UNIVERSITY OF CALIFORNIA

Santa Barbara

First-year International Chinese Undergraduate Students' Academic Writing in the Digital Age

A dissertation submitted in partial satisfaction of the

requirements for the degree Doctor of Philosophy

in Education

by

Rong Yang

Committee in charge:

Professor Dorothy M. Chun, Chair

Professor Richard Durán

Professor Karen Lunsford

December 2018

The dissertation of Rong Yang is approved.

_____

Richard Durán

_____

Karen Lunsford

_____

Dorothy Chun, Committee Chair

May 2018

ACKNOWLEDGEMENTS

I would like to express the deepest appreciation to my committee chair, Professor Dorothy M. Chun, for her continuous support and guidance over the years in my Ph.D program study. I would also like to thank my committee members, Professor Richard Durán and Professor Karen Lunsford, for their help and constructive feedback on my dissertation writing. Last but not the least, thanks go to Hui Hu and Yangxuan Hu for their unwavering love and support. I dedicate this dissertation to them.

VITA OF RONG YANG

June 2018

EDUCATION

Ph.D, Education (Teaching and Learning) with an interdisciplinary emphasis in Applied Linguistics, University of California, Santa Barbara, September 2018 (expected)

Master of Art, Education (Teaching and Learning), University of California, Santa Barbara, 2014

Master of Literature, English Language and Literature, Sun Yat-sen University, Guangzhou, China, 2004

Bachelor of Art, English Language and Literature, Sun Yat-sen University, Guangzhou, China, 2001

PROFESSIONAL EMPLOYMENT

Full-time:

Lecturer, Department of Business English, College of Foreign Studies, Jinan University, Guangzhou, China, 2004.7-2012.8

Part-time:

Teaching Assistant (Intro to University), Department of Education, University of California, Santa Barbara, 2018.4-2018.6

Teaching Assistant (Special Topics in Methods), Department of Sociology, University of California, Santa Barbara, 2018.1 - 2018.3

Teaching Assistant (Introduction to Sociology), Department of Sociology, University of California, Santa Barbara, 2017.9 - 2017.12

Graduate Student Researcher (Faculty Research Project on Parental Role Beliefs in Asia), Department of Education, University of California, Santa Barbara, 2017.6-2017.8

Teaching Assistant (Introductory Statistics/ Inferential Statistics/ Linear Models for Data Analysis), Department of Education, University of California, Santa Barbara, 2014.10-2017.6

Graduate Student Researcher (Undergraduate Alumni Educational Outcomes and Career Development Tracking Project), Division of Undergraduate Education, University of California, Santa Barbara, 2015.7-2015.9

Graduate Student Researcher (Faculty Research Project on Speech Visualization for Language Learning), Department of Education, University of California, Santa Barbara, 2014.4-2014.9
Graduate Student Assistant (Chinese Nano-faculty Study), Center for Nanotechnology in Society, University of California, Santa Barbara, 2014.4-2014.6
Teaching Assistant (Introduction to Sociology), Department of Sociology, University of California, Santa Barbara, 2014.1-2014.3
Teaching Assistant (Global Socioeconomic and Political Processes), Department of Global & International Studies, University of California, Santa Barbara, 2013.9-2013.12
Graduate Student Researcher (Faculty Research Project on Speech Visualization for Language Learning), Department of Education, University of California, Santa Barbara, 2013.7-2013.9
Certified Examiner, Cambridge ESOL (Business English Certificate), China, 2007.7-2012.8
Part-time Teacher, School of Continuing Education, Sun Yat-sen University, Guangzhou, China, 2002.9-2004.6

JOURNAL PUBLICATIONS

Yang, R. (2017). The use of questions in a synchronous intercultural online exchange project. *ReCALL*, *30*(1), 112-130.
Chun, D., Jiang, Y., Meyr, J., & Yang, R. (2015). Acquisition of L2 Mandarin Chinese tones with learner-created visualizations. *Journal of Second Language Pronunciation, 1*(1), 86–114.
Yang, R. (2009). Translation Units and Translation Teaching-- An empirical study of translation units in E-C translation of scientific & technological text and literary text. *Journal of Foreign Languages*, *6*, 79-83.
Yang, R. (2004). Communicative Context Analysis in Inaugural Address Translation. *Tianjin Foreign Studies University Journal*, *11*(5), 46-50.
Yang, R. (2004). Function and Translation of Code-switching in Literary Works: A Systemic Functional Linguistics Perspective (supported by China National Social Science Fund). *Journal of Sichuan International Studies University* (Supplement), 137-141.
Yang, R. (2004). Translating Children's Poetry from a Functionalist Perspective. *Language & Literature Research, 1*, 187-189.

CONFERENCE PRESENTATIONS

Yang, R. (2017). *International Chinese Students' Use of Digital Resources in Academic Writing*. 62nd Annual Conference of International Linguistic Association (ILA 2017). Hongkong, China, May 26-28.

Yang, R. (2017). *"I don't know what else to discuss!": Productive Online Exchange & the Use of Questions.* The Computer-assisted Language Instruction Consortium (CALICO 2017). Flagstaff, AZ, May 17-20.

Ho, H. Z., Yang, R., Lam, Y. W., Yu, Y., Pai, H. J., & Yeon, S. (2016). *Contemporary viewpoints about parenting roles in suburban China*. 18th International Roundtable on School, Family, and Community Partnerships (INET 2016). Washington, D.C., April 8.

Chun, D., Jiang, Y., Meyr, J., & Yang, R. (2014). *Acquisition of L2 Mandarin Chinese Tones with Learner-Created Visualizations*. Pronunciation in Second Language Learning and Teaching Conference (PSLLT 2014). Santa Barbara, CA, September 4-6.

Yang, R. (2006). *Function and Translation of Code-switching in Literary Works*. The First Pearl River Delta English Studies Graduate Student Conference. Macau, China, June 5-8.

Yang, R. (2002). *Translating Children's Poetry from a Functionalist Perspective*. The Fourth China Poetry Translation Forum. Guangzhou, China, December 10-12.

FIELDS OF STUDY

Major Field: Education (Teaching & Learning)

Interdisciplinary Emphasis: Applied Linguistics

Studies in Second Language Education and Cross-cultural Communication with Professor Dorothy Chun, Professor Jin Sook Lee, and Professor Jenny Cook-Gumperz

Studies in Social-cultural Theories in Education with Professor Richard Durán

Studies in Technology and Language Education with Professor Dorothy Chun

Studies in Academic Writing and Digital Literacies with Professor Karen Lunsford

ABSTRACT

First-year International Chinese Undergraduate Students' Academic Writing in the Digital Age

by

Rong Yang

Driven by the desire to expand and deepen the understanding of the academic performance and multiliteracies development of international Chinese undergraduate students, and the current scarcity of research on the said topic, this study examined first-year international Chinese students' academic writing process, and how this process was situated in the cultural- historical context, and mediated by students' use of web-enabled resources and the their interaction with the social others. This research project comprised two parts, namely, a survey study and a multiple case study. The data were collected through survey responses, interviews, and real-time screen recordings.

The most common challenges and strategies in academic writing for this group of students were investigated. While using digital resources and relying on past ESL training and writing experience were unsurprisingly chosen as the most convenient strategies, asking the instructors and teaching assistants for help was also found popular among the respondents. In addition, the participants were aware of the fact that, so far, digital tools were not able to solve all the challenges they encountered in academic writing, and the challenges were the result of an intricacy of influencing factors.

Students did not demonstrate highly advanced skills in searching for resources and determining their credibility and authorship, and they did not seem to be bothered much by the frequency of all the transactions during the writing process and were generally happy with what they could find at their fingertips for achieving the short-term goal of finishing the academic assignment. Meanwhile, they were able to articulate a series of strategies and criteria to illustrate their basic multiliteracies skills, and they were cognizant of the inadequacy of their multiliteracies.

These students interacted with various social others within the bounded system, and were influenced by and influencing others during this process. They generally preferred working alone and thinking independently on their writing assignments, but they also wished for clearer instructions and communications of expectations from the instructors and more opportunities to exchange views and ideas with other student groups.

These students' academic writing and multiliteracies practices were deeply situated in their cultural, historical, and educational backgrounds, as well as the current social-academic context. Their decision-making process in relation to writing strategies and digital resources use embodied their constant negotiation with their multiple identities evolving from the past into the present.

In addition to verifying previous research findings and filling gaps in the literature, identifying the emerging contradictions was another objective of this study. Gaps and misfits found in different levels and among different components in the bounded system provided implications for pedagogy and curriculum development and student academic support, and were expected to inspire further exploration of the related issues in future academic writing and multiliteracies studies.

TABLE OF CONTENTS

I. Introduction

The rapid development of the Internet and other ICTs (Information and Communications Technology) has brought a full range of changes to literacy (Kress, 2005; Leu et al., 2004). Not only has there been much discussion about the definition and terminology of new literacies, but also there is a fast growing body of literature on students' digital and literacies practices inside and outside the classroom. However, while there are some studies on college level ESL (used hereafter as a general term covering ESL and EFL) students' literacies development in the new era, international students, especially international Chinese undergraduate students, are very much underreported, despite their increasingly significant presence on campuses around the world. In addition, there is growing evidence that the performance of university ESL students in academic writing is associated with their overall academic experience and success (Giridharan, 2012). Considering the soaring number of international Chinese undergraduate students as transnational youth studying in U.S. colleges, their academic writing practices in today's digital environment are important not only for their social-academic success and development of identities, but also to educators and campus academic support service providers in curriculum development and fostering a supportive and culturally responsive environment for an increasingly diverse student body.

In addition, while many different theoretical frameworks have been applied to the discussion of college students' academic writing, there is not much literature available on the

investigation of the writing process in the digital environment from a cultural-historical perspective. In response to the demand of understanding students' writing practices in the digital era and the call for more attention to how students access and integrate information into their assessed work and how the decision-making process is situated (Lea & Jones, 2011), the current research was designed to look at first-year international Chinese undergraduate students' academic writing by focusing on the way they utilize various resources, digital resources in particular, and how such a process was culturally and historically situated.

The discussion foundation of this study was an interweaving of two theoretical perspectives: the cultural-historical activity theory (CHAT) in which learning activities are composed of ever-changing mediational processes characterized by the interactions between the subject(s), object(s), and other mediating artifacts in a bounded activity system (Davydov,1999; Galperin 1992; Lazarev 2004; Vygotsky, 1978), and the multiliteracies perspective (Cope & Kalantzis, 2000; Gee, 1996, 1998; Littlejohn, Beetham, & McGill, 2012; New London Group, 1996; Selber, 2004) which advocates that literacies are both constitutive of and expressive of personal identity and provides a lens for capturing the characteristics of international Chinese students' academic writing in response to their transnational life and the fast development of technology.

II. Definitions and research questions

In this study, the international Chinese undergraduate students were defined as students who had completed their senior high school education or its equivalence in China and were studying in a U.S. college with an F1 student visa at the time of the data collection. First-year international undergraduate students were at a critical transitional period linguistically, academically, and socially, and thus of special interest for studies on literacies in this new era featuring rapid development of technology and global education.

In order to ensure the feasibility and relevance of the data analysis, it is important to describe the activity settings (Daniels, 2004; Gallimore & Tharp, 1990) and the plane(s) (Rogoff, 1995) of sociocultural analysis for studies that are conducted under the cultural-historical activity theory framework (Yamagata-Lynch, 2010). In this study, the primary activity setting was the environment in which first-year international Chinese students developed their academic literacies. The key elements involved included, but were not limited to, the objective(s) and goal (s) of the activity and actions, this particular group of students, the instructors and teaching assistants, the campus academic support services providers, the students' friends and peers on the campus, the available printed and digital resources for students, the related academic rules and norms, the current social-academic context, the students' cultural and educational backgrounds, the outcome of the activity, and most importantly, the interactions between and among the above elements. Scholars

(Flowerdew, 2002; Lea & Stierer, 2000; Starfield, 2007; Street, 2004) saw literacies in the academic context as situated social practice rather than generic skills to be taught as a set of static rules, which was well in line with the cultural-historical viewpoint of the current investigation. Under the general setting described above, data collection and analysis focused on one of its sub-settings in which the target subjects in a four-year research university in the U.S. practiced literacies by working on their writing assignments and interacting with all related elements, in a process characterized by the dominance of digital resources use and the influence of students' cultural-educational backgrounds.

In addition, among the three planes of sociocultural analysis proposed by Rogoff (1995), namely, the personal, interpersonal, and institutional/community planes, the personal plane was the primary focus in data collection and analysis. Although some factors related to the interpersonal and institutional planes were also included in the study, they were discussed primarily on a case-by-case basis to demonstrate particularities and diversities within the target subject group.

By centering on the characteristics of the mediated writing process of the first-year international Chinese undergraduate students, the current research strived to achieve a better understanding of the academic writing experience of this particular group of students, the influence of the artifacts in the system, digital resources in particular, as well as gaps and mismatches emerging from the interactions between different components during the writing

processes. In order to achieve this goal, empirical evidence was collected through surveys, screen recordings, semi-structured interviews, and instructors' feedback. The findings were expected to be meaningful for people who are interested in the academic experience and writing development of international students in the digital age, and to provide implications for pedagogy development, curriculum design, and campus academic support.

Accordingly, the overarching research question was identified as the following:

How was first-year international Chinese students' academic writing process in the digital age mediated by the modern technology such as the web-enabled resources, and other factors such as social interaction and the cultural-historical context?

To address this question, the following sub-questions were examined:

1) How did students use various resources to address challenges identified in their academic writing?

2) As a game-changing artifact in the modern society, how did digital technology such as web-enabled resources mediate students' academic writing process? What were the characteristics of students' use of digital resources in their writing process?

a) What digital resources were used?

b) How often were they used?

c) What were the results of using these digital resources?

d) How were students' L1 and L2 used in this process?

3) How were students' multiliteracies, namely, their functional, critical, and rhetorical literacies (Selber, 2004) represented in their use of the digital resources?

a) Did students know how to search for information and obtain what they need from the internet or other web-enabled tools?

b) How did they decide what websites to visit and what information to trust?

c) How did they decide what to cite?

4) Did students interact with their instructors, peers, or other academic supporting service staff regarding their academic writing and the use of digital resources?

5) How were students' academic writing activities situated in their cultural, historical and educational backgrounds?

6) What were the contradictions found that would provide implications for pedagogy and curriculum development and student academic support, as well as discussion of the challenges for and the positioning of academic writing in the digital age?

In light of the research questions, the data collection and analysis were divided into two parts. The first part was to capture data that presented the general pattern regarding the perceived writing challenges and preferences of the use of resources in addressing these challenges. This part helped to describe in part the common features of the primary setting in which the follow-up case studies took place, to identify potential case study subjects, and to provide starting points for subsequent in-depth examination and discussion of the case studies. To fulfill this goal, a survey was conducted on sixty-five first-year international Chinese students.

The second part of the investigation was devoted to a multiple case study involving five subjects. Survey responses, real-time screen recordings, semi-structured interviews, and instructors' feedback were used to examine in further details the characteristics of the case study subjects' individual writing process, and the interaction between and among the related factors within the sub-settings described earlier. The discussion in this part had a focus on the changing dynamics in the system characterized by the development and prevalence of the web-based technology and the particularities and similarities across the multiple cases.

III. Literature review

A. Cultural-historical activity theory (CHAT)

Cultural-historical activity theory is often seen as a conceptual framework for understanding and explaining mediated human activity, which is enculturated and should be viewed in light of the historical trajectories (Foot, 2014). Originated from the work of L.S. Vygotsky, cultural-historical activity theory (CHAT) was often seen as a "near relative" (Daniels, 2004, p.121) to the socialcultural theory, and used as "a unified set of concepts" (Edwards & Daniels, 2004, p. 107) with the socialcultural theory for their common emphasis in viewing learning and development as evolving mediated processes. In CHAT, human activity was treated as the unit of analysis that is distributed among multiple individuals and objects in the environment (Zeek et al. 2001). By outlining the key components and their relationship in the mediational model, namely, subject, object, mediating artifacts, outcome, and later, rules, community, and division of labor, Vygotsky and his successors provided a viable framework for researchers in their investigation of the influences of social, cultural, and historical factors on human activities and collaboration, as well as the human agency manifested during the mediational processes (Cole, 1985; Engeström, 1987; Farver, 1999; Gallimore & Goldenberg, 2001; Leont'ev, 1974; Vygotsky, 1978).

In the social cultural activity model, the subject is the individual or group whose actions are the focus of analysis; the object is the goal of the activity; the mediating artifact can

include material or conceptual tools, social others, and prior knowledge that contribute to the subject's mediated action experiences within the activity; the rules refer to related conventions and regulations guiding the subject's actions toward an object, and relations with other participants in the activity; the community consists of the people who share with the subject an interest in and involvement with the same object; and lastly, the division of labor includes both the horizontal division of tasks and the vertical division of power, positions, access to resources, and rewards (Engeström, 1987, 1990).

Object is one of the most important concepts in the CHAT model, and it helps to differentiate one activity from the others. An object consists of three facets, namely, a thing-to-be-acted-upon, an objectified motive, and a desired outcome. They may be constructed or perceived differently by the subject and various members of the community (Foot, 2014). In the current study, while developing academic writing competence may be the general description for the object of the system in focus, research subjects (students), instructors and TAs, the subjects' friends and peers, and other related members of the community who provide support for student literacies development may all see the object differently, influenced and constrained by their roles, positions, and ways of participation in the system.

As another key element in the CHAT model, "tool" was viewed as a historical record of the relationship between actors and the object of their activity (Kuutti, 1996), and tools are crafted at a point in time and adapted over time-- their development is shaped by the needs,

values, and norms of the culture(s) in which they are created and used (Foot, 2014). Similarly, when discussing the role material technologies play in literacy development, Kern (2015) argued that those technologies do not in and of themselves determine what we do with them. It is the specific use of them in a particular context that can shed light on our understanding of "how we use technologies of literacy, how those technologies shape our thinking, and how we can resist using them only in 'default' modes"(p.219). As one of the focal tools under investigation in the current study, web-enabled resources' mediating effect emerged through the process of being used by research participants in their writing process based on their consciousness of the temporary goals, the object of the activity, and the relationship between the related variables in the system.

Another important tenet of the CHAT framework is viewing contradictions manifested through CHAT analysis as source for development. The term "contradiction" was used by activity theory to represent imbalances between and within elements, or between different developmental phases of an activity, as well as those between different activities (Kuutti, 1996). Engeström (1987) described four levels of contradiction in an activity system, starting with the misfits between the use values and the exchange values of elements involved as the primary contradiction. Rather than ending points, contradictions are seen by CHAT theorists as starting places, which can help to reveal "new facets and dynamics of the activity, and open new vistas of understanding" (Foot, 2014, p.337).

In the recent decades, as a holistic and dialectical analysis approach, activity theory has gained increased popularity in educational research focusing on the deeper understanding of the human learning activities and the explanation of the working mechanism behind educational changes and transformation. Several key concepts in the framework were frequently found in educational studies, such as context, praxis and practices, and contradiction emerging from category pairs. According to this theory, context was considered as the combination of goals, tools, and settings (Cole, 1996). The term "praxis" emphasizes the moments of real human activity, while practices refer to the patterned form of action (Bakhtin, 1993; Sawchuk, 2003). CHAT theorists also proposed a helpful hierarchy made up by activity, action, and operation to help with more accurate descriptions of human activities. In this hierarchy, activities are longer-term formations which are composed by shorter-term processes consisting of actions or chains of actions, which in turn consist of operations (Kuutti, 1996). In addition, popular category pairs outlined under the CHAT framework, such as individual-collective, body-mind, subject-object, agency-structure, action-goal, activity-motive, and material-ideal, provide researchers with useful tools in classifying data and examining contradictions that emerge and evolve in educational settings.

Accordingly, in this study, the object oriented activity referred to the activity in which students practice academic writing. The objectives of the activity may be viewed differently by different participants in the system. While the instructors, as important community

members in the current system, may see the objectives of students' academic writing as those defined in the curriculum and official guidelines, the students, as the subjects, may see them in a more pragmatic way. The objectives for the students can include being able to proceed in the academic program, finishing assignments and get the course credits, and practicing writing to prepare for the future job market. The goal-oriented action was the entire process when students worked on one of their academic writing assignments, whose goal was to finish this particular assignment. Each step the students took during this process was categorized as an operation driven by a specific motive.

Furthermore, CHAT highlights the mutually constitutive relationship between different elements in the system model (Davydov 1999; Rogoff 1995; Roth & Lee, 2007), the contingent nature of activity systems (Rorty, 1991), and the emergent quality of the goals and the actions that realize them (Lave, 1988). From a CHAT perspective, the subjects constantly make adjustment of their actions and goals based on their understanding of the ever-changing situation, the emerging contradictions, and their ultimate object for the activity. Such a viewpoint is particularly applicable to the analysis of current phenomena in educational settings, which witness great changes brought by the development of global education and modern technology. CHAT's emphasis of the subjects' unfolding engagement in situated activities in the system also matches well with the learner-centered trend in contemporary education research underscoring learner agency.

Researchers have been using CHAT to look at different topics in education, such as cultural variation, diversity in classrooms, student agency, student identity, and student writing. For instance, Gutiérrez and Rogoff (2003) discussed cultural variation with a cultural-historical approach. They argued that, in order to avoid overgeneralization, researchers' and practitioners' should focus on variations in individuals' and groups' histories of engagement in cultural practices instead of their traits in describing cultural regularities. Gipps (1999) reviewed educational assessments from a social-cultural perspective, and reasserted the importance of taking the social, cultural, economic, and political contexts into account in educational research. Lantolf (2000, 2006) demonstrated how social-cultural approach could help to examine the cultural dimensions of language study and the role of students' identity in the learning process.

Researchers also examined in further details the multi-faceted and dialectical nature of students' identities, and how they are continuously produced and reproduced in practical activity (Roth, Tobin, Elmesky, et al., 2004). Paul Prior (1998) asserted that "writing happens in moments that are richly equipped with tools (material and semiotic) and populated with others (past, present, future)" (p.xi). Hart-Davidson (2007) was convinced that when writing is seen as a mediated activity, it involves acting within broader social and technological systems, and interacting with people, tools, and information along the way. He believed that "we have much to learn about the way work today is mediated by writing technologies in

very detailed and interesting ways that researchers in our field have yet to pay much attention to" (p.160).

While activity theorists are specifically interested in identifying object-oriented activities, and laying out a map for researchers to grasp the reciprocal evolutionary process involving collective participation and macro-level social historical contexts, it does not mean that studies with a CHAT approach are only limited to discussions related to collective behavior and its transforming power on the environment. On the contrary, individual behavior and the individually-based goal-directed actions are often more observable and decodable, and should be "the entryway for researchers to vicariously experience their participants' activities" (Yamagata-Lynch, 2010, p.22).

In order to increase the relevance and manageability of data collection and analysis in CHAT research, Yamagata-Lynch (2010) recommended researchers to provide specific descriptions of the activity settings (Gallimore & Tharp, 1990) and explicit indication of the plane of sociocultural analysis (Rogoff 1995) in the studies. According to Yamagata-Lynch, in activity systems analysis, while the object-oriented activities under investigation still remain to be the unit of analysis, the focal subject of that activity can be an individual, group of individuals, or an organization. In addition, because both activity system analysis and case study as a qualitative research method involve examination of phenomenon or related-variables that are not removable from the context, these two are compatible. "From a case

study perspective, object-oriented activities, goal-directed actions, and activity settings can all be identified as a viable case to study," Yamagata-Lynch (2010, p.79) contended. Accordingly, a multiple case study was designed as a major part of data collection and analysis in the current study to examine first-year international Chinese students situated academic literacy practice in the digital age from a CHAT perspective.

B**. The rise of new literacies studies**

With the rapidly changing nature of literacy in today's world, it is widely agreed that the pluralized term "literacies" is a better choice to acknowledge literacies as situated knowledge practices involving "an interaction between personal capabilities or dispositions and the environment supporting action"(Littlejohn, Beetham, & McGill, 2012, p. 550; Rowsell & Walsh, 2012). Researchers have looked at literacies from various perspectives and proposed theoretical models based on different heuristics.

