation Questionnaire

Name

Research code

Instruction:

How much do you agree with the following statements? Indicate your evaluation by circling the corresponding number (1=disagree strongly; 2=disagree somewhat; 3=agree somewhat; 4=agree strongly)

1. I have contributed a lot to my group.
   1 2 3 4
2. My group won’t get a satisfactory score without me.
   1 2 3 4
3. My group worked well.
   1 2 3 4
4. My group has helped me a lot during discussion.
   1 2 3 4
5. I have learned a lot from my group members.
   1 2 3 4
6. I can always get immediate response from my group members in discussion.
   1 2 3 4
7. Our language use in discussion is mostly informal.
   1 2 3 4
8. We have to use our native language to explain ideas.
   1 2 3 4
9. Every one of us in the group is roughly equal in terms of English language proficiency.
   1 2 3 4
10. Every one of us in the group contributes equally during discussion.
    1 2 3 4
11. We keep in touch with each other frequently after class.
    1 2 3 4
12. There were frequent off-topic discussions.
    1 2 3 4
13. Although we were engaged in arguments, we seldom take these personally.
    1 2 3 4
14. We seldom use emotional language in discussion.
    1 2 3 4
APPENDIX F

Coding Scheme for L2 Learning Opportunities in SCMC Discourse

<table>
<thead>
<tr>
<th>Instances</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negotiation of meaning</td>
<td>Interlocutors focus on resolving a linguistic problem that causes the communication break-down</td>
</tr>
<tr>
<td>Co-construction</td>
<td>Interlocutors focus on resolving a linguistic problem although there is no communication breakdown</td>
</tr>
<tr>
<td>Other correction</td>
<td>One interlocutor provides corrective feedback to another</td>
</tr>
<tr>
<td>Self correction</td>
<td>An interlocutor realizes one's own mistakes and makes corrections himself/herself</td>
</tr>
<tr>
<td>Continuer</td>
<td>One interlocutor encourages another to continue elaborating one's ideas</td>
</tr>
<tr>
<td>Language play</td>
<td>Interlocutors play with language form or meaning in their interactions</td>
</tr>
</tbody>
</table>
## APPENDIX G

Coding Scheme for the Argumentative Moves in the Writing Samples

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Move</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
<td>Orientation</td>
<td>The orientation aims to provide some background information of the issue to be discussed.</td>
</tr>
<tr>
<td>T</td>
<td>Thesis</td>
<td>The thesis states the author's position with regard to the controversial issue and may include a brief outline of the supporting points.</td>
</tr>
<tr>
<td>D</td>
<td>Definition</td>
<td>The definition helps the author clarify controversial terms from his/her perspective.</td>
</tr>
<tr>
<td>SP</td>
<td>Supporting points</td>
<td>The supporting points provide substantial reasoning or evidence in support of the author's view stated at the beginning.</td>
</tr>
<tr>
<td>OV</td>
<td>Opposing views</td>
<td>Awareness of and/or discussion of opposing view in light of the author's perspective may help provide support for the author's own views.</td>
</tr>
<tr>
<td>S</td>
<td>Summary</td>
<td>The summary aims to reinforce the author's views and the most important supporting points at the end.</td>
</tr>
</tbody>
</table>
REFERENCES