Accompanying the varying conceptualizations of new literacies, there is a whole range of diverse terms falling broadly under a new literacies umbrella, including 21st century literacies, new media literacies, information literacy, ICT literacies, and computer literacy, internet literacies, digital literacies, multiliteracies, to name the most common ones. While different terms may represent different focuses and perspectives, there is often some overlapping in many of the definitions or classifications. For instance, information literacy was defined as "the ability to find, discriminate, analyze, manage, organize, and present

information as a process in which research is placed in the context of constructing knowledge for a specific purpose and audience" (McClure & Purdy, 2013, p.299). Gilster (1997) suggests that there are four core competencies of digital literacy, including knowledge assembly, Internet searching, hypertextual navigation, and content evaluation. Baker, Pearson, and Rozendal (2010) summarized and categorized five major theoretical perspectives towards literacy, namely, behavioral, semiotic and multiliteracies, cognitive, socialcultural, and critical and feminist perspectives.

Still, there has not been a clear-cut distinction among terms, and many models in this field share similar beliefs and tenets. Across a steady output of research, new literacies scholars identified a list of features of new literacies (Kalantzis, Cope, & Cloonan, 2010; Knobel & Lankshear, 2006; Lankshear & Knobel, 2013; Kress, 2003; Mills, 2009; New London Group, 1996; Selber, 2004). Literacies are viewed as digital, pluralized, hybridized, multimodal, intertextual, interactive, dialogic, hyperlinked, immediate, spontaneous, abbreviated, informal, collaborative, productive, and culturally and linguistically diverse. Many of these characteristics are well in line with what the CHAT theorists proposed about human activities and practices. Accordingly, multiliteracies theory is used in the current study for its good alignment with a cultural-historical view of literacies as a constellation of practices situated within multiple social contexts and activities, and its overt interest in cultural diversity and learner identities in the digital age.

C. **Multiliteracies theory**

As one of the major theoretical perspectives towards literacy (Baker, Pearson, & Rozendal, 2010), multiliteracies theory was first named by the New London Group (1996), an international group of educators who had a consensus on the changing nature of literacy and language learning in the time highlighted by the proximity of cultural and linguistic diversity, and on the fundamental problem that the disparities in educational outcomes did not seem to be improving. Rooted in sociolinguistic traditions, the term "multiliteracies" was used by this group to capture changes taking place in two dimensions central to literacy, namely, the multiple modalities of communication, and the growing diversity of culture and language within an increasingly global community.

Since the term was coined, it has received increasing interest in the world, and much discussion is found on pedagogies positioned by multiliteracies approaches for preparing students for better achievements and fulfilling employment in their future life characterized by the increasing cultural and linguistic diversity as well as technology development. For instance, Stuart Selber's (2004) multiliteracies framework for analyzing writing pedagogy has been influential. Selber believed there was a mutually constitutive relationship between pedagogy and technology. He asserted that there are "inextricable ties among literacy, power, culture, and context" (p.29), and an ideal multiliterate student should possess not only functional literacy but also critical and rhetorical literacies as well. In Selber's discussion,

functional literacy views computers as tools, and students as users of technology to achieve effective employment; critical literacy views computers as cultural artifacts and students as questioners of technology to achieve informed critique; and rhetorical literacy views computers as hypertextual media and students as producers of technology to achieve reflective praxis.

Multiliteracies theory was also used to reframe understandings of the nature of literacy, literacy practices, teachers' role, the Internet and other digital technologies, and students as literacy users, in particular ESL learners and transnational youth. For example, a significant body of scholarship (Black, 2009; Lam, 2000, 2006, 2009; Yi, 2008) following the multiliteracies tradition have attended to how transnational or immigrant students employ multimodal composition and narratives in learning English and with what results on the enactment of their academic and social identities, and how youths' transcultural capacities are developed through their engagements with multiple languages and literacies. With a social and ideological orientation, many of these new literacy studies (Lea & Street, 1998) emphasized learner identities and the constructed social meanings during the process of them switching between the linguistic and cultural repertoires.

However, while there are many studies focusing on transnational or multilingual K-to-12 youths' out-of-school literacies practices, there is a scarcity of research on how multilingual students at the college level approach the online space and use the digital resources in an

academic context, on how they practice functional, critical, and rhetorical literacies (Selber, 2004) across the online and the academic spaces, and how their literacy practices are mediated socially, cultural-historically, and technologically. These are therefore the foci of the current study.

In addition, Knobel and Lankshear (2006) identified three dimensions in new literacies studies, namely, the operational, cultural, and critical. The operational dimension refers to the 'means' of literacy such as the ability to search for information and use a particular online tool; the cultural dimension regards knowledge of literacy practices and appropriate ways of communicating in particular contexts, such as knowing what can be posted or what cannot be posted on a particular online forum, and understanding of issues regarding intellectual property rights; and the critical dimension regards an awareness of the power relations involved in the technologies used, for instance whose interests and values they serve or reflect and whose interests are marginalized (Guth & Helm, 2012). These three dimensions match well with Selber's functional, rhetorical, and critical propositions in his multiliteracies framework (Selber, 2004). While Selber's framework is pedagogically oriented, Knobel and Lankshear's description is more of a summary and general guideline for new literacies studies. Although the current study used multiliteracies theory as part of its theoretical framework for its historical and social-cultural viewpoint and its focus on learner agency and identities in the digital age, methodologically, a more general framework consisting

operational/functional, cultural/ rhetorical, and critical dimensions as the ones described by Knobel and Lankshear (2006) and Selber (2004) was used for structuring the data collection and analysis in light of the research questions.

D**. Academic writing in the new era**

In recent years, globalization and the rapid development of information technology have not only witnessed new debate and conceptualizations of literacy, but also brought unprecedented changes to higher education, resulting in new research topics and perspectives in traditional field of inquires such as academic writing and academic research. Since the plural form "academic literacies" was used by Lea and Street in 1998, many previously overlooked social-cultural and ideological dimensions are fore-grounded in academic literacies studies, and students' writing and learning are seen "as issues at the level of epistemology and identities rather than skill or socialisation" (p.159). In addition, Kern (2000) suggested that, regardless of discipline, academic literacy involves specific dimensions including linguistic, cognitive, and sociocultural/psychological components. Detailed frameworks were proposed (Scarcella, 2003; Singhai, 2004) for defining academic literacy based on Kern's (2000) conceptual model.

Furthermore, as writing is at the heart of assessment in higher education, it remains as a key focus in academic literacies research, and the notion of academic writing as a social practice and academic literacies as a way of "doing" that is social-culturally situated has been

upheld by more and more researchers in this field (Coffin, Curry, Goodman, Hewings, Lillis, & Swann, 2005; Grabill & Hicks, 2005; Lea & Street, 1998; Lillis & Scott, 2007; Geisler, et al., 2001; Singhai, 2004), and thus make cultural-historical activity theory a good fit for literacies studies in the academic context.

In addition, just as Warschauer (2001) put it, writing "takes place not in a psycholinguistic vacuum chamber but in particular sociocultural circumstances. And the Internet, together with the broader informational revolution that it forms part of, is rapidly shifting the terrain of writing, as well as reading practices" (p.53). Hawisher and Selfe (2012) also discussed in their review of studies on computer and composition the significant roles that digital environments play in people's meaning-making process, and argued they had become an integral part of the field of composition studies. Winner (1986) contended that technological development had restructured human activity in many ways and an instrumental approach towards the role technology plays would risk overlooking the influence of it on the elements in the system.

A growing body of research is found on the current challenges and opportunities for academic writing brought by technology development and students' easy access to information in the digital world. New technologies and applications are explored for their affordances for academic research and writing. Learners' perception towards digital resources

and their own capabilities as well as their multiliteracies practices are investigated for rethinking and redesigning academic writing and second language curriculums.

Discussions on various digital tools for language learning and academic writing are found in the literature. Theoretical models such as rhetorical theory, activity theory, and usability theory, are often used in exploring the relationship between information technology and academic writing (Geisler, et al., 2001). For example, academics look at the benefits and drawbacks of Web 2.0 technologies such as wikis for collaborative learning and writing (Handayani, 2012; Kuteeva, 2011; Jones, 2008; Strobl, 2014; Yusoff, Alwi, & Ibrahim, 2012). In these studies, learners generally had a positive perception towards using these programs, and unique revision patterns were identified in several studies. However, some learners reported that they still preferred face-to-face communication for collaborative learning, and using technologies did not make as big a difference as some researchers originally expected in terms of the quality of the writing product.

Researchers also looked at the affordances of various automated feedback or writing support and evaluation programs such as the Voice over Internet Protocol (VOIP), and applications such as *Writing Pal*, *MyAccess*, *Web Crossing*, and *iWRITE*, just to name a few (Brine & Franken, 2006; Drury, 2005; Fang, 2010; Hegelheimer & Fisher, 2006; Kozma, 1991; Roscoe, R. D., Snow, Allen, & McNamara, 2015; Odo & Yi, 2014; Sauro, 2009; Sun, 2007; Warschauer & Ware, 2006; Tuzi, 2004). While most studies found new technologies

have the potential to benefit academic writing in one aspect or another, especially in areas such as conceptual planning and language support, participants often had mixed perceptions with reservations towards using these programs in an academic context, and it was dependent upon students not only accessing these resources but also making appropriate and effective use of them. In addition, due to the limitations of research design and participant idiosyncrasies, the results are by nature inconclusive.

Furthermore, problems were also found in terms of the design of the digital tools. Grant and Ginther (2000) investigated a computerized tagging program which was designed to capture proficiency level differences of second language learners' essays. They argued that although the program was useful, additional coding or manual tagging was necessary to gain a more complete picture. In addition, using programs designed with L1 standards could be helpful but such a contribution is limited for understanding L2 writing. The potential problems of using programs designed for L1 texts analysis in L2 writing studies were also found in an earlier discussion on the design of automatic analysis programs for L2 texts (Ferris, 1993).

In the face of the changes brought by globalization and technology, scholars hold different opinions towards what should be prioritized in the field of academic literacies study. Instead of focusing on the practices in which texts are embedded like many other researchers, Lillis and Scott (2007) called for a return to the analysis of texts as linguistic and cultural

artefacts. In addition, they believed more selectively designed research is needed for the empirical and theoretical developments of the field. Lea and Jones (2011) on the other hand, suggested that more attention needs to be paid to textual practice around learning and less to the technologies and their applications. In addition, they called for more attention to how students access, read and integrate information into their study and assessed work, and how the decision-making process is situated. Similarly, Kern (2015) argued that electronically mediated discourse is not just shaped by technology, and the study of it must incorporate examination of the broader social forces, the needs of the individuals in particular situations.

Hartley, Howe, & McKeachie (2001) conducted a longitudinal study on three writers, and found that while the new technologies may change the ways that individual writers work, they do not alter the styles of their resulting products. Although the participants of this study are professional writers and the situation may be very different from that of the college students, such a longitudinal study is in short supply in the literature and it provides valuable insights for the potential influences of technologies on writing practices over time.

E. Studies on college students' multiliteracies in academic context

Nicholas Carr published his much-debated book *The Shallows: what the Internet is doing to our brains* in 2010. As the web continues to shape education in profound ways, researchers believed that a better understanding of students' information behavior and

research habits in the digital age is much needed to best leverage the web for preparing the new generation for the future society (McClure & Purdy, 2013).

Many studies regarding students' information behavior focused the discussion on students' short attention spans, multi-tasking nature, preference for online resources and basic search engines, power browsing style of reading (Rowlands et al., 2008), little or no evaluation of the quality of the information used, and cutting and pasting information into their papers without providing the correct citations. Among these characteristics, the power browsing style has been found in various groups including undergraduate and graduate students, as well as working professionals (Buchanan & Loizides, 2007; Kandra, Harden, & Babbra, 2012;Liu, 2005).

The effort taken by researchers continues to help to dispel other myths about college students' research behavior and their ability in using digital tools inside and outside the classroom (Burton & Chadwick,2000; Goodfellow & Lea, 2007; Kahn & Kellner, 2005, Lankshear & Knobel, 2008; Martin & Grudziecki, 2006). For instance, although learners are often assumed to be more capable in using digital tools as "digital natives" (Prenski, 2001), their academic literacies related to digital resources use are often considered underdeveloped.

Conroy (2010) found that while students are enthusiastic about using GALL (Google Assisted Language Learning, a corpus-based language learning resource) for second language learning and academic writing, many of them are relatively naive users of the

Internet, contrary to the assumption that students in this age group are often sophisticated internet users. The results showed that the inductive data-driven approaches of treating the Internet as a corpus and Google as a corpus search tool are new to many students, and "while many students apparently use Google to support their L2 English writing, they might employ relatively crude or simplistic techniques, or even just use Google to search for word definitions from online dictionaries" (pp.878-879). Conroy attributed such a finding to the tradition of deductive learning practices participants are more familiar with.

The widespread assumptions about students' sophisticated digital capabilities and the universities' enthusiasm in investing in new technologies also inspired Lea and Jones (2008) to look at the possibility of academic institutions harnessing students' expertise in operating across digital contexts. However, they found that students often showed a lack of willingness to transfer their multilingual and multi-literate competences across boundaries between the personal and curricular spheres. Likewise, Marshall, Hayashi, and Yeung's (2012) study found that, although participants were creatively practicing their multilitacies in safe informal contexts, "but in high-stakes academic contexts they relegate these competencies to conform to institutional expectations of standard academic writing in English" (p.28).

Besides students' functional literacies (Selber, 2004) in using digital tools for academic purposes, their evaluative and critical capabilities also raise concerns among scholars. However, there has been confusion around learners’ ability to use technologies for

information handling and their capabilities in technology-mediated learning (Littlejohn, Beetham, & McGill, 2012). Through the analysis of questionnaire responses and citations from the participants' written assignments, Stapleton (2003) discovered that, while students were somewhat aware of the quality issues of the online resources, their actual writing did not necessarily reflect such an understanding. For instance, participants seemed to be using Google as the only tool for finishing their assignments. In a later article, Stapleton (2005) found that a considerable portion of the students' references came from Web genres of questionable suitability for an academic paper. The author thus reiterated the importance of students' critical awareness of web-source nuances and instructors' heightened level of vigilance towards students' use of online resources. Likewise, Sharpe (2010) reaffirmed through a meta-analysis that the assumptions about learners' facility with technology are often misleading, because learners can be extremely confident about their Internet use while lacking evaluative and critical capabilities and research skills of any sophistication.

Based on research findings like those mentioned above, Kern (2015) suggested that "schools need to foster literacy that includes a dimension of critical semiotic awareness" (P. 257) in addition to the know-how needed to deal with the technology of writing. Kern defined "critical semiotic awareness" as young people's critical reflection on how the conventions are used to construct discourse toward social ends, and their awareness of "their

own agency not only in using conventions but also in critiquing them and potentially shaping them" (p.233).

Efforts were made to provide students and writing instructors with criteria and checklists for evaluating websites (Coffin & Goodman, 2003). For example, Stapleton, Helms-Park, and Radia (2006) examined the web sources selected by a group of L2 students for their research paper writing and they put together a rating tool that emerged from their study. They called this tool WATCH (Website Acceptability Tiered Checklist), which includes four dimensions such as authority and reputation, objectivity, academic rigor, and transparency, as well as their corresponding indicators.

In addition to the learners' judgment and evaluation capabilities, issues of originality and plagiarism that seem to be exacerbated by the information overflow in the new era have also been placed in the center of many discussions. A review of the literature is given in a later section.

Moody and Bobic (2011) believed that students nowadays come to class with perceptions, ideas, and expectations formed in a digital culture, which are greatly different from the norms of traditional scholarship. "Unless we change our pedagogy of technology, students and faculty will continue to be frustrated at poor performance, plagiarism, and misunderstandings about what each expects of the other" (p.169). For instance, for the students, the emphasis in reading Web pages is not to gain knowledge but to link information

together (Adam, Quinn, & Edmonds, 2007). Although it may not always be the case, especially based on the findings in the current study, the discrepancy between students' and faculty's expectations towards academic work is a legitimate concern. For Moody and Bobic (2011), the challenge is to "bring these wandering scholars out of the vast sea of information and back onto the dry land of knowledge" (p.186), which is characterized by landmarks, fixed references, and cumulative knowledge. According to McClure and Purdy (2013), however, the strategies of teaching research methods needs a productive overhaul, although they believed it does not necessarily mean that the expectations for thorough and ethical research should be changed.

As scholars increasingly view the internet and other technological tools as legitimate research resources in academic writing, questions remain regarding how exactly students' writing process is meditated by them, how the mediating process is influenced by other factors such as the current social-academic context, students' cultural-historical background, and other members in the bounded activity system. Moreover, compared to the traditional education environment dominated by printed materials and face-to-face communications, in the digital world, college students now have more agency in determining issues such as how they would like to carry out their research, from whom and where they would like to seek help, who they are, and how they would like to interact with their surroundings and combine their past with their present decision-making.

F. International Chinese students' academic writing

1. Inadequate attention to a growing International Chinese student population

Just as what Ren and Hagedorn (2012) pointed out "(international graduate students have) not been fully understood by higher education administrators and faculty and their diverse needs have not been met by existing services on campuses" (p.135), the same situation applies to international Chinese undergraduate students. The literature shows that there is currently a lack of research on the academic performance of linguistically diverse students at the college level (Kanno & Cromley, 2013; Kanno & Harklau, 2012), scarcer still is the research dedicated to international Chinese undergraduates' development of multiliteracies represented through their academic writing in English.

The number of Chinese students in American colleges has increased dramatically in the past few years (Fischer, 2014). Chinese graduate and undergraduate students together have become one of the major forces contributing to "a changing landscape of higher education" (Staley & Trinkle, 2011, p.16) in regard to the student profile on college campuses in the U.S.. Moreover, as the influx of Chinese undergraduates into the U.S. higher education system is a more recent phenomenon, even less is known about this segment of the student body. As "sojourners" (Gonzales, 2011) coming from a highly different social-cultural background, Chinese students encounter all kinds of difficulties and challenges on a daily basis. They have learned English as a foreign language (EFL) in the confinement of language

classrooms in their home countries, but they have to use it in and out of class or more as a second language (ESL) in their new environments. They are challenged by novel academic requirements that may be radically different from what they have been used to in their home contexts (Mina, 2014). Their social and academic experiences thus warrant more research and attention. In order to assess the current state of research on the said topic, the studies reviewed below are relevant but not limited to this group of students, and "ESL learners" is often the more general label found in this part of the literature.

2. Some common topics in research on ESL student writing

Some common topics found in studies on ESL students' development of academic and second language literacies through writing include characteristics and patterns of composition, difficulties and issues learners encounter, and corresponding coping strategies in the writing process. Although any one study might foreground one or more aspects related to one of these themes at any one time, the above topics are found to coexist in many of the studies.

For instance, Gilquin and Paquot (2008) examined the academic discourse corpus data of upper-intermediate to advanced ESL learners and found that ESL learners were largely unaware of register differences as they tended to use features that are more typical of speech than of academic prose. The authors tried to explain such a finding from multiple

perspectives including the influence of speech, L1 transfer, teaching-induced factors and developmental factors.

In addition, depending on the perspectives and theoretical frameworks researchers have taken, words such as issues, difficulties, problems, and challenges are often used interchangeably, and one specific characteristic described in one study may be treated as a "problem" in another. Throughout this study, "challenge(s)" is used most of the time to represent a neutral standpoint.

2.1 The influence of English language proficiency

Among all the challenges ESL students have in their academic life, English language proficiency is the most prominent one. Although there have been different arguments in the literature regarding L2 writers' focus in their writing process, the influence of linguistic competence on ESL students' L2 writing is hard to deny. Sarkodie-Mensah (1998) pointed out that language is among the highest criteria by which students are graded and treated in class. Likewise, Galloway and Jenkins (2009) believed that problems with the English language were the largest single determinant of international student problems. The same idea was also shared by Olivas and Li (2006) when they connected low second-language proficiency levels in English to poor academic performance of international students studying at both university and college levels in the United States.

The differentiating power of language proficiency in ESL learners' L1 and L2 writing has been well documented in the literature. Silva (1993) examined 72 reports of empirical research comparing L1 and L2 writing across various strategic, rhetorical, and linguistic levels. While general composing process patterns were found to be similar in L1 and L2, L2 composing was frequently reported to be more constrained, more difficult, and less effective. During the composing process, it is found that less planning and reviewing were involved. The L2 writers had more difficulty with setting goals and generating and organizing material, paid most attention to grammar during revision, and they exhibited less lexical control, variety, and sophistication overall. Similar findings were reported also in Ferris's (1994) study on the differences between native and non-native English speakers' rhetorical strategies in their persuasive writing.

However, not all studies arrive at similar conclusions. Raimes (1985) looked at the writing process of eight Chinese ESL students who were all unskilled English writers. The author found that the L2 unskilled writers showed commitment even to an in-class essay, and they did not seem preoccupied with finding errors but were more concerned with getting ideas down on the page.

2.2 Culturally specific writing styles of ESL students

Seemingly conflicting findings also exist in studies of the culturally specific writing styles of ESL students from non-Western cultures. While many studies revealed common

patterns including indirectness, high expectations for readers to make inferences, and placing tradition and authority over originality (Greenholz, 2003; Holmes, 2004; Kennedy, 2002; Wu & Rubin, 2000), researchers had different conclusions on some specific aspects of Chinese students' writing style.

For example, in Gregg's (1986) comments on Mohan and Lo's (1985) work on academic writing and Chinese students, based on his own understanding and teaching experience, Gregg on one hand described the linguistic and cultural elements in Chinese students' writing as imitative, inculcative, and indirectly expressive, which echoed the findings of many other related studies, on the other hand, identified "a flatly assertive, judgmental tone" as part of the Chinese students' expository style. In a latter study, Wu and Rubin (2000) found the opposite. In their study analyzing writing features conceptually linked to collectivist or individualist orientations among students from Taiwan and the U.S., the researchers found that Taiwanese students' writing in English, as compared with their LI, were more likely to use first person pronouns, were less likely to use proverbs and were also less assertive.

One possible explanation for such a marked contrast in findings may be associated with a crucial factor mentioned above, second language proficiency. While Gregg did not specify the language proficiency level of the Chinese students he had work with, the participants in Wu and Rubin's study were all first year students at a large comprehensive university in Taiwan. After all, whether students choose to be assertive in their English writing or have to

be "flatly assertive" because they lack of the language and writing skills to write what they mean are two very different situations.

Besides expository style, there are also accounts of forms of rhetoric or discourse organization in Chinese students' academic writing. For instance, it was found that Chinese speakers learn a form of rhetoric that if transferred into their English-language writing may be difficult for English-language readers to follow or may be inappropriate in that particular genre (Bloch, 2008). In an earlier study by Mohan and Lo (1985), the researchers found that Chinese students' school experience with English composition was oriented more towards accuracy at the sentence level than toward the development of appropriate discourse organization, which also matched with one of the self-perceived problems of this group of students regarding their English writing. The authors argued that, rather than attributing organizational problems in academic writing by second language learners to interference or negative transfer from the first language, greater awareness of students' native literacy and educational experience is needed in understanding the development of academic writing in a second language.

Similar findings were obtained from Mu and Carrington's (2007) study when they looked at the writing strategies of three international Chinese graduate students in an Australian higher education institution. The researchers used multiple sources of data for analysis, including semi-structured interview, questionnaire, retrospective post-writing discussion, and

written drafts of papers. The findings indicate that the three participants employed rhetorical, metacognitive, cognitive, and social/affective strategies in their writing practice, and all strategies, except rhetorical strategies represented through organization of paragraphs, were transferred across languages positively.

In order to find out more about Chinese and Japanese rhetoric, Kubota and Shi (2005) examined the L1 language arts textbooks used in junior high schools in Mainland China and Japan. They found that while there were many similarities between writing instruction in English and in Chinese/Japanese regarding the recommended practice, such as emphasizing clarity, logical organization, awareness of audience, and so on, the reading materials and model essays used in these schools did not entirely correspond to the recommended practice. The researchers called for the recognition of "the diverse and dynamic nature of rhetoric and transcultural influences" (p.102) rather than monolithic perspectives in writing studies.

Although a cultural lens could be effective and helpful in examining ESL students' academic writing, and Ramanathan and Atkinson (1999) believed that sociocultural knowledge is vital in knowing who the students really are, Li and Pearson Casanave (2005) cautioned researchers against "polarized characterizations to cultural differences" (p.8) and argued that multiple perspectives and contexts are much needed in the studies of academic literacy. In addition to language proficiency levels and writing styles, learners' writing

strategies, L1 and L2 interaction, and academic socialization are another three important perspectives adopted by researchers in the field of L2 academic literacy.

2.3 ESL learners' writing strategies

While ESL writing strategy studies have been robust in the past few decades (Lei, 2008), there is a paucity of research focusing on international Chinese students at the college level. In an earlier report, Leki (1995) put together a list of coping strategies of ESL students in writing tasks across the curriculum based on narratives of five students' experiences at the initial stages of acquiring discipline-specific discourse strategies in a disciplinary content course. In this study, two of the participants were from mainland China. Lei (2008) examined the writing strategies of two proficient English majors in a Chinese university. Within the Activity Theory framework, Lei used the data collected from interviews, stimulated recall, and process logs to explore how these two learners strategically mediated their writing processes with diverse resources. It is worth noting that, although this study was conducted in China, it is among the few accounts of how Chinese students utilize different resources, including digital resources, in their academic writing process.

2.4 L1 and L2 interaction in ESL writing

Besides challenges, distinct patterns, and coping strategies, L1 and L2 interaction in ESL students' writing is another major area that researchers have been investigating through the

years. Rather than regarding ESL learners' first language merely as an impediment to the development of their academic literacy in L2, an increasing number of researchers see it as an important and helpful resource and advocate a more open and objective attitude towards the influence of learners' native language on their L2 production (Bean, et al., 2003; Canagarajah, 2003). Such a belief is well grounded in the results of many empirical studies, although more evidence and an expanded scope of exploration are needed in this new digital era.

For example, Wang and Wen (2002) examined the composing process of sixteen Chinese ESL learners by using think aloud protocols. Results show that students were more likely to rely on L1 in managing writing processes, generating and organizing ideas, but more likely to rely on L2 when undertaking task-examining and text-generating activities. In addition, it was found that L1 use decreased with the writer's L2 development.

Think aloud protocols were also used as a data source along with other sources including retrospective interviews, questionnaires, and written compositions in Wang's (2003) exploration of how switching between L1 and L2 is related to adult Chinese ESL learners' L2 proficiency and how the switching assist writers in their composing processes. Both quantitative and qualitative analysis indicated that frequencies of language-switching varied slightly by learners' L2 proficiency, suggesting that L2 proficiency might determine writers' approaches and qualities of thinking while composing in their L2.

Research results reaffirming those of the previous studies about the positive influence of L1 were also found in Williams's (2007) report of two Chinese women students in two UK universities on their literacy practices in two domains, study and leisure, and in two languages. The researcher found that the students' first language was used to mediate and support learning in their second language. In other words, the broader and longer language experience in Chinese was a valuable asset in the improvement of their English competency. While all these above reviewed studies provide thought-provoking results, it would be interesting to see how L1 and L2 are used in the process of students' looking for external support such as digital resources in their academic writing.

2.5 Research on academic socialization of ESL students

Not many studies were found on how ESL students interact with their instructors, peers, or other on-campus academic supporting services, and it is even harder to find discussions about such an interaction regarding the use of digital resources in academic writing. While cognitive and sociocultural theoretical frameworks are most frequently employed in the exploration of ESL learners' composition process and product, most existing studies about their social interaction in an academic writing context were conducted in a language and literacy socialization paradigm. Studies in this field looked at issues such as how professors think of and evaluate ESL learners' academic writing (Ives, Leahy, Leming, Pierce & Schwartz, 2014; Zawacki & Habib, 2014), how students are mentored, prepared, or

positioned as writers through classroom discourse (Duff & Anderson, 2015), and how these students interact or engage with other social resources outside the classroom. In all these above-mentioned processes, an intricacy of factors is in play.

For example, the difference between ESL students' self-evaluation of their academic writing and the expectations of their instructors is noted in Giridharan (2012)'s study of the ESL students' academic writing experiences. Many participants found that they and their instructors evaluated their writing differently. While there could be various factors contributing to such a difference, culturally specific way of thinking and evaluation as well as composing styles that students have previously been exposed to may have played a role in it.

In addition, ESL students are often found reluctant to approach other social resources due to their limited second language proficiency. Nam and Beckett's (2011) case study of five Korean ESL students at an American university examined participants' access to and use of various academic writing resources and relationships with local classmates and professors. It was found that the students underutilized the university's academic resources, such as the writing center and other ESL-focused programs, many of which required sufficient oral proficiency to be able to have meaningful discussion with their interlocutors. Instead, the students were found to be more likely to resort to various "self-help" measures such as finding personal private tutors, online blog-postings, and newspapers.

According to Ferris and her colleagues (2011), most instructors were aware of the need of adjustments in responding to L2 writers' writing, but there was significant variation across subjects in terms of the nature of adjustments, and instructors had very different attitude toward the endeavor of responding to L2 writers. Matsuda, Saenkhum, and Accardi's (2013) study on the other hand, discovered that, although teachers did recognize the needs of L2 writers and were willing to work with this group of students, they did not make any special provisions to address these needs due to a number of institutional and professional constraints. Studies like these provide valuable administrative and pedagogical implications. However, as mentioned above, there has been little research on ESL students' online or offline interaction with different campus resources around the use of digital resources for academic writing, and it is one of the missing pieces in the puzzle of ESL learners' academic writing in the new era.

2.6 ESL writing in writing classes and across curriculum

Another traditional research topic in this field is the relationship between students' writing in a writing class and that in an academic content class (writing across the curriculum). Coffin and other researchers (2005) viewed the lack of explicit writing instructions within disciplinary courses as one of the major issues in academic writing in higher education. The researchers argued that there had been great changes in academic writing due to the technology development, the change of student profile, the increasing

numbers of inter- and multi-disciplinary courses offered in the curriculum. However, the instructors of disciplinary courses either assumed that students were already familiar with the rules or conventions governing academic writing, or they would "'pick it up' as part of learning their subject knowledge" (Coffin, et al., 2005, p.3). The researchers were thus advocates of the Writing Across Curriculum (WAC) movement, which supports incorporation of writing in the disciplines and "emphasizes the sequencing of writing tasks throughout a course so that students build gradually into particular forms of writing" (p.7).

While studies emerged in recent years in relation to the WAC movement, related discussions specifically involving Chinese international students and their mediated writing practices are very limited. Through the examination of the writing practices of some the case study subjects, the current study hoped to provide a glimpse of what was actually happening when students were working on their writing tasks in disciplinary courses.

Believing in the need of giving students voice to balance a top-down approach to curriculum design, Leki and Carson (1994) conducted a survey study of former ESL students who were then in university-level content courses to investigate their perceptions of the relationship between the writing instruction they had received in ESL writing classes and the actual writing tasks they found in courses across the discipline. While the majority of the students surveyed felt that their training in EAP writing courses helped them accomplish their goals in writing assignments in classes across the curriculum, they also expressed their

frustration with their EAP writing courses in several specific areas. However, the researchers cautioned that we must carefully consider the nature of the mismatch between students' sense of their own needs and our sense as professionals of what they need. Neither should we jump to a conclusion that we must immediately change our courses, nor we should simply assume that we must convince students that we know better than them.

The same researchers (Leki & Carson, 1997) later conducted another study of ESL students' experience in EAP writing classes and academic content classes. Based on their findings, they called for the use of source texts to better engage L2 writing students in the kinds of interactions with text that promote linguistic and intellectual growth.

More studies have been carried out in recent years to explore the possibility of closing the gap between ESL composition programs and disciplinary writing (Du, 2014) and the relationship between writing across the curriculum and second language writing (DePalma, 2014). In addition, DePalma and Ringer (2011) critiqued traditional notions of transfer and recommended the use of an adaptive transfer approach to investigate not only students' reuse of writing skills learned from the past but also their "conscious or intuitive process of applying or reshaping learned writing knowledge in order to negotiate new and potentially unfamiliar writing situations" (p. 141).

2.7 Research on plagiarism in ESL writing

Academic dishonesty, including plagiarism, is an ongoing problem in higher education (Henderson & Whitelaw, 2013), and the ease with which academic dishonesty could be done in this digital era seems to aggravate the situation (Stapleton, 2005; Thomas & Sassi, 2011; Warschauer, 2007). In addition, as Pecorari (2003) put it, although "no evidence exists that NNSEs (non-native speakers of English) plagiarize more than their NES (native English speakers) counterparts, it has sometimes been asserted that they do" (p.321). As a result, this is another important topic emerging from the exploration of international Chinese students' development of multiliteracies and thus relevant to the current study.

Research shows that there is no one simple and straight- forward answer to this phenomenon. While language proficiency level is often relevant in the discussion (Hewlett, 1996), culturally specific beliefs, social conventions, and everyday-practices Chinese students have been accustomed to are also considered as important factors. Kern (2015) pointed out that, "how we acknowledge that borrowing in different contexts" (p.197) is key to the discussion of plagiarism. Research demonstrates that, if students come from an education system concentrating on knowledge accumulation, they may not find many important concepts and distinctions familiar, such as notions of authorship and attribution, ownership of ideas and texts, and critical thinking, as well as differences between their own ideas and those of others, and between what is common knowledge and what are borrowed

ideas (Carroll & Oxford Centre for Staff Development, 2002; Ercegovac & Richardson, 2004; Rinnert & Kobayashi, 2005; Sutherland-Smith, 2005; Zhuang, 2009).

For instance, in Shi's (2004) study of how first language and the type of writing task affect undergraduates' word usage from source readings in their English writing, Chinese students were found using source texts mostly without citing references. Different understandings of critical analysis and plagiarism were also found in Holmes' (2004) report of an 18-month ethnographic study of thirteen ethnic Chinese students in a New Zealand university.

Rinnert and Kobayashi (2005) looked at Japanese students' perception towards borrowing words and ideas without citing the source and found that students did not regard such a behavior as entirely negative. The researchers attributed such a finding to several factors such as a lack of writing and researching experience in high school, traditional Japanese educational practice and the concept of learning. And the situation described in this study is applicable to a large extent to Chinese students in regards to their traditional educational practice and beliefs.

Efforts were taken to further the exploration of Chinese students' knowledge of plagiarism through their educational experiences in China. Peters and Frankoff (2014) conducted a survey-driven study on college students' digital scrapbooking strategies and their knowledge of plagiarism. The research subjects are a group of third-year business English

program students at a Chinese University. Results indicated that students frequently used the internet to look for information to write their school assignments. In addition, while students in this study were frequently warned against plagiarism, the teachers often assumed that students already know how to avoid plagiarizing and do not need much help with its prevention. A similar situation may apply to international Chinese students who are studying in a foreign environment (Zhao & Mawhinney, 2015). Peters and Frankoff (2014) argued that "rather than lament the fact that many of our students are copying and pasting information in their writing assignments, we need to be proactive and tap into these new digital skills that students have acquired" (p.259).

The belief in proactive teaching instead of post facto punishment resonates with the one held by Pecorari (2003) in his study of the writing of 17 postgraduate students (international students and NNSEs). Pecorari found that, while students' writing was found to contain textual features which could be described as plagiarism, based on students' accounts of their work and the textual analysis results, they did not seem to have the intention to transgress academic conventions. Such a finding echoes with similar suggestions in the literature (Angelil-Carter, 2000).

Research on this topic suggests pedagogical implications and sheds new light on the design of academic support resources for students. For example, Thomas and Sassi (2011) proposed a model called Plagiarism 2.0 to help instructors to understand and deal with the

issue of academic dishonesty. Based on the insights drawn from the literature and results of their pilot study, Henderson and Whitelaw (2013) developed a series of accessible and meaningful e-learning resources for international Chinese students in Australian colleges to improve their understanding of and skills associated with academic literacy and assist them in settling into their studies in the foreign environment. These set of resources received highly positive feedback from both students and instructors.

Again, as McClure and Purdy (2013) pointed out that the contemporary claims of plagiarism are often anecdotal and over-generalized, and attention should be directed towards students' research practices, more research is needed to verify these assumptions. And the current study intended to contribute to the literature on this issue based on solid data of the case study subjects' moment-by-moment authoring process.

2.8 Recent trends in research on ESL writing

While arguments about mismatches such as the one between students' primary discourses acquired in familial settings and their secondary discourses used in their school environments (Gee, 1989) are still valid, the often inconclusive and sometimes contradictory findings found in the literature of ESL students' English writing warrant more research. The increasingly broadened and deepened understanding of this group's writing experiences and strategies raises challenges for the definition of "good writings" and for teachers in

responding to difference rather than deficit approaches to teaching and learning (Holmes, 2004; Li & Pearson Casanave, 2005; Mohan & Lo, 1985).

The proposition for the "breadth of visions" (Leedham, 2015, p.5) has been shared by more and more scholars and educators. For example, in a discussion of ESL writing instruction, Cai (1993) focused on cultural factors which may be misconstrued as poor writing techniques in Chinese students' composition. The author argued that the different rhetorical conventions that ESL students incorporate into their English writing are based in the deeper and broader social, political, and ideological beliefs of their native culture, and that these underlying factors must be taken into consideration in the evaluation of the students' writing.

Furthermore, the development of information technology in the digital era has helped to expand the scope of exploration in this field and bring in new perspectives regarding Chinese students' academic writing practices and coping strategies. While Bloch (2008) felt that "L1 composition has become more technologically driven while L2 composition has remained more problem-driven" (p.3), studies on the development of L2 digital literacies involving the use of new technologies have begun to emerge.

For instance, acknowledging the fact that little is known about their (international Chinese students') university-level writing and the challenges they face, Leedham (2015) contrasted Chinese students’ written assignments in English with assignments from British

students across a range of university disciplines by drawing on the British Academic Written English corpus - a large corpus of undergraduate student writing collected in the UK in the early 2000s. The keyword analysis of the two student corpora suggested that L1 Chinese students used significantly more visuals and lists than L1 English students. Based on the fact that the writing of both student groups was judged by discipline specialists to be of a high standard, the researcher proposed that scholars, discipline lecturers, and EAP tutors expand their open-mindedness beyond lexicogrammatical considerations to also exploring assignments and multimodality. Leedham believed that different ways of achieving the same end goal in writing should be recognized, and the cultural backgrounds of L2 English students should be valued and embraced to promote the development of their L2 academic literacy.

Zhao and Mawhinney (2015) looked at the difference between native Chinese-speaking and native English-speaking engineering students from the perspective of their self-identified challenges in researching and writing an academic paper. Unique information-related challenges in the areas of searching, evaluating information, reading, writing, and citing were identified among native Chinese-speaking students. While the participating Chinese students' did not think it was hard for them to search for information, they did believe they had difficulties in citing resources properly. Different reasons for the findings were discussed, such as language difficulties, cultural differences including ideas about textual ownership

and seeking external help, and previous learning and research experiences. However, as one of the limitations the researchers pointed out, this study relied on participants' perception and evaluation of their information literacy. To obtain more convincing results, more empirical evidence and triangulation among different types of data are needed to depict international Chinese students' use of digital resources in their academic writing.

G. Research findings about the social, technological, and educational backgrounds of international Chinese students

The Chinese society has a long history of strong family commitment to education (Mansell, 2011), and "education has always been an extremely important means of personal advancement in China" (Chen & Uttal, 1988). Parents are making every effort to provide what their children need for a better future. Young people long for the outside world and parents believe that a foreign diploma can make their children more competitive in the job market. Therefore, sending them abroad to get an international education experience and a global vision is among some of the most preferred family investment plans in China.

The reform and opening-up policy in the past few decades in China has witnessed a dramatic economic and technological development in the country. With a steadily increased household income, more and more Chinese families are able to send their children abroad to receive higher education on foreign campuses. Along with this trend, the test preparation centers and international schools for different age groups are booming in China. Meanwhile,

U.S. colleges are expanding their international student admission plan in recent years due to a number of considerations. As a result, the enrollment of Chinese international undergraduate students on U.S. college campuses has doubled or even triple in the past few years. However, as indicated in the literature, neither the administrations, faculties, nor the staff on these campuses are fully ready for such an influx of international undergraduate students, and not much research has been conducted on their experiences here academically and socially. Their use of different resources in their L2 academic writing is no exception. A sketch of the current educational and digital environment in China based on research findings would be helpful for situating international Chinese students' academic writing social-culturally and historically to prevent assumptions and speculations.

It is important to note that the discussion below has no intention to position research participants in a homogeneous background. On the contrary, contemporary China is diversified in every facet of the society like many other countries in the world. And it is for the same reason that the multiple case study was designed to bring out important nuances of the phenomenon under observation, and hence avoid overgeneralization and polarization of the characteristics of the target group. However, just as Li (2005) argued, while China is no doubt changing rapidly, it has not lost its distinctive cultural identity. "Fluidity is a valid concept only in relation to stability, just as permeability is a phenomenon that exists only when there are still borders" (p.128). A brief overview of the current situation of the

technology and education development in China would provide a helpful context for the following data analysis and discussion.

With the huge advances in the infrastructure of Internet and other ICTs such as the networked mobile telephony, the Internet penetration rate (percentage in population) in China has increased from 1.8% in 2000 to 52.2% on July, 1, 2016 (Internet Live Stats, 2016). China's digital generations have undergone a dramatic transformation, with rapid adoption of digital devices and the Internet across different city tiers and in rural areas. While some of the world's biggest online services, like those run by Google, Facebook and Twitter are severely disrupted or simply blocked, domestic technology firms which provide similar services or platforms, such as Baidu, Tencent (WeChat & QQ), and Weibo (micro-blog), have witnessed huge user growth over the past decade.

Furthermore, according to Michael and Zhou (2010), social, historical, and economic factors have shaped a unique set of needs and behaviors among Chinese digital consumers. For instance, more than 80 percent of Chinese digital consumers use instant messaging (IM), read news online, and stream or download music via the Internet. Three-quarters stream video content, and more than 50 percent use search engines and play games online. Michael and Zhou attributed the rapid development of the digital society in China to several historical, economic, and cultural factors, including cheap connectivity, the digital move, the strong historical and cultural emphasis on education (Chinese parents view PCs as important

educational tools, not as luxuries), China's online workplaces, the state-run media void, the lonely only children, the expression of individuality, the online communities, and a common tongue.

Michael and Zhou reported that Chinese teenagers (85% penetration) spend an average of 2.7 hours a day online, usually focusing on communication and entertainment looking for fun and also support in studying. Additionally, with the fast economic development of the country and the unwavering support from the family, the young generation's (aged 14 to 25) life experience has been characterized by opportunity and choice, and they readily embrace mobile-phone use and the Internet. This description applies to the increasingly bigger group of international Chinese undergraduate students nowadays in the U.S. as well. Moreover, there is a 99% penetration rate among Chinese university students (19 to 25), and they are reported as heavy uses with broad activities (3.6 hours a day) focusing on information, entertainment, and community (BCG Digital Generations Consumer Research, 2009) (as seen in Michael & Zhou, 2010). Along with e-commerce, users are spending much more time on community-oriented and information activities including e-mail, instant messaging, and different forms of social media. The Internet in China starts to "look and feel similar to the Internet of more developed nations. In fact, in some case, Chinese consumers are more avid users of online services than U.S. consumers are -- using their mobile devices to listen to

music, read books online, or engage in social networking" (Michael, Nettesheim, & Zhou, 2012).

However, while students spend hours each day on the internet and their personal computers, not much is known if their multiliteracies in the academic context, either in L1 or in L2, are enhanced during this process. Chinese students may have been well-versed in using online social networking apps or the Internet for basic information searching; they are not necessarily familiar with using digital resources for academic purposes. As shown in the literature, they may have difficulty in locating the most relevant websites or quickly figuring out about the credibility of the information found online.

In addition, although this generation has been exposed to abundant information through modern technology and they are doing many things like communication and leisure in a completely different way compared to previous generations, many of them have grown up in a traditional education system, at least before their senior high school stage. The traditional system tends to be exam-oriented and instructor-centered, and is deeply rooted in Confucianism. As a result, many students may experience lots of confusion and struggles when they first come to the U.S.. In a completely different environment, they have to deal with their own identity and external expectations while moving back and forth between the past and the present, the traditional and the modern, and the online and the offline, without adequate understanding and help from the local community.

Furthermore, among the growing number of discussions in the literature focusing on transnational youth, immigrant students are often the subjects of observations. However, the situation of international Chinese students could be even more complicated. On one hand, unlike immigrant students, many of these international students come to the U.S. after they have received years of education in China, with fully developed Chinese language literacies. And they may return to China once they finish their academic programs. On the other hand, unlike their peers who study and use English as a "foreign language" in China, they start with various English proficiencies in the U.S., where they are actually living and studying in a place where English is spoken. Just as what Duff (2007) pointed out, while the goals and intentions of international students' may not include adopting all or most of the cultural and linguistic norms of the local community, they are regardlessly being socialized into the new language and aspects of culture through curriculum materials, interaction patterns, sociocultural activities, and the language itself.

In addition, Fawley (2011) reminded educators that "international students come from a variety of different educational systems that may place value on attributes such as memorization and group work that are at odds with critical thinking and independent work expected at their host schools" (p. 161). While the majority of international Chinese undergraduate students are from well-off families which can afford sending them abroad to study in colleges, some of them have graduated from regular senior high schools, and most of

them have at least attended regular junior high schools in China. These high schools are taught by Chinese teachers and have a more or less unified curriculum across the country with the most immediate goal as having students pass the national college entrance examination. Project-based instruction is usually not part of such a curriculum (Eyring, 1989), and students do not have much, if not none, experience in doing academic research.

Furthermore, it is believed that Chinese students are accustomed to traditions of respecting authority and authoritative knowledge (Beckett, 2005). They are more familiar with deductive learning practices (Conroy, 2010) and language reduction type of exercises such as fill-in the blanks and matching, which do not typically foster higher-order thinking skills nor encourage imagination and creativity (Cummins & Yee-Fun, 2007). Also, as modeling is often regarded as one of the most effective teaching and learning methods, Chinese students may find it hard to understanding the concept of plagiarism. As a result, a combination of factors may be in play in international Chinese students' actions and decision making process in their L2 academic writing, especially when it comes to challenges such as determining the credibility of an online source, how to better use the resources, and how to cite. These factors include the traditional values, beliefs in authoritative figures, an education system that values knowledge accumulation and deductive practices, to name just a few.

In terms of the English learning background, many Chinese students start learning English from first grade. English has been in the standardized assessment system for decades.

In 2013, China began a major education reform effort aiming at reducing the importance of standardized testing. English, which used to be among the Big Three (Chinese, Mathematics, and English), has become one of the major targets of the education reform. According to the plan, the role of English in the education system is going to be downgraded. There are social, political, and educational considerations behind such a reform. Nonetheless, English is still a very important subject taught in school nowadays.

According to Wang (2007), starting the year of 2000, accompanied by the nationwide concern over the quality of education, people started to question the existing English language curriculum. Students were found to be spoon-fed a lot of knowledge and spending a lot of time memorizing facts for examinations. They lacked the ability to think independently and to learn by themselves. They were better at understanding the language than actively using it for communication. As a result, a revised English Syllabus and a new English language curriculum were introduced, and they both put a strong emphasis on teachers' ability to make good use of modern educational resources and expand the use of multimedia technology in teaching. However, not much was mentioned in these documents regarding students' competencies in utilizing digital resources in their language learning in the new era.

Moreover, after graduating from junior high school, some students go to study in international schools or the international division in some regular high schools, where most teachers come from English-speaking countries and a foreign curriculum is used. Students in

those schools or international divisions are expected to receive their higher education abroad upon graduation and they usually would not take the traditional college entrance examination. Therefore, depending on their educational background in the high school stage, they may have very different English proficiency levels and different experience in L2 academic research and writing.

In addition, many previous studies found that Chinese students often do not seek help from on-campus services and prefer consulting co-nationals or solving problems by themselves due to their typically conservative, modest, face-saving Chinese personality (Zhao & McDougall, 2008) and limited English language proficiency. However, such a situation may change with more frequent and easy contact with other cultures and communities in the online world, and it may really just depend on individual preferences or other constraints rather than the membership of a particular culture group. Furthermore, people may be under the impression that international Chinese students are very cohesive as a group and they tend to interact a lot with their co-nationals, both academically and socially. These assumptions or impressions need further verification with concrete data and in-depth studies.

International Chinese undergraduate students share common characteristics as a cultural group, but they also have distinct social-cultural and educational backgrounds and experiences as individuals. Selber (2004) contended that "working and learning styles in

academic settings can be highly idiosyncratic" (p.49). And he called for more research on how students actually experience or engage an artifact such as computers as he believed that contexts of use deserve more attention. In order to better describe their situated literacies practices in the digital age, it is important to not only have quantitative data through big scale studies for identifying general trends and patterns, but also conduct case studies for more in-depth qualitative analysis to avoid over-generalization and bring into light important nuances.

H. Research gaps

While the existing literature of ESL students' L2 academic writing is very informative and insightful, obvious research gaps exist. First, as mentioned earlier, many studies in this field look at ESL learners as a group, without differentiation between countries of origin or even between graduate or undergraduate students. Although many of the challenges and strategies are no doubt applicable to all ESL students regardless if they are graduate or undergraduate students, more targeted research is needed on international Chinese undergraduates' unique experiences in their academic writing. There are several reasons: 1) L2 writing is heavily influenced by students' cultural, linguistic, and educational background; 2) international students could be very different from immigrant ESL students in terms of issues like their social networks, resources, and coping strategies; 3) undergraduates are on a totally different developmental stage and often less resourceful than their graduate co-nationals in a new environment.

Second, although there is a growing body of research on challenges and new resources for students in the digital era, the exploration of how students use digital resources in academic writing and the related decision-making process has just started. In addition, the major part of literature on students' research behavior in the digital age looks at students in general, without specific account of international ESL students. And there is a lack of studies on international Chinese undergraduate students' use of digital resources in an academic context. While many of the traditional challenges and strategies recorded in the literature are still valid and important, this field has witnessed tremendous changes and hence the creation of new research topics brought by the development of computer and information technology.

Third, going through the literature, there are not many studies looking at multiple layers of data which reflect both what the students thought they had been doing and what they actually did during the writing process, nor accounts of writing challenges based on students' self-perception, the screen recordings of students' writing process, as well as instructors' feedback. In addition, although lots of data have been collected through surveys, interviews, process logs, submitted compositions, and so on, observation tools have been comparatively limited. As indicated in the literature, think-aloud protocols seem to be often the one and only most accessible and feasible option researchers had in the past for the observation of writing process. Nowadays, with the development of network-based audio-visual tools and software programs for key-stroke logging (Flinn, 1987; Leijten & Van Waes, 2013; Van

Waes, Leijten, & Van Weijen, 2009), screen recording(Park & Kinginger, 2010), and eye tracking (Smith, 2012), writing research in an even broader and deeper dimension has become possible. Rather than only relying on self-reported challenges, strategies, and evaluation criteria reflecting what research subjects believe they have been doing, researchers now are provided with more tools to triangulate their data with objective recordings about what participants were actually doing and using in their writing processes.

Many of today's undergraduates bring to their studies a wealth of experience of using web-based technologies in their day-to-day lives, so do international Chinese undergraduate students. Prompted by the paucity of research from a cultural-historical perspective on the development of multiliteracies among this particular student body, the current research aims at examining how, by using different types of resources, digital resources in particular, first-year international Chinese undergraduate students deal with all sorts of potential challenges in their academic English writing including those suggested in the literature and the emerging ones in the new era, how their actions are directed by the object and goals, and mediated by all the relevant elements in the bounded activity system.

In addition, it is important to note that the data collection processes of many previous studies on students' writing processed took place in classrooms or computer labs within designated time slots and with carefully prepared materials or pre-loaded programs on the computers. In these types of settings, students composed in a constantly monitored

environment often with strict time limits and a natural feeling of pressure and anxiety. Although such a method may be more convenient and controllable, and the data collected may be easier to categorized and analyzed, such settings are not what students would normally have nowadays when working on their academic writing tasks. In order to examine what students actually did in their academic writing, in addition to more traditional types of data such as survey and interview responses, the current study looked at screen recordings of participants' personal laptops when they were doing their writing assignments completely at their own pace and space with high level of autonomy.

IV. Research design

A. Sampling criteria and participants

The target participants of this study were first-year international Chinese undergraduate students, who came to study in the U.S. with an F1 visa after they had finished senior high school education or its equivalence in China. A convenient sampling was conducted at a four-year public research university in the U.S.

Sixty-five survey respondents were recruited. Among them, five students were successfully recruited as the multiple case study subjects. Most survey respondents were recruited from a course specially designed for first-year students, the rest were recruited

through snowball sampling or from online social networking platforms such as the Facebook group page of the Chinese Students and Scholars Association (CSSA) of the university.

Compared to getting survey respondents, the recruitment of case-study subjects encountered more difficulties. As the research project was totally independent from any academic courses, according to the approved protocol, there were several criteria to follow during the recruitment process. First of all, students should sign up to be the case study subjects on a completely voluntary basis and the result of their participation would not be linked with their academic records in any way; second, based on the planned research timeline for data collection, the volunteers should be taking writing classes or disciplinary subject classes with writing assignments in the winter quarter of the 2016-2017 academic year; third, the subjects should be first-year Chinese international students; fourth, in order to be able to examine students' writing processes involving different assignment topics, one subject would be randomly picked if there were multiple student volunteers taking the same course.

In addition to the pre-defined criteria above, it was anticipated that there would be other factors contributing to the difficulty of participant recruitment and attrition. For example, although screen-recording is generally regarded as a less-intrusive data collection method, it is, after all, an additional commitment for students who often have a very busy schedule during the school year. Also, just as any type of pre-informed recording may cause

psychological stress, screen-recording is no exception. It was expected that participants would be students who were either highly motivated to succeed academically, interested in research using screen-recording, or simply confident enough in their academic writing.

In total, seventeen students indicated in their survey responses that they were interested in becoming a case-study subject. After applying the selection criteria, there were eleven of them left in the pool. However, once the winter quarter actually began, six out of the eleven students stopped being responsive to the researcher's emails. As a result, there were only five case study subjects successfully recruited in the end. In addition, the only male participant failed to record his writing process due to a self-perceived high level of stress when using the screen recording program, so the multiple case study was left with four complete sets of data from four female students. In other words, except for the male student participant, each of the four cases contained data including survey responses, real-time screen recordings, interview responses, and instructors' feedback. Although the male student was not able to conduct the screen recording, he did share his insights and thoughts regarding his writing experiences and his use of digital resources. The data collection was conducted and finished in the second quarter of all case study subjects' freshman year, following the quarter in which they did the survey.

B. Research methodology

The current study was composed by a survey study and a multiple case study. As a result, the data set had two main components, survey responses from the sixty-five respondents and the data collected through the multiple case study (Merriam, 2009) involving five subjects. The case study research methodology was chosen because, firstly, it is believed to be able to "provide insight into an issue or refinement of theory" (Stake, 1998, p. 88), and it is most appropriate for studies which are descriptive, dynamic, rely upon naturally occurring data (Braine, 2002; Petrić & Czárl, 2003), and aim to reveal complexities and intricate interaction between multi-dimensional factors in a given context, which are endemic to situated qualitative research (Atkinson, 2005). Secondly, Addison (2007) believed that, by putting the subject into a specific cultural, social, and historical moment, case study was a good fit for describing and critically understanding the situated nature of human experience such as literacy. Thirdly, Yamagata-Lynch (2010) argued that activity system analysis is compatible with case study research, and doing case study within clear and bounded systems in natural settings helps to make data collection and analysis more organized and focused. Fourthly, one of the goals of conducting this research was to "dismantle stereotypes of cultural patterns in writing and of writers labeled simplistically as representatives of their respective cultures" (Casanave, 2005, p. 29). Accordingly, the research design of the current study was not only to look at similarities among first-year international Chinese undergraduate students in their

academic writing, but also more importantly, to observe particularities and appreciate the idiosyncrasies that characterize human experience. To this end, the multiple case study design is a viable choice.

Data analyses were thus performed using a two-step procedure. First, a quantitative analysis was conducted on the survey data. The main objective of this analysis was to identify basic trends and describe the general situation. Second, a multiple case study was conducted on the five students' data. In consideration of the merits and shortcomings of different research techniques, a combination of multiple methods was adopted. Surveys, real-time screen recording observations, interviews, as well as instructors' feedback were used to examine the research topic from a number of different perspectives and achieve as much triangulation as possible. The combination of methods is similar to Perrin's (2003) "progression analysis" method in combining objective with subjective data to capture what the participants are actually doing and how they account for it.

To be more specific, survey was used to collect responses from a bigger group of students in the first part of the study for gaining a general picture of the situation in question and identifying potential case study participants. Survey is no doubt convenient and effective in collecting data for analysis about general trends and preferences, but it tends to impose preconceived classifications and elicit decontextualized responses (Braine, 2002). As a result, the survey data needs to be interpreted with caution.

In the multiple case study section, data analysis was carried out on participants' survey responses, their screen recordings, semi-structured interview responses, and the instructors' feedback on their writing assignments. Real-time screen recording allows researchers to observe what happened on the screen during students' writing process and obtain more detailed information about local, contingent factors that might influence particular cases of writing and writers' actions. In addition, it offers a less obtrusive way to glimpse how participants handle each observable challenge along the way and how they select, use, struggle, and proceed with the use of web-enabled resources.

Real-time screen recording has gained increased popularity as a research tool over the past two decades for recording and analyzing the richness in detail of online writing processes. Park and Kinginger (2010) used screen recordings, together with retrospective reflections and corpus search queries, for an in-depth, moment-by-moment analysis of an L2 writer's composing process. Geisler and Slattery (2007) recommended the use of video screen capture to make visible phenomena that might otherwise have gone unnoticed in digital writing. According to them, the screen recordings can be analyzed at different scales depending on the phenomenon of interest in the study. In their own study based on the activity theory framework, Geisler and Slattery analyzed their screening recordings in a two-stage process beginning with what can be directly observed from one frame and then moving to what requires inferences across several frames. The data analysis of the screen recordings

collected from the multiple case study subjects in the current study involved a combination of both the directly observable phenomena and those that required inferences and calculation.

However, screen recording alone does not provide answers to all the research questions; therefore, guided by the theoretical framework and the research questions, a semi-structured (Spradley, 1979) and open-ended (Patton, 2002) interview was used to gain complementary information and have participants reflect on that particular writing experience and on their writing experiences in general. The specific approach used for interviews in this study was what Cohen, Manion, and Morrison (2000) referred to as an interview guide approach, where the topics and issues are specified in advance as an outline (see Appendix B) and the interviewer decides the sequence and the emphasis of the questions. Such a method "offers a systematic way to cover salient issues, yet is flexible enough to allow for follow-up of interesting possibilities when participants introduce their own ideas and connections" (Hyland, 2005, p.185). However, like many other research techniques, interview is not without its problems. The most notable one may be the double (and often conflicting) functionality of interviews (Hammersley & Atkinson, 1995), which refers to both reporting what happens (etic description) and what the participant thinks about what happens (emic description).

Despite its potential drawbacks, the interview method may help to enhance learning, as reflection is "an engine for the reconsideration of knowledge" (Kurek & Hauck, 2014, p.135).

Flinn (1987) suggested that when students become more aware of their writing decisions through the help of reflection in the retrospective interview, they can learn to manage their own writing processes more effectively. While the recounts or perceptions provided by the participants in interviews do not necessarily match with the reality and are sometimes not accurate (Park & Kinginger, 2010), it provides an opportunity for researchers to obtain a more comprehensive understanding of the phenomenon under study and for interviewees to reflect on their literacies practices.

Furthermore, in order to lower the participants' level of anxiety and make sure they fully understood the questions and expressed themselves, the interlocutor usually asked the questions in both English and Chinese, and the interviewees were allowed to answer the questions in whatever language(s) they preferred. Although the students ended up using Chinese most of the time during the interview, they did often code-switch between English and Chinese to help clarify their ideas.

During the data analysis process, the CHAT approach and the multiliteracies theory perspective were used to explore the goal-driven and artifacts-mediated human behavior of the case-study subjects during their academic writing process and to investigate contradictions and tensions emerging from the analysis. In addition, according to Hyland (2005), in composition studies, "from a social perspective, we must also make decisions about how these perceptions and beliefs carry traces of wider participation frameworks not

immediately accessible in the composing context" (p.187). As a result, analysis will always involve inference and is always selective. This is exactly what happened in the current study. Although multiple layers of data were collected and analyzed in this study, the analysis was tentative and by no means exhaustive. However, by grounding the discussion in triangulation of several data sources, effort was taken to make sure that the interpretations are not pure speculation either.

C. Research process

A survey was designed (see Appendix A) to solicit respondents' basic demographic information (including age, gender, year in the university, whether they are taking a writing class or a disciplinary subject class with writing assignments, and whether they are willing to participate as case study subjects), and respondents' reflection regarding their academic writing (including perceived challenges, how they use different resources to address these challenges, and what kind of resources are used most often). The survey was distributed in hard copies in a freshman class with the permission of the instructors. An e-survey was also created online by using Google-forms with identical survey items for students who preferred to do it digitally or who learned about the study from online social networking spaces such as Facebook. All participants took the survey on a voluntary basis. They were able to take the survey home and return it to the researcher or their teaching assistant at a later date. The

completion of the survey and expression of willingness to participate in the follow-up case study were not connected in any way with students' academic record.

After the multiple case study subjects were identified, a face-to-face meeting was held between the researcher and the participants to go through the purpose of research, the procedures, and the expectations. During the meeting, the students also received a short training about how to use the screen capturing tool (Camtasia). After the meeting, participants downloaded and installed the thirty-day free trial version of Camtasia onto their personal computers. Participants then used the screen capture software to record the process of finishing one academic writing assignment on their computers, starting with the brainstorming and outlining stage to the revision part. Camtasia recorded everything that was visible on the participants' computer screens while they were working on their writing assignments. After conducting the screen recording, participants submitted the video files generated by Camtasia to the researcher for analysis.

Semi-structured interviews (see Appendix B) were then conducted with the participants to obtain complementary information regarding their academic writing experience and a more detailed understanding of the writing process the screen recording represented. All interviews were audio-recorded, and were mostly in Chinese. It was believed that interviewees would find it more comfortable and less challenging to use their first language in describing their experiences and reflections. During the interview, participants were able

to reflect on their own writing behavior and their perception of the influence of other factors on their academic writing. Once participants received written feedbacks from the instructors, they emailed them together with their assignment submission to the researcher.

D. Data and data analysis

In order to address the research questions, this study triangulated data from multiple sources, including surveys, video files from screen capturing, interviews, and instructor feedback. Both qualitative and quantitative analyses were used. Each participant in the follow-up multiple case study was treated as a case. Then a cross sectional analysis was performed in the discussion section to identify the particularities and similarities of the mediational processes of different case study subjects and to further the understanding of the interaction between and among the related factors in the bounded activity systems. Information collected through survey and that through screen capturing including time, artifacts used, operation, duration, repeated transitions (Geisler & Slattery, 2007), motive, language use, and consequence, was coded and calculated.

Qualitative analysis was conducted on the interview responses, the related texts produced or used in the digital resources and participants' writing assignments, and the instructors' feedback. The purpose of the qualitative analysis was to understand students' mediated writing process and examine the conflicts and contradictions in students' writing activity in the academic context. Camtasia was used for real-time screen recording during data

collection, and the online transcription tool *Transcribe* (transcribe.wreally.com) was used for interview audio recording transcription. Software packages including Microsoft Excel, IBM SPSS, and nVivo were used for the coding and data analysis process.

In analyzing the screen recordings, the concept of "transaction" was borrowed from Park and Kinginger's study (2010, p.37). In their study, a "transaction" represents a sequence reflecting the writer's needs followed by an effort to address those needs, and it normally begins and ends with a visual signal in the screen recordings. In the current study, a transaction was defined as a sequence beginning with mouse cursor moving away from an interface such as the subject's writing or an open web page and switch to a different interface, such as from the writing to the web browser, or from the writing to the desktop of the computer to open up an pre-installed program, and ending with going back to the previous interface or switching to a third one.

During the data analysis of the screen recordings, information about each transaction, including the start and end time, motive/purpose of transaction, keyword used, website or program used, event (what had happened), consequence of the transaction, and language used, was recorded manually into an Excel spreadsheet. A list of thirteen motives (see Appendix C) was developed based on what was seen repeatedly from the recordings. This list was used to code each transaction to indicate the type of information the case study subject seemed to be looking for.

Another piece of information labeled "stage" was originally in the spreadsheet to record the writing stage (planning, authoring, and revising) in which each transaction occurred. As the data analysis continued on, it was found that it was not very operational as most subjects' writing processes did not have distinct stages. There could be several possible reasons for such a phenomenon. First, each person's writing style could be different; second, writing is often not a linear but a recursive process; third, it is possible that some case study subjects simply did not have time to divide their writing into different stages. As a result, this item was removed from the coding spreadsheet.

In addition to using data triangulation to increase validity of the research findings, help was sought from another two graduate students who are also native-Chinese speakers with adequate English proficiency during the coding and data analysis process. While the interview transcriptions were in Chinese, the coding scheme and nodes used in nVivo were in English. After the researcher of this study fed the transcriptions into nVivo and set up the nodes based on the interview questions and what emerged through the transcriptions, the research did the first round of coding. The two research helpers then randomly picked one of the transcriptions and repeated the same process without influence from the previous coding by setting up new projects with un-coded transcriptions in them. Inter-coder reliability was calculated with high levels of agreement on most of the nodes, ranging from seventy-two to a hundred percent. The nodes were then refined and adjusted to form a final coding scheme for

a final round of coding by the researcher to be used for analysis. One of the research helpers also helped to check randomly for the coding and analysis of the screen recording to make sure the coding is accurate and consistent.

V. Data Analysis

A. International Chinese undergraduate students' academic writing in the digital age: what did the survey tell us?

An anonymous survey (see Appendix A) was designed to fulfill three major goals: 1) to identify general trends in first-year international Chinese undergraduate students' academic writing in the digital age in regard to the perceived challenges of completing academic English writing assignments, strategy preferences, and the digital tools used; 2) to shed light on the follow-up multiple case studies; 3) to help to identify potential case-study subjects. In order to improve the comprehensibility and clarity of the content, the survey was written in both English and Chinese. Back-translation was used to ensure the accuracy of both versions. It started with short-answer questions asking for basic demographic information such as age and gender, academic information such as major and year in the university, whether they would be taking any writing classes or disciplinary subject classes with writing assignments in the next quarter, and what their general TOEFL score or IELTS score was (optional). The questions regarding class enrollment were used to identify potential case-study subjects.

A 5-point Likert scale was used in the next two sections eliciting participants' self-evaluation. Section I had three items asking participants to rate how comfortable they were when they were using a computer to do their writing assignment, surfing the Internet or using various web-enabled apps, and conducting research in the library. Section II was composed of thirteen items covering different challenges students might have during their academic writing process, such as understanding the requirements and expectations of the writing assignments, using appropriate vocabulary, and using connectors and transitional phrases, and so on. The participants were supposed to rate the perceived difficulties of these thirteen items based on the Likert scale 1 (not difficult at all) through 5 (extremely difficult). Section III had participants choose the strategies and type of resources they would use to address the exact same thirteen writing challenges in Section II. The strategies included consulting the instructor or teaching assistant, discussing with classmates or friends, rely on past writing experiences or current or past ESL writing training, consulting a librarian, and using digital tools. Participants were allowed to choose more than one answer for each challenge.

The fourth and the fifth sections were again short-answer questions asking about participants' willingness to enter a drawing for gift-card prizes and to participate in the follow-up multiple case study involving doing screen-recording and interviews. The purpose of these two sections was to encourage participation and identify potential case study subjects. The last section (VI) asked participants to list the digital resources that they had

been using most frequently in their writing process and the language(s) the resources were in or they normally used when utilizing those resources.

The survey was circulated both digitally and in hard copies. Students took the survey on a completely voluntary basis. An e-version was created with identical questions by using Google-forms and a link was put on the homepage of the university's CSA (Chinese Students Association) and CSSA (Chinese Students and Scholars Association) on Facebook with a brief introduction to the research project and the survey itself. Hard copies were distributed primarily to students who were taking a course named Introduction to the Research University in the 2016 fall quarter, which was designed to introduce international students to the role of higher education in society and the role of students in a community of scholars. With the instructor's permission, the researcher brought the hard copies to the class and talked briefly to the students about the survey and answered students' questions there. The students then did the survey at home and returned it to the class. As it was an anonymous survey, it was completely independent from the course itself. The majority of the enrolled students in this course were first year Chinese undergraduate students. Some hard copies were also given to students who were not taking the said course but were referred by the students from that class and were interested in taking the survey.

Seventy-two responses were collected in total, of which sixty-five were from first-year international Chinese undergraduate students. The data analysis of the survey was only

carried out on these sixty-five responses. Based on the data collected through the survey responses, participants were mostly eighteen (58.5%) to nineteen years (26.2%) old, with the youngest at sixteen (1.5%) and the oldest at twenty (7.7%). There were thirty-seven female students (56.9%) and twenty-eight male students (43.1%). Out of the thirty eight students who had reported their Internet-based test TOEFL scores, 36.8% of them had scores lower than 100 points and 63.2% had scores over 100 points. The lowest score reported was 87 and the highest was 109. The minimum accepted score for university admission consideration for the TOEFL is usually set at 80 or better on the Internet-based test. The majors that students were in or considering enrolling varied widely from computer science, biology, economics, to communication, art history, and theater.

Twenty-five (38.5%) students planned to take various disciplinary subject classes potentially with writing assignments in the following quarter, such as Communication1, Sociology1, Greek Myth, and Global 2, whereas forty-two students (64.6%) planned to take writing classes in the following quarter, of whom only four were to take Writing1 or Writing 2 and the rest were going to take one of the courses in the Linguistics3 (A, B, C) & Linguistics12 Academic English sequence.

Writing1 and Wring 2 are provided by the Writing Program of the university, whereas the Lingusitics3 (A, B, C) & Linguistics 12 sequence was provided by the EMS (English for Multi-lingual Students) Program for students who require additional reading and writing

instructions. The students' placement in writing classes was decided based on their English Language Placement Exam (ELPE) scores. Although both U.S.-educated and international students could take the courses in the EMS sequence in partial fulfillment of the university's Entry Level Writing Requirement (ELWR), international students were the absolute majority. Linguistics 12 (Approaches to University Writing for Multilingual Students) is the highest level class in the sequence and is parallel to the Writing Program's Writing1. In addition, according to the information provided on the program website, while all four courses "focus on helping students develop proficiency in academic literacy, they differ in the kinds of focus on areas of language instruction, depending on students' current proficiency levels."

About half of the respondents missed Section I in the survey regarding perceived level of comfort when using computer, other networked tools, and the library in doing academic writing. It was possibly due to the fact that this section was rather short and unnoticeable in between the demographic questions with answering lines and Section II with the big table. Among the respondents who did complete this section (Table 1), most of them rated using a computer/laptop or using various network-based apps on a digital device for completing an academic writing assignment as very or extremely comfortable. In contrast, only less than one-third of the respondents chose the same ratings for conducting research in the library.

Table 1.
Perceived level of comfort in using computer, other digital tools, and library for academic writing.

		Not comfortable at all	Slightly comfortable	Moderately comfortable	Very comfortable	Extremely comfortable
Computer	Frequency	0	0	3	11	22
	Percent	0	0	8.3	30.6	61.1
Other networked tools	Frequency	0	0	5	13	18
	Percent	0	0	13.9	36.1	50.0
Library	Frequency	2	11	11	6	4
	Percent	5.9	32.4	32.4	17.6	11.8

All sixty-five respondents answered Section II regarding the perceived level of difficulty of different writing challenges. As numbers 1 through 5 represent the level of difficulty from "not difficult at all" to "extremely difficult", eight out of thirteen challenges were mostly viewed as "slightly difficult", while "knowing idiomatic expressions in English", "having sufficient background information about the topic", and "content (having sufficient ideas to write about)" were most frequently seen as "moderately difficult". Many respondents regarded "spelling" and "punctuation" as the least challenging, "not difficult at all".

A closer examination on the three most challenging aspects in academic writing indicated that, despite the fact that 'moderately difficult" was chosen most frequently (36.9%) for "content", nearly half of the respondents (49.2%) rated it as "not difficult at all" or "slightly difficult". Similar findings applied to "having sufficient background information about the topic" as well. While 40% respondents chose "moderately difficult" for this item, about 44% students did not seem to see it as very challenging ("not difficult at all" or "slightly difficult"). However, "knowing idiomatic expressions in English" stood out as the most challenging

aspect in academic writing with two thirds of the respondents rating it as "moderately difficult" or more. In fact, 15.4% participants thought it was very difficult and 20% participants saw it as "extremely difficult". This item was the only one in all thirteen items that had a two-digit percentage in the "extremely difficult" level.

The total scores of the difficulty ratings were calculated for each respondent. Descriptive statistics indicated that, the distribution of the total scores was approximately normal. With a mean total score of 29.72, the overall average rating for each item of challenges was 2.29, which leaned towards "slightly difficult". In other words, on average, the respondents did not see the listed challenges in academic writing too intimidating and unsolvable. However, with a range of 43 (min.= 13 and max. = 56, *SD* = 8.66), there was quite a bit of variation in between.

Table 2
The most frequently chosen rating for different writing challenges

	Mode	Percent
Requirements	2	55.4
Conventions	2	36.9
Vocabulary	2	36.9
Spelling	1	46.2
Sentence patterns	2	43.1
Idiomatic expressions	3	33.8
Connectors	2	33.8
Grammar	2	55.4
Background information	3	40.0
Content	3	6.9
Composition organization	2	1.5
Punctuation	1	9.2
Citation	2	0.0

Table 3

Frequencies and percentages of difficulty ratings of writing challenges

		1 Not difficult at all	2 Slightly difficult	3 Moderately difficult	4 Very difficult	5 Extremely difficult
Requirements	Frequency	19	36	7	3	0
	Percent	29.2	55.4	10.8	4.6	0
Conventions	Frequency	20	24	16	5	0
	Percent	30.8	36.9	24.6	7.7	0
Vocabulary	Frequency	8	24	18	14	1
	Percent	12.3	36.9	27.7	21.5	1.5
Spelling	Frequency	30	22	9	4	0
	Percent	46.2	33.8	13.8	6.2	0
Sentence patterns	Frequency	10	28	19	5	3
	Percent	15.4	43.1	29.2	7.7	4.6
Idiomatic expressions	Frequency	8	12	22	10	13
	Percent	12.3	18.5	33.8	15.4	20.0
Connectors	Frequency	17	22	20	4	2
	Percent	26.2	33.8	30.8	6.2	3.1
Grammar	Frequency	10	36	13	3	3
	Percent	15.4	55.4	20	4.6	4.6
Background information	Frequency	11	18	26	8	2
	Percent	16.9	27.7	40.0	12.3	3.1
Content	Frequency	16	16	24	7	2
	Percent	24.6	24.6	36.9	10.8	3.1
Composition organization	Frequency	16	27	15	6	1
	Percent	24.6	41.5	23.1	9.2	1.5
Punctuation	Frequency	32	25	5	3	0
	Percent	49.2	38.5	7.7	4.6	0
Citation	Frequency	15	26	14	9	1
	Percent	23.1	40.0	21.5	13.8	1.5

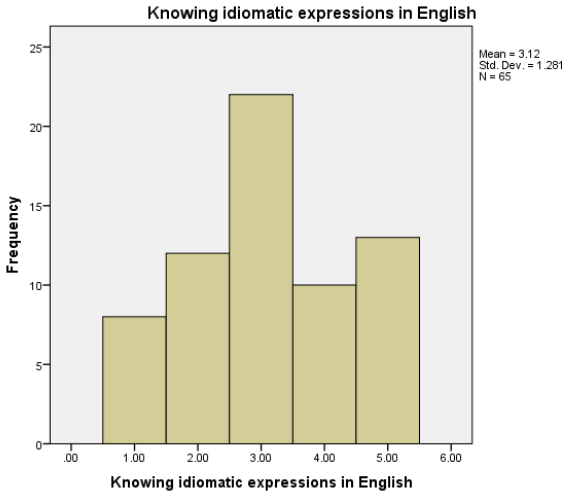


Figure 1. Distribution of ratings for challenge "knowing idiomatic expressions in English"

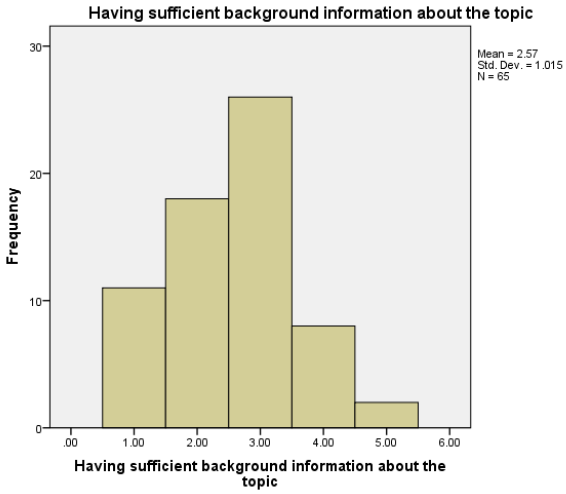


Figure 2. Distribution of ratings for challenge "having sufficient background information about the topic"

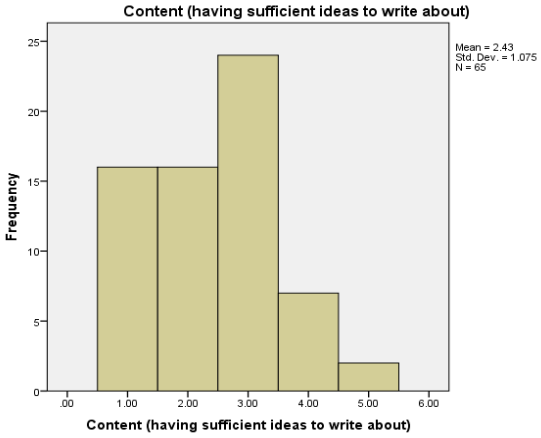


Figure 3. Distribution of ratings for challenge "having sufficient ideas to write about".

Independent sample t-tests were conducted to examine if there was any significant mean difference between male and female respondents (Table 4). Results indicated that there were no significant mean differences across genders except for "knowing how to organize a composition" ($t(63)= -2.38$, $p = .02$) and "punctuation" ($t(63)=-2.59$, $p =.012$). In both cases, male students had a higher mean ($M_{Organization}= 2.54$, $M_{Punctuation}=1.96$) compared to female

students ($M_{Organization}$=1.97, $M_{Punctuation}$=1.45). In other words, male respondents tended to see these two challenges more difficult than their female counterparts did.

Table 4
T-tests for difficulty ratings across genders.

		Levene's Test for Equality of Variances					
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Understanding the requirements and expectations of the writing assignments	Equal variances assumed	0.40	0.528	-1.18	63.00	0.243	-0.22
	Equal variances not assumed			-1.18	59.49	0.241	-0.22
Knowing the Conventions of academic writing	Equal variances assumed	0.16	0.687	-0.92	63.00	0.362	-0.21
	Equal variances not assumed			-0.92	59.10	0.361	-0.21
Using appropriate vocabulary	Equal variances assumed	0.00	0.985	-0.83	63.00	0.411	-0.21
	Equal variances not assumed			-0.83	58.64	0.411	-0.21
Spelling	Equal variances assumed	0.63	0.431	-0.44	63.00	0.661	-0.10
	Equal variances not assumed			-0.44	59.39	0.660	-0.10
Using an adequate variety of sentence patterns	Equal variances assumed	0.46	0.501	-0.73	63.00	0.466	-0.18
	Equal variances not assumed			-0.73	56.45	0.470	-0.18
Knowing idiomatic expressions in English	Equal variances assumed	1.56	0.216	0.28	63.00	0.780	0.09

	Equal variances not assumed			0.27	52.47	0.785	0.09
Using connectors and transitional phrases	Equal variances assumed	0.27	0.605	-0.17	63.00	0.869	-0.04
	Equal variances not assumed			-0.16	57.13	0.870	-0.04
Grammatical accuracy	Equal variances assumed	0.00	0.968	-0.33	63.00	0.744	-0.08
	Equal variances not assumed			-0.34	62.03	0.738	-0.08
Having sufficient background information about the topic	Equal variances assumed	0.66	0.420	-0.51	63.00	0.615	-0.13
	Equal variances not assumed			-0.50	53.88	0.622	-0.13
Content (having sufficient ideas to write about)	Equal variances assumed	2.24	0.140	-1.39	63.00	0.168	-0.37
	Equal variances not assumed			-1.35	50.86	0.182	-0.37
Knowing how to organize a composition	Equal variances assumed	3.31	0.074	-2.38	63.00	0.020	-0.56
	Equal variances not assumed			-2.35	54.71	0.022	-0.56
Punctuation	Equal variances assumed	0.16	0.695	-2.59	63.00	0.012	-0.50
	Equal variances not assumed			-2.50	49.88	0.016	-0.50
Proper citation	Equal variances assumed	1.21	0.276	0.15	63.00	0.882	0.04
	Equal variances not assumed			0.14	51.52	0.886	0.04

Totdiff	Equal variances assumed	0.25	0.622	-1.15	63.00	0.253	-2.49
	Equal variances not assumed			-1.16	60.24	0.249	-2.49

The third section focused on how students usually address the thirteen challenges in their writing. Six strategies were listed. Respondents were asked to choose all that applied. Numerical evidence (Table 4) indicated that, generally speaking, using digital tools was the most popular strategy among respondents, while consulting a librarian was the least popular. On average, 59.4% students would resort to digital tools in addressing academic writing challenges, but only about 1.8% students would think of asking the librarians for help. The next most popular strategy was to rely on past writing experience, with an average percentage of 43.3%. Consulting the instructor or TA (35.5%) shared similar average percentage with relying on current or past ESL writing training (35.6%). A little less than one-third of the respondents (31.2%) would discuss with their classmates or friends regarding academic writing issues.

A closer look at the numbers revealed a clearer picture. Although using digital tools was the most popular strategy in addressing nine out of thirteen challenges, including those related to writing conventions, vocabulary, spelling, idiomatic expressions, grammar, connectors, background information, content, and citation, the situations regarding the rest of the four challenges varied. When trying to understanding the requirements and expectations

of the writing assignments, most respondents inclined to consult their instructors or TAs (69.2%) and to discuss with their classmates or friends (72.3%). In dealing with composition organization, punctuation, and using an adequate variety of sentence patterns, most students reported that they would rely on past writing experience or current and past ESL writing training. In addition, students also tended to turn to their instructors and TAs for help with academic writing conventions (53.85%), background information for a particular writing topic (40%), and proper citations (41.54%). The percentage of frequency of this particular strategy was the second highest in these three items of challenges, following that of using digital tools.

As respondents generally regarded "idiomatic expressions", "background information" and "content" as more challenging compared to other aspects (Table 2 and Table 3), it is worth looking into these three items in greater detail. In dealing with idiomatic expressions, 67.7% respondents used digital tools, and at least one third of the students would also consider other strategies except consulting a librarian. While almost 90% students looked for background information online, many of them (40%) might also consult their instructors or TAs. In terms of looking for ideas to write about, in addition to using digital net-worked tools (76.9%), many respondents also relied on their past writing experience in their brain-storming process. However, as it was mentioned earlier, one of the most criticized aspects of survey data was that, the survey responses often only reflect respondents' subjective

evaluation of the issues involved, which results in partial and inaccurate recounts. Therefore, it is important to have additional layers of data, preferably objective ones, to verify and triangulate the findings.

Table 5
Number and percentage of respondents choosing each strategy in addressing different writing challenges.

		Consult instructor or TA	Discuss with classmates or friends	Rely on past writing experience	Rely on current or past ESL writing training	Consult a librarian	Use digital tools
Requirements	Frequency	45	47	30	25	1	29
	Percent	69.23	72.31	46.15	38.46	1.54	44.62
Conventions	Frequency	35	26	22	23	1	36
	Percent	53.85	40.00	33.85	35.38	1.54	55.38
Vocabulary	Frequency	20	21	30	22	0	45
	Percent	30.77	32.31	46.15	33.85	0.00	69.23
Spelling	Frequency	10	15	18	9	0	50
	Percent	15.38	23.08	27.69	13.85	0.00	76.92
Sentence	Frequency	13	16	38	31	0	30
patterns	Percent	20.00	24.62	58.46	47.69	0.00	46.15
Idiomatic	Frequency	27	30	25	23	0	44
expressions	Percent	41.54	46.15	38.46	35.38	0.00	67.69
Connectors	Frequency	17	17	35	27	1	34
	Percent	26.15	26.15	53.85	41.54	1.54	52.31
Grammar	Frequency	23	24	30	32	1	37
	Percent	35.38	36.92	46.15	49.23	1.54	56.92
Background	Frequency	26	19	14	8	3	58
information	Percent	40.00	29.23	21.54	12.31	4.62	89.23
Content	Frequency	22	18	25	16	2	50
	Percent	33.85	27.69	38.46	24.62	3.08	76.92
Composition	Frequency	25	15	41	27	2	21
organization	Percent	38.46	23.08	63.08	41.54	3.08	32.31
Punctuation	Frequency	10	6	34	30	1	23
	Percent	15.38	9.23	52.31	46.15	1.54	35.38
Citation	Frequency	27	10	24	28	3	45
	Percent	41.54	15.38	36.92	43.08	4.62	69.23
Average	Frequency	23.08	20.31	28.15	23.15	1.15	38.62
	Percent	35.50	31.24	43.31	35.62	1.78	59.41

Section IV and Section V asked about participants' willingness to enter a drawing for gift cards and to become a case-study subject. Fifty-two respondents indicated that they would like to enter into the drawing and left their email addresses, and seventeen students, including

thirteen female students and four male students, indicated that they were interested in participating in the follow-up multiple case study.

The last section in the survey asked respondents to list the digital resources that they had been using most frequently in their academic writing. At least one-third of the respondents left this section blank. As the entire section was put on the back of the last page in the hard copies, it was easy to get overlooked. Also, some students might have left out this section due to time constraints. Among all the responses collected, while the students might have used a wider range of digital resources, what actually got written down seemed to be very limited and did not vary much between individuals. For instance, the websites respondents listed were largely related to language issues, such as dictionary.com, synonym.com, grammarly.com, youdao.com, and the website for Purdue OWL (https://owl.english.purdue.edu/owl/), as well as the university's course management system (CMS). There were only two search engines mentioned by the participants, namely, Google and Baidu. Baidu is a Chinese web services company offering many services, and is most famous for a Chinese search engine for websites, audio files and images.

In terms of computer/ cell-phone/ tablet apps, there were again only several names listed, including Microsoft Word, Youdao, and Merriam-Webster. The latter two were referred to as cell-phone dictionary apps. Under online databases and digital libraries, the responses included JSTOR, Kuangren (a Chinese digital library), Zhihu (a question-and-answer

website), wiki, and Baidu Baike (a Chinese-language, collaborative, web-based encyclopedia, which is also called Baidu wiki). Most respondents reported that the resources they often used were in either English or Chinese, and they used both Chinese and English when they were utilizing digital resources during writing.

The data analysis of the survey responses suggested some general patterns among the survey respondents regarding their academic writing in the digital age. However, what the respondents thought they had been doing did not necessarily match with what they were actually doing. In light of the research questions, a multiple case study was designed to obtain a more detailed and contextualized representation of how international Chinese undergraduate students completed their academic writing assignments and how this process was mediated by various factors in the system. Additional layers of data were collected from real-time screen recordings, semi-structured interviews, and instructor or TA feedbacks, if there was any.

B. Multiple case study

The multiple case study section of the current research was designed to have an in-depth investigation of how the case study subjects' academic writing process was mediated by technology, social-educational context, and their cultural-educational backgrounds, and how agency was enacted in subjects' interaction with other elements in their writing activities.

As a major component of the multiple case study data, the screen-recording aimed to unveil what students were really doing in a private setting in which they could decide when, where, and how to work on their writing assignments at their own pace. Most existing writing studies that involve the use of screen-recording have students work on their writing assignment on computers with pre-programmed resources and pre-installed apps in a lab. This kind of setting is not how students would normally work on their academic writing assignments. Also, almost all writing studies that look at students' writing process were conducted by the instructors of particular courses or on students who were taking the same classes and working on the same assignments. While such a research design would no doubt make the data collection process much more controllable and the findings across individuals more comparable, it can undermine internal validity and fail to capture diversities and complexities. In fact, no study was found in the current literature that is completely independent from the curriculum, and examines students' writing processes involving different topics and different academic courses in a setting in which students have the least possible external monitoring and intervention. While this is one of the most distinguishing features of the current study, it also partly explains the difficulty in case study participant recruitment.

As mentioned earlier in the research design section, due to the selection criteria and other foreseeable or unforeseeable influencing factors, among the survey respondents, five case-

study subjects were identified and recruited. They were all first-year international Chinese students of different STEM or non-STEM majors or pre-majors. They all expressed their willingness in participating in the follow-up case study involving the use of a screen recording software program and interviews, and they were enrolled at the time of the data collection in either disciplinary classes with writing assignments or writing classes offered by the university's writing program. The four students who were able to complete the entire data collection process were all female students, and the one who failed to carry out the screen recording was a male student. Since there was not much evidence shown in the data collected regarding their academic records and they were taking different courses, it was difficult to categorize them by their academic performance. However, based on the results of the data analysis, they did seem to represent different English language proficiencies and educational backgrounds during high school years. Also, they were considered to be socially active and academically motivated students, given the fact that they volunteered to participate in the present study and managed to stay committed till the end of the data collection process.

1. Y.

Y. was an 18-year-old first year female student. She graduated from a regular high school in China. She was a pre-math major student. Although she had not taken any writing program classes, she had taken an English reading and writing class offer by the EMS program. The writing assignment she recorded was for a cinema study class in the Department of Film and

Media Studies. Her essay was a discussion of a Chinese movie called *Chungking Express* (Chongqing Shenlin). The screen recording videos she submitted covered the entire process of planning (except for the part of re-watching the movie), drafting, and revision that took place on the screen of her personal laptop.

1.1 What the screen-recordings showed

Y. submitted seven screen recording files which were four and a half hours long in total. These files were recorded across four days. Except for the shortest second file which was only two minutes long and the last file for the revision process which lasted approximately nine minutes, all the screen recordings had records of "transactions", in which the mouse cursor was seen switching between different interfaces. Most of the transactions happened when Y. left the writing interface in Microsoft Office Word and went to the web browser or a pre-installed computer software program before going back to the writing interface. Some of the transactions happened when Y. switched directly from a web browser to a software program or vice versa. By using the coding method described in the methodology section, the transactions in the five screen recording files were carefully played through and coded (see the screenshot of part of the spreadsheet below).

A	B	C	D	E	F	G	H	I	J
	Transaction#	Start	End	Type/Motiv	Keyword	Interface	Event	Consequences	Language
Y.									
		25:15:21							
	1	0:00	5:08	9		Word doc	Opened the writing rubric and read it		1
	2	5:08	6:28	6	Temporal structure	address bar/Google	Read a little on the 3rd link	Start writing down the temporal structure in the	1
	3	15:09	15:21	10		address bar/Youtube	Did not view anything		1
	4	15:22	17:55	10	重庆森林	address bar/bilibili.com	Briefly skimmed the related part in the movie		2
	5	17:57	18:48	11		CMS	Went over the list of materials and did not click on anything		1
	6	18:49	20:18	13	film/smith	Mail	Found an email from the TA about other options of the movie selection		1
	7	20:26	21:43	7	豆瓣/重庆森林	baidu/douban	Went over the breif summary and the list of the first few most popular comments about the movie		2
	8	21:44	22:12	7	重庆森林时间顺序	baidu	Read the first search result on douban (a comment)	write down "sound bridge" on the outline on the	2
	9	24:05	25:15	11		CMS	Went over the list of materials and did not click on anything		1
		1:04:58							
	10	1:47	3:09	7		movie.douban.com	Back to the douban page on the movie		2
	11	3:11	4:06	10		CMS	Clicked on several links on the course site in CMS which led to clips like the "Chongking Express opening scene" on youtube,but did not actually		1
	12	4:07	5:23	7		douban	Back to the douban page on the movie, quickly read through several comments on the page		2
	13	5:56					Started to write down the first word in a blank MS Office Word document		
	14	8:16	8:24	3	叙述	Pre-installed Youdao dict	Found the English translation for the keyword	"Chongking Express 'narrate' two different stori	3
	15	8:54	9:24	3	失恋/lovelorn	Pre-installed Youdao dict	Found the English translation for the keyword, then look up "lovelorn"	"Chongking Express is a film that narrates two d	3
	16	11:28	12:11	1	separate	Pre-installed Youdao dict	Tried to type in "separate" a few times to look for the correct spelling and make sure it is the right word		3
	17	45:43	45:51	3	motif	Pre-installed Youdao dict	Read the meaning of motif	Did not use it in the writing	3
	18	51:50	51:58	3	轻松	Pre-installed Youdao dict		put down "relax" almost even before the results	3
	19	52:01	52:03	1		Pre-installed Youdao dict	Back to the result of "轻松"	"relaxed"	3
	20	52:08	52:14	3	tone	Pre-installed Youdao dict		"He uses quite relaxed 'tone' to ask...	3
	21	54:50	55:56	11		CMS	Seemed to be reading the list of materials on the course page		1

In total, forty transactions were found. Among them, over half (55%) were transactions with language-related motives (1. Spelling or part of speech & 3. Translation). In almost half of the transactions (47.5%), Y. used a pre-installed digital dictionary on her laptop called Youdao Dictionary to look for the English translation of a Chinese word or vice versa. Because her writing assignment was a discussion of a movie, there were at least seven transactions for viewing certain episodes in the movie for discussion, including those directly going to the video sharing websites such as Youtube.com and bilibili.com as well as some that happened on the CMS course site. Only 15% of the transactions were about looking for background information and content ideas. When the duration of each transaction was added together, the forty transactions had cost Y. about half an hour (29:04), with an average of 43.6 seconds for each transaction. Considering the fact that Y. spent the first half hour in the recordings in planning before she wrote down the first word of the essay, at least one-eighth of the authoring time was devoted to these transactions. In addition, if only the language-related transactions were counted, it was 6 minutes and 11 seconds in total, with an average of 16.86 seconds for each transaction.

In terms of language used, almost half of the time both English and Chinese were used during transactions, especially when Y. was looking for translations of certain words. A quarter of the transactions were English only, those were mostly when Y. was reading

the writing rubrics and going through the CMS. Still there were seven transactions in which only Chinese was used. Those happened when Y. went to douban.com, a Chinese social networking service website allowing users to create content related to film, books, and music, etc. In other words, Chinese was used in three-fourths of the transactions during the process of Y. finishing this particular writing assignment. The factors contributing to this phenomenon may include the movie under discussion in the essay, Y.'s L2 proficiency level, and the availability of digital resources related to the topic.

Table 6
Frequencies and percentages of transactions of different motives.

	Motive(s)	Frequency	Percent	Cumulative Percent
1	Spelling and part of speech	3	7.5	7.5
3	Translation	19	47.5	55.0
6	Concept	1	2.5	57.5
7	Background information/content/ideas	6	15.0	72.5
9	Writing rubrics	1	2.5	75.0
10	Movie/TV episode	5	12.5	87.5
11	CMS (course management system)	4	10.0	97.5
13	Lecture notes	1	2.5	100.0
Total		40	100.0	

A closer observation of the transactions revealed that, in dealing with language-related issues, Y. always relied on the pre-installed dictionary, except for once when she went to view a clip of the movie on Youtube to check the English translation/ subtitle of a dialogue. The queries she made on the digital dictionary were almost all individual words. Most of the time, a Chinese word was keyed in, which could be a noun, a verb, or an

adjective, then a list of two to four English equivalents would be provided in the search result box. Y. would pick one and use it in her writing. For instance, Y. switched to Youdao and type in a Chinese word "挽救"(wan3jiu4), the dictionary returned two options, "save" and "rescue". Y. switched back to her writing, and wrote "... to save their relationship". The entire switching out and switching back process took only three seconds.

In some other times, after Y. found a translation from Youdao, she would use it as a key word for a new query to learn a bit more about her choice. For example, not long after she started her writing, she switched to Youdao and put in "失恋". She found the word "lovelorn". Then she put "lovelorn" into the query bar and read a little bit about the word in Youdao, including its Chinese translation, a fuller explanation of the word in English, and some sample sentences. Finally, she switched back to her essay, and wrote "Chongking Express is a film that narrates two different but parallel stories of lovelorn people." This transaction took thirty seconds. In another case, she put in the word "dump", but did not seem to find the exact Chinese equivalent that would help confirm her guessing. She then quickly typed in the Chinese word "被甩". This time, she found the English translation of this word as "been dumped". So she switched back to the essay, and put down "as Wu said, she was dumped by May twice."

In looking for other types of information, Y. only used Google once. Instead, she often went directly to Douban.com or Baidu.com. She read Chinese reviews and comments about the film on Douban.com and on a blog post found in the Google search results. She did not cite anything in this essay. There was no doubt that the screen recording alone only captured the process of Y. working on one writing assignment for a disciplinary content class with a very specific topic and focus. However, given the fact that it was a close-to-reality representation of Y.'s actual writing process because of the use of the screen recording tool, it made her use of digital resources during this process observable, including the motives, and the actual operations and results, and thus served as a valuable data source in the current study, and helped to promote a better understanding of the subject's mediated writing activity.

1.2 Biggest challenge in academic writing

In her survey responses, Y. indicated that she felt highly comfortable in using a computer to complete writing assignments and surfing the Internet or using various network-based apps. However, she gave a rather low ranking for her level of comfort in doing research in the library. In terms of specific items of challenges in academic writing, she saw "requirements and expectations", "conventions", and "punctuation" not difficult at all, "sentence patterns", "idiomatic expressions", and "content" moderately difficult, and "background information" very difficult. All the rest of the listed challenges in the

survey were "slightly difficult" for her. While she heavily relied on her past writing experience in dealing with all the challenges and would also use digital tools to help with most of them, she only chose consulting the instructor or teaching assistant for understanding writing requirements and obtaining background information about the topic.

When being asked what the most challenging part was in her English academic writing in the interview, Y. expressed her frustration about not being able to fully describe what she had in mind, which she associated with her English proficiency level. And she thought she had the same issue both in completing the recorded writing assignment and doing her academic writing in general. According to Y., unlike the assignments she received from the EMS class, which mostly asked students to synthesize information from the given reading materials and organize their arguments based on a pre-structured template, the writing assignments in disciplinary content classes often give students more freedom in choosing topics, generating ideas, and articulate them in written language, resulting in bigger challenges and often less support for students of other languages. For Y., instead of finding evidence from the given texts to support her arguments, she had to gather all the linguistic resources by herself in her writing and elaborate on her points as clearly and fully as possible.

Although the biggest challenging in Y.'s L2 academic writing seemed to be identified differently in the survey and the interview, the discrepancy may be a result of a number of factors. First, on one hand, the list of challenges in the survey was designed to cover different aspects of writing with the corresponding strategies in the following section. As a result, each item usually represents a comparatively specific and distinct aspect in writing. On the other hand, challenges like not being able to fully express one's thought can be more general issues related to several different areas involving linguistic, cognitive, rhetorical factors. Although Y. thought it was due to her L2 proficiency level, it could often be more than that. And "expressing exactly what I want" was more of an overarching and macro-level challenge compared to those listed in the survey. Second, unlike the challenges listed in the survey that could be more or less addressed directly by using different types of resources, the more general type of issues demand a continuous long-term effort. While Y. may consult the instructor or teaching assistants and use digital tools to gain access to adequate background information for her writing assignment, to be able to fully express oneself is a constant challenge for all writers not limited to L2 learners.

Nonetheless, Y. did seem to identify language proficiency level as an important influencing factor correctly. Referring back to the previous analysis of the screen recordings, one can see that over half of the transactions she needed to make during her

writing process were related to language issues. In addition, the instructor's written feedback also corroborated her frustration about not being able to clearly and fully express her thoughts.

According to the feedback, the main issue that needed attention seemed to be the issue of clarity. In addition to the side notes the instructor put along the essay here and there asking for clarification of ideas and expressions, the instructor commented at the end of the essay, "some very interesting analysis of the film, though some areas lack clarity. What do you mean by 'special' plus 'successful'?" Given that Y. took the interview before she received the instructor's feedback, she was indeed cognizant of a major challenge she was having.

1.3 Choice of digital tools and determination of credibility

As was discussed earlier, competent multi-literate students are expected to be questioners of technology in the new era (Selber, 2004), and their evaluative and critical capabilities are among the main topics in digital writing studies. In the current study, interview questions were designed to investigate participants' choice of digital tool and how they evaluate the credibility of the digital resources.

During the interview, Y. talked about her use of websites and a mobile dictionary app called Youdao Dictionary. Like many other Chinese students, Y. uses Youdao Dictionary

(both the mobile app and the website) and another dictionary website called dictionary.com frequently. As dictionary.com only has English to English search, Youdao is an important tool for her with its two-way (Chinese to English and vice versa) translation, especially when she was looking for the English equivalents for the Chinese words or expressions she had in mind. In addition, Y. preferred digital resources over printed ones in general. However, she did like writing down her main ideas on a piece of paper to generate a rough outline for her writing, mostly because it was faster and more convenient and casual for her, as she did not need to worry as much about alignments and fonts as when she did it in a word-processing software.

When searching for information online, unless there was a website suggested by the instructor, Y. almost always resorted to either Google or Baidu to search for information. There are no specific strategies for her when choosing which search results to click. She normally starts from the top of the list and takes a look at each of them down the list until she finds what she wants. In deciding the credibility of websites, Y. mentioned a few criteria that she had been using, which come down to two main categories: what the teachers suggest and how she feels about them.

For instance, during the interview, she reported that she did not think information found on Douban.com was very reliable, unlike the information on another English movie review website for a previous assignment from the same course. That English

website was recommended by the instructor. Also, she had been under the impression that Wikipedia was not very trustworthy as everyone can participate in the editing of the content. And it is a similar situation in Douban, where everyone can post their reviews or comments about a movie. There is not much scrutiny or censorship in place. In addition, she believed domain suffixes such as ".edu" and ".gov" signify credibility of the websites. The above two criteria were both mentioned by the instructor of the EMS reading and writing class she previous took.

When it was all up to her to decide, she would first consider if she agrees with what it says on the website or in the online paper, or if there are many people agreeing with the idea when she does not have a specific standpoint herself. In other words, when the opinion or idea she finds online happens to be the same as hers, she often does not question its bias and subjectivity. And the same trust extends to opinions shared by a group of people online when she does not have her own viewpoint towards the topic.

Furthermore, she mentioned that, if she is only looking for inspirations online during her brainstorming process, she would not pay much attention to the nature of the websites, such as whether they are hosted by individuals or professional organizations. On the contrary, if she decides to cite the sources, she would be more careful with the issue of information credibility. The screen recordings matched with what she described in this regard. As mentioned earlier, she did not formally cite anything in her essay and there

was no list of references included at the end, so she did not seem to be bothered by the idea of resource credibility when she browsed through comments about the movie on Douban and personal blog posts.

1.4 To cite or not to cite_citation and authorship

Understanding of authorship is another issue under heated discussion in digital writing studies, and is closely related to students' multiliteracies development. In deciding authorship and whether citation was necessary, Y. seemed to be relying on her own judgment more than others' instruction. Her interview responses suggested that, in regards to the comments and reviews she read online in completing her current writing assignments, she did not do any citation, because, in her opinion, unlike she herself who had a main thesis to develop, people on those movie review websites or forums were mostly just sporadically exchanging their random views. Those views might be helpful for her brainstorming process, but they were often not directly or closely related to the main arguments she had in mind.

When being asked what she would do if she found people with an exact same idea as hers, she responded:

"If they are authoritative figures, I may cite. But if they are not, I would just describe them as my own ideas without citing them. Instead, I would have more confidence in my idea, as I now know there are people agreeing with me."

For the follow-up question about how she decides whether those people are authoritative figures or not, she explained:

"I would check the related information on the website. Sometimes the websites would provide author profiles to add to the credibility of the articles, including details such as the titles and affiliations of the authors. If it looks like an article coming from a random person without any additional information about his/ her professional background, I would not see him/her as an authoritative figure".

In reflecting on her use of digital resources in writing during the interview, she was not as confident in her competencies as what was shown in the survey responses. She felt that she had not spent enough time in searching for more useful resources from credible sources in English, reading and understanding the articles, and using them in her own writing. She thought it might due to the fact that she was a first-year student, and had not had many writing assignments requiring the use of scholarly resources and sophisticated research skills. Her response also indicated that she may be primarily focusing on the functional aspect in her multiliteracies when answering the specific survey question, but incorporating both the critical and rhetorical aspects in answering the similar question

during the interview when she was given more time to think and a richer context to reflect on.

1.5 Social interaction related to academic writing

Writing is a social activity. In addition to the fact that the norms and conventions of writing are socially built, the activity itself always takes place in a social environment. While Y. seemed to be working on her writing alone most of the time, especially during the authoring process, there are other people in the education community that she may interact with in regards to her academic writing, voluntarily or involuntarily. Information regarding the subject's social interaction was solicited during the interview to investigate how the participant's writing was socially situated.

When doing her academic writing, Y. sometimes communicates with other international Chinese students regarding requirements and expectations, mostly online by using instant chatting tools such as Wechat. She seldom communicates with local American students regarding writing assignments. In addition, she shared that she often did not know or have the intention to get to know other students in the same discussion section, and the sections she had taken so far did not have group discussions. However, based on her survey and interview responses, she would sometimes ask the teaching assistants for help regarding the writing assignments. In addition, people from the

academic support or other campus resource sectors may also be part of the community in the related bounded system.

Responses were also collected in the interviews regarding the case study subjects' use of other types of resources and their interaction with the people involved. While Y. did occasionally use the journal databases available on the university library website for article searching in the past two quarters, she reported that it was usually a requirement in the syllabus. She would not normally think of going to the library website when doing her writing assignments, and she had never interacted with a librarian. However, from time to time, she would utilize the writing lab service, a part of the university's campus learning assistance services (CLAS). When that happened, she would bring her writing draft to the lab and have the writing tutors there help her mainly with issues like expression clarity. Although no one there spoke Chinese, she found it helpful just to explain her ideas orally and get suggestions about how to clearly articulate them in her writing.

In terms of improvements the university and faculties could make regarding academic support and writing instructions for international students, Y. was not able to think of any particular suggestions. She said she was happy with what they had to offer in these days and understood that it would be hard to provide all-inclusive support considering the sheer number of disciplines and courses a university has.

1.6 Influence of the cultural-historical and educational background

Y. attended a regular high school in China before she came to the U.S.. In describing her English writing experiences in those days, she said:

> "We did not need to (do research papers). It was just English for *Gaokao* (college entrance examination). It was all for the exam. We basically just learned vocabulary and grammar. For writing exercises, the teacher would give us a topic and then we just wrote what came to our mind based on the topic. So we almost never felt the need to do any research for the writing... In fact, the first writing assignment I got from a course in the Communication Department last quarter was the first research paper assignment I had ever had."

In order to prepare for SAT and her study in the U.S., she had also taken some language classes and study-abroad preparation classes offered by test preparation centers or international schools in China. According to Y., although those classes might be helpful for test preparation and getting a sense of what a typical classroom time may look like in the U.S., they were not very helpful in getting them prepared for doing research papers, which is an essential part of her study life here now. The writing assignments of those classes were all too simple and straightforward and did not require much critical thinking and research. "I felt like those assignments were for primary school students," she said.

In terms of the influence of her Chinese language, she took a neutral stand. "I feel that it is O.K.. It does not make a big difference. There may just be an additional translation process, and it does not affect me much", she said. Although the fact that English as a second language did partially contribute to the biggest challenge Y. identified in her academic writing, and the screen recordings showed that she had to pause over twenty times in her writing for language-related challenges, she might have long got used to it and regarded it as something natural and inevitable as a second language learner.

As she did not really communicate with other nationals regarding writing assignments, it was difficult for Y. to discuss the differences between international Chinese students and other ESL students or the local American students in regards to their academic writing processes and the use of resources. "There may be differences due to different language proficiencies and educational models in the home countries if you ask me," She said.

2. M.

M. was a 19-year-old first year female student. She graduated from the international division of a regular high school in China. She was a pre-communication and pre-psychology major student. She was taking Writing 2 during the time of data collection. Her writing assignment was about a comparison between two academic articles from two disciplines regarding the same topic. According to M.'s understanding, the assignment

consisted of three parts: two working drafts, each discussing one article; and one final paper putting the two articles together to make a comparison. The screen recordings she submitted covered the writing of the second working draft and the final paper. Only shortly before she started on the final draft, did she find out that she had misunderstood the writing requirements of this assignment. This incident will be discussed later in this section.

2.1 What the screen-recordings showed

M. submitted two screen recording files capturing the process of her writing the second working draft in one and the final paper in the other. The two recordings were four hours and forty-eight minutes long in total, the first one about two hours long and the second one a bit more than two and a half hours long. M. finished writing the working draft in one sitting and the final paper in another sitting about two weeks later.

Transaction	Start	End	Type/Motiv	Keyword	Interface	Event	Consequences	Language	
1	0:10	0:39	9		CMS	read the writing rubrics, already started a paragraph		1	
2	13:35	13:52	3	document	baidu	read the Chinese translation on baidu about "document"	Did not put down anything in the writing	3	
3	14:00	14:07	4	personal account	google		Did not use the phrase. Instead, she wrote ...in	1	
4	24:39	24:54	9		CMS			1	
5	25:32	28:32	7		JSTOR	Clicked on the JSTOR tab that was already open which led to an article on AS. Sensory issues in AS and autism) (can see the t		1	
6	28:46	34:06	7		JSTOR	Back to the JSTOR paper, then go back and forth between the article and her own writing for a while		1	
7	44:05	46:02	8	in text citation multiple authors	google/UMUC library	Read the instruction about in-text citation	put in an in-text citation	1	
8	47:28	47:56	7		JSTOR	Back to the JSTOR paper, then go back and forth between the article and her own writing for a while		1	
9	56:11	57:26	7	psychology study convention/psychology stud	google	typed keyword in the address bar to search, changed the key words until she found it. Clicked on the first result: a brief guid to		1	
10	57:29	1:40:13	7		JSTOR	Back to another JSTOR article on the topic: Art lessons for a Yohng Artist with AS, then go back and forth between the two a		1	
11	1:40:29	1:40:52	8	citation machine/easybib	google/easybib	typed keywords in the address bar	found the website but did not do anything yet	1	
12	1:41:51	1:45:17	8		easybib	back to easybib	use the info from the JSTOR article to create a c	11	
13	3:06	4:32	2	draw attention/attract/ attract synonym	google/www.thesaurus.com	read "draw attention to" on thesaurus, back to google and looked for attract, click the first result and went to thesaurus again		1	
14	5:03	5:20	4	wide spread	google	wrote "the wide spread of AS" then went to check the phrase on google, did n	changed it to "wide-spread AS"	1	
15	5:41	6:09	2		thesaurus.com	back to the "attract" page on thesaurus.com, then the "draw" page, then "attra	put donw "the wide-spread AS draws" then "...	1	
16	6:37	7:04	4	across disciplines	google	went through the results list, did not click on any links	Changed the previous sentence into "from differ	1	
17	19:04	19:20	4	transipire/ auto corrected to transpire	google	read the google translation	did not use it	1	
18	31:47	31:55	3	sailient	baidu	get the chinese translation, did not end up using the word	Instead, put in "...that are different enough to d	3	
19	37:30	37:57	4	on one hand/on one hand synonym	google/www.thesaurus.com		did not use it	1	
20	1:25:13	1:25:27	1	college/collegue	google	Got a red line under the word colleague, went to confirm the spelling		1	
21	1:29:34	1:30:11	4		CMS	went through the course materials and click on a slide about research process, look for wordings for "find a gap in knowledge to		1	
22	1:49:16	1:50:14	7		JSTOR	get jstor article from bookmark (Sensory issues in Children with Asperger syndrome and autism) then write about how the dat		1	
23	2:05:36	2:06:42	7		JSTOR	repeat the previous step and get the article "art lessons: for a young artist with asperger syndrome"		1	
24	2:07:04	2：07：27	3	叙述 英文	baidu	look at 百度翻译中译英 then go back to writing and put down ... Dr. Gillian's	... that follows her personal account	3	
25	2:08:03	2:08:10	7		JSTOR	back to the JSTOR article		1	
26	2:11:32	2:11:40	7		JSTOR	back to the JSTOR article		1	

Table 7

Frequencies and percentages of transactions of different motives.

	Motive(s)	Frequency	Percent	Cumulative Percent
1	Spelling or part of speech	1	3.8	3.8
2	Synonym	2	7.7	11.5
3	Translation	3	11.5	23.1
4	Expression	6	23.1	46.2
7	Background information/content/ideas	9	34.6	80.8
8	Citation	3	11.5	92.3
9	Writing rubrics	2	7.7	100.0
Total		26	100.0	

Twenty-six transactions were found in the two screen recording files. They were carefully coded and checked based on the coding scheme. When a transaction was found as a combination of more than one motive, it would only be coded based on the main motive. For instance, M. went to the course site twice on the CMS in order to read the writing rubrics. The two transactions were coded under "9. Writing rubrics" instead of "11. CMS".

The numeric evidence above showed that almost half (46.2%) of the transactions were related to language challenges. Another major category of transaction was about background information and content, in which M. went back and forth mostly between the two academic articles she was comparing and her own writing. She also went to Google once to look for information regarding the psychology article conventions. She changed the key words twice in order to locate the article she wanted: "A brief guide to writing the psychology paper" posted on the Harvard College website. In addition,

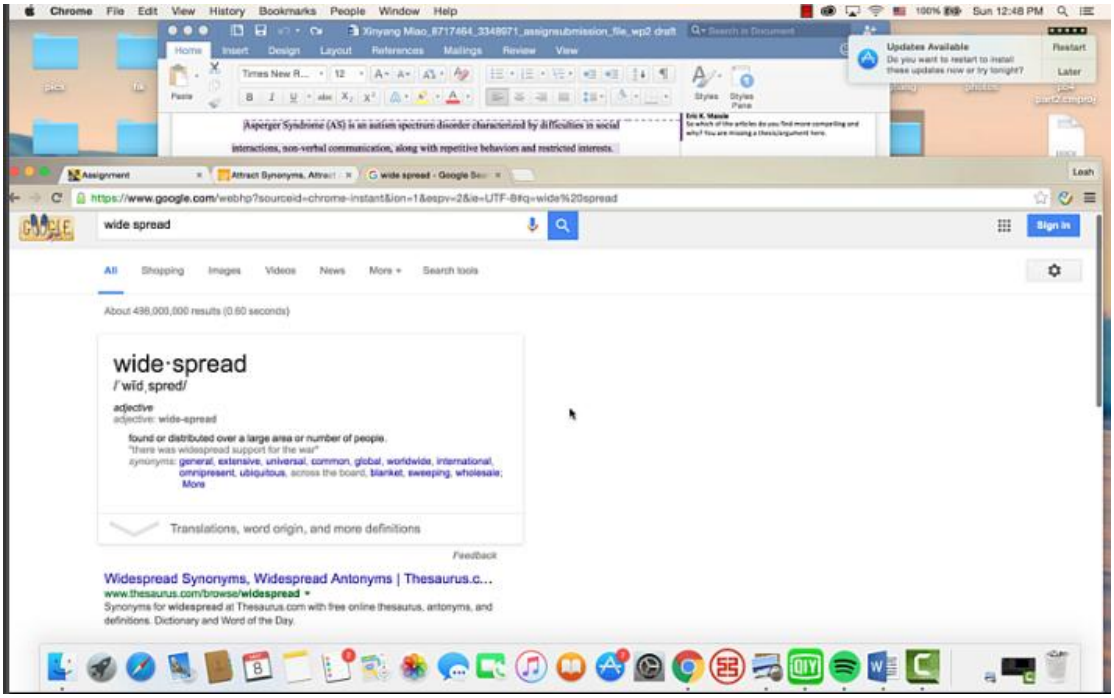
probably due to the nature of the assignment, M. did not search for much additional content information beyond the two academic articles she had found. As a result, not many transactions involving the use of other websites or digital resources presented in the recordings.

Furthermore, the twenty-six transactions cost M. a bit over half an hour (34:26), with an average of about eighty seconds for each transaction. The twelve language-related transactions took five minutes and eight seconds in total, each transaction of approximately twenty-six seconds. In comparison with Y., M. spent a similar proportion of her writing time (one eighth) on searching for information from digital resources, but a longer time on average in each transaction, regardless if it was related to language issues.

Among the language-related transactions, unlike Y., M. did not use any pre-installed software packages. Instead, she relied on websites such as Google.com, Baidu.com, as well as thesaurus.com. Also, instead of looking for simple and direct translation of a Chinese word, M. often typed an English phrase in the Google search bar, she would then quickly glance through the results and confirm whether that was a commonly used phrase based on the information returned on the screen, before she went back and made changes to her writing. For instance, she once keyed in the phrase "personal account" in Google. Not seeing the phrase used in sentences as expected, she then quickly went back to her writing and put down "...in which she describes and analyzes her experience spending

time with a young artist with AS," without using the phrase "personal account". This transaction took seven seconds.

In another occasion, M. wrote "The wide spread of AS...." in her writing, she paused then switched to the web browser Chrome and put "wide spread" in the address bar, which took her to the search results page on Google with the basic information of the word "widespread" generated by Google Translate on the top. She read it without scrolling the screen further down, and then she returned to her writing and changed the previous clause into "The wide-spread AS...." This transaction cost her seventeen seconds. Later in the interview, M. explained that she had the habit of checking the use of a word or a phrase in Google. She would glance through the result list to decide if it seemed to be used in the way she expected. Such a habit was clearly shown in the screen recordings.



In addition to looking up phrases rather than individual words, M. also explicitly searched for synonyms multiple times, indicating her effort in accurate expression and enriching the language in her academic writing. For example, she tried several different key words such as "draw attention", "attract" and "attract synonym" by visiting both Google and thesaurus.com before she wrote down "The wide-spread AS draws", and in the end changed it to "The wide-spread AS attracts scholars across disciplines."

Another indication of M.'s potentially higher language proficiency level compared to Y.'s was her use of L1 and L2 in the transactions. M. used only English most of the time (88.5%). She used both English and Chinese in only three out of twenty-six transactions (11.5%) when she went to Baidu.com and checked on Baidu Translate the Chinese meaning of an English word or the English equivalent for a Chinese word.

2.2 Biggest challenge in academic writing

M.'s survey responses indicated that, like Y., while she chose the highest comfort level for the first three items in Section I, she did not find herself comfortable in conducting research in the library. In regards to specific challenges in writing, she found "vocabulary", "sentence patterns", "idiomatic expressions" and "composition organization" moderately difficult, and all the rest of the items slightly difficult or not difficult at all. Out of the six strategies for dealing with different challenges, she only chose "consult the instructor or teaching assistant", "rely on past writing experiences" and

"using digital tools". For the four challenges that stood out from the rest, digital tools were used to address two of them, namely, "vocabulary" and "idiomatic expressions", which seemed to match with what was shown in the screen recordings. Furthermore, while past writing experiences guided her through "sentences patterns", "idiomatic expressions" and "composition organization", instructors and TAs were helpful with "sentence patterns" and "composition organization".

During the interview, M. shared that the most challenging stage in writing was usually at the beginning. For the one she had recorded, it was when she needed to decide what to write about and look for the suitable articles to compare. For writing assignments in general, she felt that coming up with ideas and writing the introduction were the most difficult. Again, there seemed to be a discrepancy between her interview and survey responses in regards to the challenge related to content and coming up with ideas. While it was perceived as "slightly difficult" in the survey, it was reported as the most challenging during the interview.

Interestingly, although she did not identify "understanding the requirements and expectations of the writing assignments" as challenging based on her survey responses, she did mention in the interview that her biggest issue with this specific writing assignment was not able to fully understand the requirements at the beginning. She reported that, not until about two-thirds of way through, she realized her

misunderstanding of the original assignment requirements. While she was expected to focus on the discussion of the comparison between two articles starting from the first working draft all the way through the final draft, she thought she needed to discuss them separately in her two working drafts before putting them into a comparison in the final draft. And that was what she did and it was shown in the screen recordings. She found out about her mistake through the instructor's feedback on her second draft and by reading her classmates' drafts in the in-class "peer review" activity. She wished she could have better understood the writing requirements before she had actually started her planning and writing.

More information regarding the challenges M. was facing was discovered by examining the instructor's feedback. In the written comments, the instructor pointed out several issues that needed attention, including weak thesis that needed more supporting evidence and explanation, ambiguous ideas that required more clarification, awkward expressions and sentence patterns, as well as the issue with a missing in-text citation. Although she received a high grade (9.5/10), the instructor's feedback indicated that they were in agreement about the areas in which she needed improvement.

2.3 Choice of websites and determination of credibility

When writing this particular assignment, M. frequently used a digital library website called JSTOR, especially at the beginning stage when she had to look for two scholarly

articles to compare. JSTOR was a website that she had learned from the instructor of the writing class. She found it easy to use as it supports keyword search and provides full text access through the subscription of the university. Like Y., she believed it was a credible resource because of the teacher's recommendation and its scholarly content.

M. explicitly expressed her preference of digital resources to printed materials. She initially found an article that she wanted to write about for this assignment, but it only existed in the traditional printed format and was not available at the university library. She eventually switched to another article that she had full access to online. She had never taken the initiative to interact with a librarian except once, when she was required by the syllabus to consult a librarian for completing a course assignment. She had not used other pre-installed web-enabled programs or applications except a dictionary mobile application called Youdao Dictionary. She did not use it for this assignment, though.

When using digital resources, like many other students, M. would almost always resort to search engines such as Google.com for help, except when she knew exactly where to go like the JSTOR in this assignment. Just as what was shown in the screen recordings, she would type in an expression or a sentence in the search engine to see if it had been used by other people before. This was a method she had been using to check authenticity of expressions.

In addition, M. would search online for writing samples to read to better understand the genre and expectations for a writing assignment. For instance, she found online that many students who had previously taken the same writing class had created their personal blogs according to the requirements of the previous course syllabus. She did some search and read some of the writings posted to gain a more solid grasp of the writing requirements and conventions of the specific genres. While this strategy did not work very well for this particular assignment, she seemed to like the idea of having a sample writing a lot, as she mentioned it specifically later during the interview regarding suggestions for pedagogical development.

In terms of resource credibility, in addition to what instructors' had suggested such as looking for information regarding the source of the article such as the publisher and the review process, M. referred to "personal feeling" for a few times during the interview. She shared that when she used the online search engines, she usually started from the top of the results list and went down one by one until she found what she wanted. In deciding which one to trust, "probably I would just see whether I feel that it is trustworthy. If I do, then I would use it (in my writing)," she said. When being asked where she thought her feeling of trustworthiness came from, she responded that:" I would of course read the content itself. If the content seems to be from professionals and not amateurs, I would

feel that it is credible. It is just my feeling." While she emphasized the word "feeling", she did name a few more concrete criteria as she went on explaining.

> "I feel that I would probably first determine the genre of the article. If it is an academic paper, especially if it is on a scientific topic, I would feel that it is more objective. Then I would see if it has a long reference list of scholarly works at the end of the paper, and whether it has any formal in-text citations. I would also check whether the author uses first-person pronouns in the writing. If he/she does, I think it makes the article more subjective... Then I may just rely on my instinct (to decide whether the information is credible or not). If I myself happen to share the same idea, I would think that the author is talking about a fact instead of a purely personal opinion."

Like Y., M. was not very confident in her proficiency of using digital tools for academic writing during the interview. She explained that it was because she was still in the process of learning how to evaluate the credibility of resources and needed much more practices in this regard.

2.4 To cite or not to cite_citation and authorship

M. did not spend much time talking about the citation issue, and she seemed to adopt a fairly straight forward rule: if she was using the exact words of others, she would do a

direct quote with proper citations; if it was something that everyone knows, such as a piece of news, she would do a summary without citation; in addition, if the author had a same idea as hers, she might just "reword a little" without a citation. "However," she added, "the instructors are all very strict about this and I don't want to take any risks."

2.5 Social interaction related to academic writing

As indicated in the survey and during the interview, M. did not tend to communicate with either Chinese students or other nationals regarding writing assignments. She believed that students were often working on different topics and subjects, so there was not much to discuss about. Instead, she preferred direct communication with the instructor or the TA via emails or office-hour visits instead. Although she did not know whether the way English speaking students search for information online was the same as hers or not, she believed students would all start from Google if they do not have a specific resource in mind. However, she did think that local students may know more about online academic resources than the international Chinese students. For instance, she recalled that when she heard about JSTOR for the first time in a writing class, it seemed that many local students were already familiar with it. Nonetheless, she had not asked them for suggestions regarding digital resources.

However, she did have opportunities to communicate with other nationals in class regarding writing assignments. There were peer review activities in the writing class she

was taking, and she was often assigned to work with several local American students as the group assignment was based where they sit in the classroom. She mentioned that she once received a very positive comment from one of her local peers about the clarity in describing her thoughts in her paper. Given her self-evaluation and the instructors' feedback about the vagueness of her argument in writing, M. still found the peer's comment surprising and encouraging long after.

M. did not have much to share when it comes to utilizing current campus academic support. She knew the existence of the writing lab, but she had never used its service. She did not see the need for it, just as what she thought about consulting the librarians. She found the writing class she was taking quite helpful in improving her academic writing compared to the other classes she was taking, as the instructor could be more responsive to students' needs and questions in a smaller class. Moreover, she reported that instructors from disciplinary content classes may also give limited instructions towards academic writing, and she did not expect much additional help from those classes with much bigger groups of students. In addition, she felt that the writing classes focused more on how students write and their improvement from draft to draft, whereas instructors of non-writing classes gave writing assignments to check students' comprehension of the disciplinary concepts covered in class. Different focuses resulted in different expectations and requirements, as well as different needs for digital research on the students' end.

2.6 Influence of the cultural-historical and educational background

M. attended the international division of a regular high school in China before she came to study in the U.S.. For all the other students in that high school, the ultimate goal was to achieve high scores in the national college entrance examination after three years of study. Their teachers were almost all Chinese native speakers. For the students in the international division of the school, however, their goal was to get ready for studying abroad upon graduation under the guidance of mostly foreign teachers from English-speaking countries. However, it did not necessarily mean that M. had received more training in English academic writing compared to her peers in the non-international division. On the contrary, she reported that she had not had much practices in English writing in high school, and the teachers did not really talk about research papers.

In addition, as mentioned earlier, M. reported in the survey her tendency in relying on past writing experiences regarding composition organization. This might help to partly explain the issues the instructors saw in her papers, and the confusion she experienced in her English writing in the U.S.. When being asked during the interview whether she saw any gap between her own understanding of a good paper and the instructor's, she described:

> "Sometimes, when I wrote, it was mostly the structure (that was problematic). I am more used to writing while I am thinking, or elaborating my ideas along with or

after the presentation of evidence. But the instructors here usually expect you to write down all of your points before you get to anything that is used to support them. Maybe the teachers' way is more direct. Also, they would normally expect you to describe in great details with a lots of examples. Sometimes I felt that my description or discussion was already detailed enough, but they would think it was not, and I still needed to discuss more...In addition, (the teacher said) there should not be any irrelevant paragraph. For example, when you put forward your thesis at the beginning of your paper, all the following paragraphs should be closely related to this particular thesis. In the past, my writing might include discussions of my ideas that I thought were related to my thesis, but I did not explain the connections clearly. Then the teacher told me I should not do that".

Furthermore, although M. did not use Chinese often in the transactions shown in the screen recordings, she believed Chinese was helpful for her online research. Sometimes it could be because the information she wanted was only available in Chinese; other times it was just easier and faster for her to read through the content and get a general idea of what it was about before she moved on to the search in English; still other times she just wanted to double check the meaning of an English word or phrase in Chinese and make sure it was the one that she needed.

3. X.

X. was a first year female student, 19 years old. She graduated from an International Baccalaureate (IB) program in China. She was a sociology major student, and was taking Philosophy 4 from the Philosophy Department during the time of the data collection. The writing assignment she was working on was an analytical paper focusing on the comparison of the viewpoints of two philosophers. The screen recording files she submitted covered almost the entire writing process from her planning to revising.

3.1 What the screen-recordings showed

X. submitted three screen recording files with a total length of three hours and eleven minutes. She completed the three recordings in two days' time.

Transaction#	Start	End	Type/Motive	Keyword	Interface	Event	Consequences	Language
1	00:08	00:12	12		youtube	started the "2 hour long piano music for studying, concentrating, and focusing playlist", then started to write		
2	00:47	00:57	7		pdf viewer	read the pre-opened "All animals are equal" by Peter Singer		1
3	1:07	1:10	12		金山词霸	Activated the program's floating window		2
4	2:05	2:11	7		pdf viewer	back to "All animals are equal", started to write at 2:18		1
5	2:25	2:42	9		pdf viewer	Read the pre-opened "Paper 1 instruction"		1
6	3;49	4:40	13		Word	Read the lecture notes		1
7	4:41	5:22	7		pdf viewer	back to "All animals are equal"		1
8	6:20	8:17	13		Word	Justapose lecture note with her writing doc		1
9	8:18	8:25	7		pdf viewer	back to "All animals are equal"		1
10	8:27	8:38	9		pdf viewer	Back to "Paper 1 instruction"		1
11	12:49	13:02	9		pdf viewer	Back to "Paper 1 instruction"		1
12	13:06	13:23	5	refer	金山词霸	read the chinese translation (no sample sentences)	Changed "as Singer refers..." to "as speciecism refers to discrimin	3
13	14:46	15:05	6	speciesism	google	read the google translation and results, did not click on any links		1
14	15:56	16:01	9		pdf viewer	Back to "Paper 1 instruction"		1
15	18:25	19:13	7		pdf viewer	back to "All animals are equal"		1
16	19:15	21:34	13		word	read the lecture notes that was justaposed to the writing and highlighted some of them		1
17	30:34	32:30	13		word	read the lecture notes that was justaposed to the writing and highlighted some of them		1
18	32:40	33:17	7		pdf viewer	back to "All animals are equal"		1
19	33:20	34:28	13		Word	read the lecture notes that was justaposed to the writing and highlighted some of them		1
20	37:40	38:00	7		pdf viewer	back to "All animals are equal"		1
21	43:09	43:54	13		Word	read the lecture notes that was justaposed to the writing and highlighted some of them		1
22	57:47	58:27	3	推断/infer	金山词霸	The disctionary gave four English translations "infer, deduce, deducti	"Singer further infers that if we believe that..."	3
23	1:07:18	1:08:14	7	animals emotional capaci	google	Went over the search results and did not click on any links	"for instance, elephants mourn their dead."	1
24	1:17:04	1: 18: 00	3	共同/共同点/共通	金山词霸		"I find there are both agreements and conflicts"	3
25	00:00	1:04	13		Word	read the lecture notes that was justaposed to the writing and highlighted some of them		1
26	03:58	6:00	13		Word	read the lecture notes that was justaposed to the writing and highlighted some of them		1
27	23:30	24:07	7		pdf viewer	Read Utilitarianism (1861) by John Stuart Mill		1
28	24:08	24:37	7	mill utilitarianism it i	google	Got a quote from the lecture note then put it into google but did not continue with the search process		1

Table 8
Frequencies and percentages of transactions of different motives.

Motive(s)		Frequency	Percent	Cumulative Percent
2.00	Synonym	1	1.8	1.8
3.00	Translation	12	21.8	23.6
4.00	Expression	2	3.6	27.3
5.00	Word meaning/ usage	14	25.5	52.7
6.00	Concept	1	1.8	54.5
7.00	Background information/content/ideas	11	20.0	74.5
9.00	Writing rubrics	4	7.3	81.8
12.00	Other	2	3.6	85.5
13.00	Lecture notes	8	14.5	100.0
Total		55	100.0	

In total, fifty-five transactions were found in the three screen recordings files. Data analysis indicated that, like the other two subjects discussed above, almost half (52.7%) of the transactions in X.'s writing were related to language challenges. Among the eleven transactions in which X. looked for background information or content ideas, most of them happened when X skimmed through the related sections of the two philosophers' works in a PDF View software package. X. also went to her lecture notes from time to time to look for relevant points she took during the lectures. In addition, there were four times when X. referred back to the writing rubrics to make sure she was on the right track in her writing.

Although the two transactions categorized under "12. Other" did not seem to be directly related to this writing assignment, they revealed two habitual behaviors of X. at the beginning of her writing. The first transaction happened when she clicked to start a video in Youtube called "2 hour long piano music for studying, concentrating, and

focusing playlist"; the second was when she went to the taskbar at the bottom of her laptop to activate the floating window of a pre-installed digital dictionary named iCIBA.

In terms of the use of search engines, X. only used Google in this assignment. Most of the times, like M., she used it to verify the usage of certain terms and phrases. For instance, she put in the term "animal farm" in the search bar, scanned through the result list to check if was a valid expression, then wrote down "...workers in animal farms" in her writing. There were only three times when X. seemed to be using Google to look for something unrelated to linguistics issues. One time, she put in "animals emotional capacity", then added the word "examples" to the end of the key phrase. Once the results were out, she quickly read through the list without clicking on any specific links, and she found what she needed just by reading the abstracts of the search results. Finally, she went back to her writing and put down "for instance, elephants mourn their dead." The entire transaction took about a minute. In another time, she copied "Mill utilitarianism it is better to" from her lecture note and pasted it into the Google search bar, but she did not continue with this operation. Still another time, she searched for "speciesism", read the Google translation at the top of the result list, and did not click on any links or put anything down in her writing.

The fifty-five transactions added up to about half an hour (31:54), with an average of about thirty-five seconds (34.8) for each transaction. The twenty-nine language-related

transactions took thirteen minutes and thirty-three seconds in total, which left each transaction of approximately twenty-eight seconds (28.03). In comparison with Y. and M., X. spent a bigger proportion of her writing time (almost one sixth) searching for information from digital resources. While her transactions were shorter in general compared to Y. and M., she spent more time in each language-related transaction in comparison.

In looking for language related resources, like Y., X. used a similar pre-installed digital dictionary called iCIBA. Out of the twenty-nine language related transactions, twenty-four of them were directly related to the use of this particular software program. And this probably explains why X. activated the floating window of the program at the very beginning of her writing process.

Another clear pattern found in the recordings was that X. usually put the word she found from the list of translations back in the search bar of iCIBA to verify whether it was the right one that she needed. For instance, she put in a Chinese word "推断" (tui1duan4) in iCIBA and got a list of translations as "infer, deduce, deduction, conclude". Instead of waiting for another second or two until the full content of explanation was loaded, X. picked the first word from the list and put "infer" into the search bar in iCIBA. After skimming through the explanation and sample sentences of this word, she returned to her writing and wrote down "Singer further infers that if we believe that...." On another

occasion, X. searched for the word "coordinate" in iCIBA. The results returned on the screen did not seem to satisfy her, so she changed her search to a Chinese word "符合" (fu3he2). Like in the above example, X. picked the word "conform" from the list of translations and put it back in the search bar, before she finally wrote down "...which conforms to utilitarinism's...." While the previous transaction took forty seconds, this transaction lasted only for about twenty-seven seconds. In addition, unlike M., X. did not spent much time looking for synonyms. Only for once, she went to Google and put in "regardless of synonym" and aborted the operation abruptly without putting anything related in her writing.

In terms of the use of L1 and L2, in about half of the transactions (56.4%), X. used English only, especially when she was reading the works of the two philosophers and the writing rubrics. Then she used both English and Chinese in almost all of the other transactions (41.8%).

3.2 Biggest challenge in academic writing

Survey results indicated that, just like the other two case study subjects discussed earlier, X. found herself very comfortable in using a computer to do her writing assignment and surfing the Internet. However, opposite to Y. and M, she was also very confident in conducting research in the library. What made her stand out even more were

her responses to the section regarding the level of difficulty of each challenge in academic writing. She chose "not difficult at all" for all the items listed.

For writing strategies, she used a combination of strategies to address various challenges, but she did not choose the option "consulting a librarian" at all for any of the challenges. She seemed to be heavily relying on her past writing experiences and current or past ESL writing training most of the time except for dealing with "spelling" and "idiomatic expressions in English". In addition, she sought help from digital tools except for "punctuation" and "composition organization". She also turned to the instructors, TAs, classmates, or friends for help with issues such as "writing requirements and expectations", "writing conventions", "vocabulary", "idiomatic expression", "background information", and "composition organization". In the last section of the survey about the most frequently used digital tools, X. filled in the blanks with "Google" all the way through. The screen recordings revealed that she used Google in about one-fifth of the transactions to address various challenges including language and concept understanding.

During the interview, X. shared that she spent a lot of time at the beginning stage of this recorded writing assignment to fully understand the two philosophers' theories and come up with her own ideas. Everything went fairly smoothly after she had a general outline. However, it was not always the same story. "It really depends", she said, "my last assignment in the writing class (Writing1) which I was also taking this quarter was about

my own writing experiences. If I was working on an unfamiliar academic topic (like this one for the philosophy course), I may need extra time for the brainstorming and preparation process. If I was writing about a familiar topic or my own experiences, there was usually nothing in particular that would cost me extra time."

Although X. did not think she had much difficulty in her academic writing and locating information she needed, there were still resources that she wished she would have had access to. She described a time in her IB program when she failed to gain access to some governmental data about traffic control in Hongkong and had to switch to Copenhagen instead for its publicly available government data. Although she understood that an educational institute may not be able to help with every issue like that, she believed it would be very helpful if more instruction or guidance could be provided to students regarding how to gain access to data bases and governmental resources.

The written feedback given by the teaching assistant indicated that X. did well in this writing assignment. Despite a few misuses of words or connectors and one missing point from the key statements of one of the philosophers, X. presented a clear thesis with well articulated supporting evidence. She received an A (93/100) for the essay.

3.3 Choice of websites and determination of credibility

While lecture handouts and notes were important non-digital resources X. reviewed before she started to write, like other participants, X. did not normally think of the library as the place to go for academic writing. She indicated her preferences clearly in the strategy section in the survey, and she explained during the interview in further details. First, she did not feel the need to go there. "Maybe it is because I am now just a first-year student. I have not had those assignments which would require me to dig really deep in a topic and get access to those really dated resources (that are not likely to be digitalized)," she explained. Second, like M., she remembered the frustrations in her previous experiences in using the online databases on the university library website, and felt that the resources there were neither user-friendly nor easily accessible. She shared the story during the interview:

> "I took a class called Introduction to the Research University last quarter. There was a final paper asking us to read the academic works of three professors of the university and write a paper to demonstrate our critical thinking around the materials we read. I started with the library catalog search on the library website. I don't know if it was because I was not familiar with the website and its structure, I felt that the online search function was not very easy to use. For example, if I use a keyword in Google, it would give me many search results, usually starting from the most

relevant ones. But in that search (the library catalog search), after I typed in the name of the book, many totally irrelevant books turned up. Maybe it was because I didn't remember the exact name of the book? Also, the teacher mentioned that we should be able to access the full text online as we were registered students to the university, which had subscribed to those online resources. But I was often only able to see the abstract of a paper I wanted. Then I thought maybe I should check if I could check out a hard copy from the library. I felt frustrated again when I saw that the number of copies available at the local library was zero. It left me with an impression that the library resources were so hard to use. I ended up going back to Google to search articles written by those professors."

Although the catalog search function that X. had tried out was only a small portion of what the library website has to offer, and she admitted that she had never used the articles and databases search, the negative impression has nonetheless influenced her preferences in information searching. In addition, the type of writing assignment, the teachers' instruction, and her own needs all influenced X.'s decision of what and how much information to look for.

For instance, as the instructor of the philosophy course cautioned them about citing ideas of other philosophers, X. kept it in mind and did not do any research of other philosophers' theories on the topic. She believed it was also helpful for herself; otherwise,

she would be very likely to get confused by all the different kinds of propositions. As a result, just as shown in the screen recordings, she mostly only looked for additional clarification of the two target philosophers' ideas, especially when she could not find a satisfactory explanation from the course materials.

The situation could be different for a different writing assignment. For example, unlike the assignment for the philosophy class, the one X. got from an anthropology course in the previous quarter had a very different format and requirement. In that class, she was asked to conduct some interviews and write an essay based on her interview data and other related materials from the lecture or news from the media. She did quite a bit of research on the websites of various popular media during her brainstorming process.

As for the credibility of the websites and articles found online, X. used the same expression as M. did, which was "feeling" (gan3jue2). While "feeling" may sound vague and abstract, she described some more concrete criteria or methods she had been using in determining the trustworthiness of the information she found online. For instance, she would deliberately go to the homepage of a website after she had read something from its other web pages.

> "The homepage usually contains information about the nature of the website, such as whether it is hosted by an individual or an organization, and whether it is a professional website dedicated to a specific field or a 'hotch-potch' of everything. If

there is nothing I could find about the website itself, I would feel that it may not be very reliable."

In addition, X. would also refer to the domain suffixes for clues regarding the credibility of the resources. Although she often used the word "feeling" in describing her decision-making process, she did provide more details about the development process of her evaluation criteria for resource reliability:

> "They (the techniques) originally came from my high school teachers (when I was in the IB program). They specifically instructed us about the issue with domain suffixes. They said we should try to collect data from official websites of organizations or governments with suffixes such as '.gov' or '.org'. Actually, almost in every subject course, the teacher would talk about what we should pay attention to during data collection or information searching before we did our academic writing assignments. With all sorts of practices and the instructors' guidance, an evaluation system just naturally came into being. That is, you know what you can trust and what you cannot."

3.4 To cite or not to cite: citation and authorship

When considering whether to cite someone else's opinions or ideas, X. would first examine whether they were clearly stated in a logical way and were well supported by

evidence. She would cite more examples than opinions if her own point of view was the focus of the paper; if she was supposed to remain a neutral stand, she might cite and present more different opinions held by others.

In terms of information found in chat-rooms and forums, X. said she may or may not cite, depending often on the length of the resources themselves. If they were just short comments of a few sentences, she found it hard to cite or use directly in her writing. If they were longer reviews, she may consider citing them and spending some time finding out how to do it properly.

3.5 Social interaction related to academic writing

Unlike many of her co-nationals who like doing exam preparations and assignments together, X. shared that she always liked doing those things alone. "I think it is a matter of habit. I feel that I would be more efficient when I am doing my thinking and studying independently," she said, "it is just a personal preference and style." As a result, she usually did not discuss with other people regarding writing assignments, except for visiting the TAs occasionally during their office hours for assistance with expanding ideas and making sure she was on the right track.

X. shared that she did not think there was much difference between international Chinese students and domestic students in using digital resources, except maybe for the

frequency in using digital dictionary and that Chinese students might sometimes use Chinese websites such as Baidu.com. Like M., she believed students would usually turn to Google first, regardless what nationalities they are. She also mentioned that she was actually not very familiar with the ways how her local peers did their research and academic writing, and she had not exchange ideas with them in this regard.

For academic support and faculty instruction, like M., X. understood that it was hard to have detailed and tailored instruction regarding writing assignment and doing research in those disciplinary content classes with a big number of students in one class. But she did think it is very important to provide specific and detailed instructions about citation for students who may not be very familiar with the notion of authorship and plagiarism. She believed the reason why she had not had much trouble in this matter was because her teachers in the IB program understood their needs and gave them meticulous instructions regarding citations. The program even had two courses dedicated to these topics. "I feel that if someone had not told me about it and it was my first time doing a research paper, I would have had very serious problems regarding citations," X. said.

For other on-campus writing support services, although X. had heard about the writing lab of CLAS, she had never been there before. In addition to her preference of working independently, she had a feeling that going to the writing lab not only was unnecessary at this stage but also might have counter-effect if the peer advisors there had

contradictory ideas to hers. "If I am to go there, I would most likely wait until I am almost done and have a very clear framework, then I would just ask them to help me check if there is anything that needs to be slightly revised and finer-tuned."

3.6 Influence of past experiences and educational background

X. attended an international school in China after she graduated from junior high school. In the first year, she finished the Cambridge International General Certificate of Secondary Education (IGCSE) program which was designed for 14-to-16-year-old ESL learners. In the next two years, she did an international education program called International Baccalaureate (IB). Based on the information on the official website, IB is an international educational foundation, headquartered in Geneva, Switzerland and founded in 1968. IB has four levels of programs based on age groups and the purpose of education, namely, primary years program, middle years program, diploma program, and career related program. The one X. took was the diploma program, which "aims to develop students who have excellent breadth and depth of knowledge – students who flourish physically, intellectually, emotionally and ethically" (http://www.ibo.org/en/programmes/).

According to X., the IB program in China was originally offered to the children of foreign diplomats, and it was expanded gradually to enroll domestic Chinese students. There had been quite a few IB authorized schools that could offer the program in Beijing

and Shanghai, but it was still very new in Wuhan, where X. went to school. X. shared that the IB class she was in was the second one in the entire Hubei Province in those days. There was only one IB class in her school with 30 students in it. The school started to have two more IB classes in the next year after she had started. While almost all the courses except Oral English were taught by Chinese teachers in the IGCSE program, the courses in the IB program were taught entirely by foreign teachers.

Like most of the other students who go to international schools for high school education, students from the IB classes apply for universities in foreign countries upon graduation, with their transcripts sent to the foreign universities directly by the program administration center. IB has a highly comprehensive curriculum. According to X., students were required to take at least one course from each of the six main disciplines in the program.

> "The IB program focused on helping students with their comprehensive development. Although I am not a STEM person, and I love social sciences and humanities a lot, I wrote lots of papers (in that program) on all kinds of topics, such as mathematics, physics, chemistry, and economics. So the program was really challenging but rewarding for me," X. said.

She also described another experience of doing a research paper in her IB program. It was called the "Extended Essay (EE)", which was regarded as their graduation paper. The

students were asked to choose a topic from all the disciplines they had learned about and write a research paper of at least 3000 words. In order to finish the paper, the students needed to conduct their own research and collect all the data by themselves. With such intensive and rigorous academic training, X. had done a lot of practice in academic writing. "It was really challenging and tiring. That is why when most international Chinese students feel that undergraduate study here in a foreign country is more difficult and exhausting than their high school years in China, I feel the opposite. It was just because I was super busy during my IB days," X. said. When being asked whether her IB experience made it easier for her to get used to her academic life here, X. gave an affirmative answer. "The frequency of doing academic writing here was much lower than that of the IB program," X. shared. This may help to explain why she chose "not difficult at all" for all the writing challenges listed in the survey.

Such a high school education background also affected her responses towards the question about the influence of her first language. Attending the IB program had shifted the transition between an all-Chinese education environment to an all-English environment to her high school years. For X., Chinese and English were very different in grammar and the ways of thinking associated with them. Nonetheless, with three years' preparation, she did not have much difficulty in adapting to the new environment when she came to the U.S..

4. S.

S. was a first year female student, 18 years old. She graduated from an international school in China. She is a pre-economics student, and was taking the Introduction to Communication course from the Department of Communication. She was also at the same time taking an English reading and writing course offered by the EMS program, where all students were from China. Her writing assignment was an analytical paper for the communication course focusing on a specific episode in the American television sitcom named *Modern Family*. Students were asked to apply the concepts they had learned from the course to the analysis of the characters' behaviors in the TV episode. She finished practically the whole paper in one four-hour-long sitting, and she reported that she stayed up till early morning in order to finish the paper. The screen recordings she submitted covered most of her writing process from planning to revising.

4.1 What the screen-recordings showed

S. submitted three screen recording files with a total length of three hours and fifty minutes. She completed the three recordings in one sitting from late night to early morning the next day.

Transaction	Start	End	Type/M	Keyword	Interface	Event	Consequences	Language
1	00:00	2:22	9		CMS	Read the writing rubric, then started writing the first word (chatting with her friends on wechat i		1
2	08:57	13:04	10		acfun.cn	Switched to a pre-open webpage of the TV episode, then continued to write her writing outline		3
3	23:50	25:48	10		acfun.cn	Back to the TV episode		3
4	27:05	28:47	6		pdf viewer	Read an article about basic communication processes and used keyword search to locate the info		1
5	35:56	36:40	10		acfun.cn	Back to the TV episode		3
6	36:57	37: 22	3	摆手	youdao (preinstalled program)		put down "Cam keeps waving his hands wh	3
7	51:29	51: 39	3	急躁	youdao (preinstalled program)		put down "his impatience and..."	3
8	51:45	52: 05	3	着急	youdao (preinstalled program)		put down "his impatience and anxiety..."	3
9	54:20	54:35	10		acfun.cn	Back to the TV episode		3
10	55:06	57:13	6		pdf viewer	Read an article that has been open about connotati	Read a section called "Gestures and Body M	1
11	1:03:21	1: 03: 27	1	pat	youdao (preinstalled program)		Put down "Cam pats his shoulders and..."	3
12	1:10:54	1:11:18	6		pdf viewer	Back to the article section on "guestures and body	Put down "Haptics is the use of touch to ...	3
13	1:13:16	1:13:36	10		acfun.cn	Back to the TV episode	Afterwards, she formated and corrected wor	1
14	1:15:27	1:19:03	6		pdf viewer	Back to "Real communication_An introduction"		1
15	1:19:23	1:20:42	10		acfun.cn	Back to the TV episode, then back to it a few more times before the end of the recording		3
16	07:43	11:30	10		acfun.cn	TV episode		3
17	11:52	11: 57	3	回忆	youdao		Put down "are recalling..."	3
18	18:03	18:48	6		pdf viewer	Back to the "Real Communication" e-book		1
19	19:07	20:45	6		pdf viewer	Back to the "Real Communication" e-book	Copied and pasted a sentence about "love in	1
20	22:20	22:29	1	care	youdao		Put down "to show his care"	3
21	23:11	23:19	3	化解矛盾	youdao		put down "He tried to resolve the conflicts b	3
22	24:05	25:58	10		acfun.cn	TV episode		3
23	27:40	29:31	6		pdf viewer	back to the "Real Communication" e-book		1
24	29:32	34:06	10		acfun.cn	TV episode		3
25	40:25	42:19	10		acfun.cn	TV episode		3
26	43:19	44:03	10		acfun.cn	TV episode		3

Table 9
Frequencies and percentages of transactions of different motives.

	Motive(s)	Frequency	Percent	Cumulative Percent
1.00	Spelling or part of speech	3	4.2	4.2
2.00	Synonym	7	9.7	13.9
3.00	Translation	23	31.9	45.8
5.00	Word meaning/ usage	7	9.7	55.6
6.00	Concept	10	13.9	69.4
8.00	Citation	1	1.4	70.8
9.00	Writing rubrics	2	2.8	73.6
10.00	Movie/TV episode	19	26.4	100.0
Total		72	100.0	

Seventy-two transactions in total were found in the three screen recording files. Data analysis indicated that, very much like the other case study subjects, more than half (55.6%) of the transactions in S.'s writing were related to language challenges. The next biggest category of transactions was for viewing the related TV episode of *Modern Family*. S. went back and forth between her writing and a popular Chinese video sharing website called Acfun.cn for nineteen times to watch the TV episode, accounting for over one-fifth of the total transactions. Then all of the ten transactions related to concept explanations took place when S skimmed through the related sections in an e-book named *Real Communication* in the PDF Viewer software package. In addition, S. referred back to the writing rubrics twice to read the requirements, and went once to Purdue OWL through Google search to look for citation instructions.

Unlike other case study subjects, S. only used the search engine tool once, which was to locate an online writing lab for citation examples. The number of different interfaces she switched between was quite limited. Besides the PDF viewer, the video sharing website, Purdue OWL, and the online course management system from which she read the writing rubrics, all the rest of the transactions were the use of a pre-installed e-dictionary called

Youdao Dictionary, the same one used by Y., and an online dictionary website called vocabulary.com.

Furthermore, the seventy-two transactions added up to over an hour's time (63:32), with an average of about fifty-three seconds (52.94 secs) for each transaction. The forty language-related transactions took only less than one-fifth (11:44) of the total transaction time, in which each transaction took approximately eighteen seconds (17.6 secs) on average. In comparison with the other three case study subjects discussed above, S. spent the biggest proportion of her writing time (almost one third) on re-watching the TV episode or searching for information from digital resources. While her transactions were significantly longer in general compared to Y., M., and X., it was mostly due to the time she spent watching certain scenes in the TV episode over and over again. The average time she spent looking up words in the digital dictionaries, on the other hand, was shorter in comparison.

In looking for language related resources, same as Y., S. used a pre-installed digital dictionary called Youdao. Out of the forty language-related transactions, twenty-seven of them were directly related to the use of this particular software program. The pattern in language searching found in X.'s recordings was also found in S.'s. S. often looked for the English translation for a Chinese word in Youdao before she went to the vocabulary.com to look for more information about the English equivalent. For instance, she put a Chinese word "赞美" (zan4mei3) in Youdao and found the translation "praise". She then put "praise" into the search bar on the vocabulary.com and obtained the English explanation and some sample sentences, before she went back to her writing and keyed in "positive word to praise his ex-boyfriend". The two transactions took thirty-three seconds in total. Sometimes, she seemed to be looking for alternatives to a word by looking it up on the vocabulary.com. For

example, she first found "sad" in Youdao for the Chinese word "伤心", then obtained a list of synonyms for "sad" on the vocabulary.com. At last, she wrote down "Cam is heartbroken by his disappear." Also, towards the end of this sentence, she was trying to spell the word "disappearance", but got it wrong. She then right-clicked on the word and chose "disappear" from the list of auto-correction choices provided by Microsoft Word instead. Unfortunately, this time, the software did not signify the incorrectness of the word.

In terms of the use of L1 and L2, in about one-third of the transactions (36.1%), S. used English only, mostly when she was reading the digital book "Real Communication" or using the vocabulary.com to look for word usage. She used both English and Chinese in all of the other transactions (63.9%). These involved all transactions on Youdao and the video sharing website where she watched the TV episode with Chinese subtitles.

4.2 Biggest challenge in academic writing

According to the survey responses, S. perceived herself being very comfortable in using the computer or the internet, as well as library resources for conducting research and completing academic writing. She regarded "using appropriate vocabulary", "using connectors and transitional phrases", "grammar", and "having sufficient background information about the topic" moderately difficult. For her, the most difficult of all was "knowing idiomatic expressions in English", as she rated it as "very difficult". She did not find the conventions of academic writing and punctuation challenging at all. When addressing the challenges, S. did not often rely on past writing experiences or her ESL training; instead, she tended to consult the instructors or the teaching assistants more often than the other case study subjects. For instance, she would choose to seek help from them regarding multiple challenges such as "writing requirements", "sentence patterns",

"idiomatic expressions", "background information", "content", and "organization". In addition, among all these six items, only for "background information", she chose using digital tools as another alternative.

Likewise, for "idiomatic expressions", the thing that she found most challenging for her, instead of using digital tools, she tended to turn to her instructors or friends for help. She explained her choices during the interview.

> "Because I think it would be hard to learn those (idiomatic expressions) from the internet and there is no direct way to search for them. You won't know which one is indeed a good one. However, if they are used by the instructors and classmates during written or oral communication, and I happen to notice them, I would gradually learn to use them. Although I also think the fact that I sometimes read some interesting English articles online also helps (in this regard)."

For the screen-recorded writing assignment, S. felt that the most difficult part was to fully understand the related concepts discussed in class before using them to analyze the characters in the TV episode. In order to do that, she carefully reviewed the lecture notes she took, read the handouts, and discussed with her classmates. She believed that the brainstorming stage in academic writing was always most time-consuming and difficult for her.

In regards to different types of resources, S. usually chose to follow the instructors' direction, if there was any, then search online for additional information that she may need. If she could not find it online, she would ask others for help. According to her survey responses, like all other case study subjects, she did not consider consulting a librarian a

viable option for any of the challenges listed in the survey. She gave more detailed explanation during the interview about it.

> "It is just too much trouble and not very operational. For instance, if I want to look for some explanation of a concept, lots of books would have it. It would be hard to know which one(s) I should check out. I may only go to the library if there is one book specifically referred to or recommended by the instructor. If I have to go and check out books, I would still go online first to search and decide what I want."

Moreover, S. could not recall any instruction she had received regarding how to do research by using the data bases on the university library website, although a library tour and a database use workshop was usually an integral part of the university's new student orientation program. Like the other case study subjects, she had not used those data bases and did not feel the need to use them yet. The writing assignments she had so far usually did not require students to go much beyond reading the materials provided by the instructors. In addition, like M., S. also thought that the main difference between the writing assignments given in the writing class she was taking (Ling 3c) and other disciplinary courses was the purpose of writing, with the former aiming at having students practice writing and the latter at making sure students understand the concepts or theories covered in class.

Like many students, when S. went online for information, the first place she would go was Google.com, unless she was looking up a language related issue, such as spelling or translation. In that case, she would directly go to the dictionary websites. This matched with what was shown in her screen recordings. On Google, she would usually start from the top of the search results list and click on the first five links to see if she could found anything relevant; if not, she would do another search by changing the keywords. Occasionally, she

would go to the second page of search results if she was looking for something that was hard to locate. However, she did not often click on the second-level hyper links on a webpage, because she felt that information that came from second-level links was usually not as relevant as that obtained through direct keyword search in Google.

S. described a typical process when she used the online dictionaries. If she thought of something in Chinese but did not know how to put in into English, she would use Youdao.com, the pre-installed Youdao software program on her laptop, or even the Youdao mobile app to look for its English equivalent. When there were multiple results, she would look some of them up on the vocabulary.com or the longman.com for more detailed English explanation and sample sentences regarding its connotations and collocation. She would at last decide on one and use it in her writing. Such a pattern was clearly shown in the screen recordings.

S. did not receive any written feedback on this writing assignment that she recorded. She got a 38/50 grade. So the result was not very informative regarding her writing.

4.3 Choice of websites and determination of credibility

In deciding how to choose websites, S. would consider first about the relevance of the content. When two websites had similar content, she would then consider the nature of the website, such as whether it was a professional website focusing on a specific field of knowledge. In S.'s opinion, websites with domain suffixes of ".edu" or ".org" were more reliable, and websites hosted by famous newspapers or magazines could also be trusted; whereas websites such as wikipedia.com where everyone could edit and comment on the

content did not have much credibility. S. shared that she first learned about these criteria from one of her former foreign instructors in the international school she attended in China.

4.4 To cite or not to cite_citation and authorship

S. answered the questions about citation and authorship rather briefly during the interview. For her, as long as she had used someone else's ideas, she would cite, even if she shared the exact same ideas with the author. Like M., she also mentioned that the instructors had been very strict with the issue of citations and plagiarism, so she would cite whenever possible or even "force" herself to cite, just to be safe. She seemed to be certain about the way of doing the citation when there was no author information on the website. She usually turned to online writing resources such as Purdue OWL for citation instructions as it was recommended by a previous instructor, and such a process was also recorded in the screen recording.

4.5 Social interaction related to academic writing

As mentioned above, S. did not have problem asking the instructors, teaching assistants, or her peers for help regarding her academic writing. While Y., M., and X. did not like communicating with their peers about writing assignments, S. seemed to be more willing to do so in her daily life. For instance, before she actually started writing the current paper for the communication course, she discussed with her classmates about the potential content and structure of the paper, as it was difficult for her to grasp the gist of the related concept and the writing requirements. However, she usually communicated with Chinese co-nationals after class. Communication with local American students only happened during sections under the TA's direction.

S. had not used the CLAS service and did not like going to the library to conduct research. Although she did not think instruction regarding digital resources use was much needed at this stage, she did have a suggestion for instructors regarding academic writing assignments.

> "It would be great if a sample paper can be provided for writing assignments. I find it especially important. I can immediately understand how to go about it. Also, it would be helpful if more detailed analysis or instruction could be done in class before we start on our own writing project. Sometimes it is hard for us to ask questions. But we may have our 'oh, I get it now' moment once we get the answer from the analysis to the questions we have left unasked."

S.'s preference of a sample paper was also shared by M. as discussed before. Considering the comparative fixed requirements and expectations towards academic writing assignments, a sample paper may be helpful for students, especially international students who might have trouble understanding the writing requirements.

4.6 Influence of past experiences and educational background

S. went to an international school in China after she finished junior high school. There were both Chinese teachers and foreign teachers. She had research paper assignments during her high school years, so she did not experience as much an adjustment in English academic writing as that of her other Chinese peers, who did not have any research experience in the past.

As for the influence of her first language, while she agreed that it was sometimes helpful as she would search in Chinese websites, she thought the negative influence was more

obvious. She reported that as it would cost more time for her to read in English, she would get tired more easily and did not want to continue reading. In comparison, local American students are at a great advantage as they are able to read more English materials in less time and hence do better in academic writing. In addition, like M., she mentioned the influence of the different way of thinking across languages.

> "In writing, we think differently when using Chinese. People here seem to prefer a clear three-part structure for a traditional academic paper, and it is a different way of describing things. I feel better now. When I first came here, I tended to 'beat around the bush' and go back and forth or in different directions in my discussion. They told me not to do this and just say directly what I meant to say."

5. C.

C. was an 18-year-old first year male student, he was also the only male student who had volunteered and been successfully recruited for the case study. Unfortunately, after several attempts, he found that the screen recording was simply too stressful for him, so he was not able to do it. "Whenever I started the screen recording program and tried to write, I would feel very uneasy, as if someone was watching me all the time. I started it and paused it for a few times without being able to write down a single word," he described, sounding frustrated. However, he was happy to share in the interview about her writing experiences and his thoughts about the challenges of English academic writing for international Chinese students.

C. graduated from a regular high school in China. He was a pre-biology major student here in the U.S.. He had not taken any classes in the writing program, but had been taking

the English reading and writing sequence (Ling3b and Ling3c) in the EMS program since his first quarter in the U.S.. The writing assignment he originally planned to record was for a sociology class on the topic of racism. For the reason mentioned above, he was not able to do the screen-recording of his writing process.

5.1 Biggest challenge in academic writing

According to his survey responses, like most of the other case study subjects, C. felt highly comfortable in using the computer and other digital tools in his writing, but did not like conducting research in the library. For C., "sentence patterns", "connectors and transitions", and "composition organization" were slightly difficult, whereas "writing requirements", "spelling", and "grammar" were moderately difficult. He felt that using appropriate vocabulary and idiomatic expressions were very difficult for him and all the rest of the items listed were not difficult at all.

For writing strategies, like S., C. seemed to prefer to seek help from the instructors or teaching assistants, as well as his classmates or friends. He chose these two strategies for addressing almost all the challenges listed, except for "sentence patterns" (not included in "consulting the instructor or TA"), and "writing conventions" and "vocabulary" (not included in "discussing with classmates or friends"). He also liked using digital tools to help with many of the challenges, except for "assignment requirements", "punctuation", and "composition organization". He chose "relying on past writing experiences" only for "writing requirements and expectations", and chose "relying on current or past ESL writing training" only for addressing "grammar accuracy". Like almost all the other case study subjects, he did not choose "consulting a librarian" at all in the survey.

Although C. did not feel "content (having enough ideas to write about)" difficult at all, during the interview, he reported that the most challenging and complicated issues in academic writing for him were to have his main thesis, come up with content ideas, organize and elaborate on the ideas, and probe deeper into the topic. Regarding these issues, he believed that there was no difference between writing in different languages.

> "The ultimate goal of writing is to describe your thinking. A good paper is a paper that can clearly and appropriately express your thoughts and probe deep enough into them. It is the same when writing in Chinese. So the real difficult part in writing is how to best express your ideas. For me, it is no longer a matter of language; it is a matter of expressing my ideas."

During the interview, C. reiterated his preference towards using digital tools in writing. He used a Microsoft preloaded network-enabled dictionary a lot, because it was most convenient for him. However, he was cognizant about the accuracy of the search results in the online dictionary. As he understood that different words should be chosen for different contexts, he would go over the sample sentences to determine which word or phrase would be a good fit in the current context. In addition, he did not use any mobile apps to assist his writing process. "When I am using my phone, I google. So there is nothing different in essence (compared to using the Internet on the computer)," he said.

While he seemed to like communicating with instructors and other students a lot based on his survey responses, he reported that situations varied. For example, the instructor in the English reading and writing class he was taking had specifically arranged certain class time for group discussion and exchange of ideas. But C. found the process not very efficient and helpful. Sometimes the students working on the same writing topic did not live closely

together, so there were not many face-to-face interaction opportunities for him to exchange ideas with them regarding the common topic. As a result, he often had to rely on himself to figure out what and how to write, and look for inspirations and ideas by reading materials online. In addition, as he was a pre-biology major student, online resources were useful and important not only when he was working on a science research project, but also when he was investigating topics in social sciences and humanities that were not familiar to him.

5.2 Choice of websites and determination of credibility

Unlike many students who would go to Google for most information searches, C. had his own way of online research. He liked bookmarking different types of websites, especially those that he found useful and credible, and going back to those bookmarks directly when needed. He categorized those bookmarks into different groups for convenience of use.

He used sciencedaily.com as an example. He liked going to this website to search for published studies on various science topics. The website aggregated press releases about the latest scientific discoveries as well as journals and academic papers in that field. The website supported keyword search and the interface was user-friendly. C. liked this website for several reasons. First, its multimodal content with text, images, and sometimes videos makes a science topic more accessible and appealing to read, compared to the "all-text" appearance of other journal databases; second, it often provides a brief summary in easy-to-understand words for an academic article and the digital object identifier (doi) to it, so it again increases the readability and accessibility of scientific topics; three, the content of the website is updated several times a day, and it is helpful for users to get a sense of the latest development on a specific topic. As a result, the sciencedaily.com had become C.'s main platform for learning more about science topics outside class.

In addition to the sciencedaily.com, C. also mentioned that websites hosted by famous associations or journals such as www.sciencemag.org and nature.com were among his favorite websites as well. C. knew that the university library website and search engines like Google Scholar could also be helpful, but he had never used Google Scholar, and he did not like searching on the library website and its databases. He felt that the content and web pages on the library website looked really dull and boring, and they were much less interesting than the multimodal content on websites like the sciencedaily.com. When he did turn to Google.com for information, C. would usually determine the credibility of a link based on the information revealed in their domain names. Like other case study subjects, he tended to choose those ended with ".edu" or ".org", or websites hosted by renowned organizations or institutions.

5.3 To cite or not to cite_citation and authorship

In regards to doing citations, C. reported that he would cite whenever possible, because the instructors were all very strict about citations and he was afraid of committing plagiarism. He shared that he almost never went to online chat-rooms or forums for information for academic purposes, as remarks and comments there were too casual and unprofessional. If someone influential in the field happened to have the exact same idea as his, he would cite it as an evidence to support his argument.

5.4 Social interaction related to academic writing

C. communicated with his co-nationals from time to time, but usually not about issues related to academic writing. He did not know many American students, but he was getting along well with his two roommates, who were both American students, and a few local

students living across the hallway. He often exchanged ideas with them for academic purposes. For instance, he once asked for their opinions regarding racism, the topic for his current paper, and found that his local friends had very different perspectives in examining sensitive social issues like this.

When talking about the differences between international Chinese students and local students in academic writing, C. believed there was not much difference between these two groups in general, except for the different English proficiency levels.

> "(American students) may know a bit more about the writing conventions, but I don't see it as a big problem. Chinese students did not have much training in this field. Once they familiarized themselves with these (conventions and topics), they are more or less the same as the local students. I believe it is more about individual styles. There are in fact pretty big discrepancies between individuals. (In using digital resources), some people may find some very weird and unreliable sources and directly use them in their writing; some people would prefer highly scholarly works. I think it is a matter of personal preferences."

However, C. did mention the difference he found in the values held by these two groups of students, which was unveiled mostly during the interactions he had with his roommates and a few other local friends. Unlike other case study subjects, he had the opportunity to observe how his roommates did research online. Again, he did not find much difference between him and local American students in going to Google with keywords and clicking on the first few results returned on the screen.

In terms of consulting the instructors and teaching assistants, C. specifically pointed out that the instructor of the English reading and writing class in the EMS program helped him a

lot with his English grammar. He used to have great difficulties with grammar, which affected his academic writing seriously and was reflected in the instructors' feedback to his writings multiple times. According to C., it was also the main reason why he had to take the English reading and writing course sequence for multilingual students. He was determined to make progress quickly, so he went to the instructor's office hours and asked her to help him find out all the grammatical errors he had in a paper he wrote. Then he made changes to all the errors and memorized them by heart. From then on, he became extra careful with grammatical issues and proofread everything he wrote. After some time, he found that his grammar was indeed significantly improved. He was happy and felt more confident about his writing.

When talking about the current on-campus academic support and resources for international students, C. did not really focus on the academic aspect. Instead, he thought the biggest issue with Chinese international students was not being motivated to "mingle in". "I feel like we are not in the same circle. If we look at the American students as a circle, the Latino students a circle, and the Chinese students another, there is not much intersection between these circles," he said.

C. believed that such a phenomenon affected interaction and exchange of ideas between students, and it was not beneficial for international students in their academic and social development. Unfortunately, according to C., although many international students might feel isolated from time to time, they either had no intention to change the situation or did not know how to do it. With time, many them got more and more comfortable of staying inside the "circle" and even started to have this strange feeling towards those Chinese students who were able to "fit in" better and see them as "traitors" who betrayed their co-nationals. At the

mean time, the majority of the local students also did not seem to be interested in really embracing the multicultural campus environment and reaching out to the international student groups. C. believed that it was a very complicated issue with lots of different factors at work. He wished that the university and the instructors could do more to build a real effective "bridge" between different student groups and to foster a campus culture of learning and sharing across cultures.

5.5 Influence of past experiences and educational background

C. attended a regular high school before he came to the U.S.. But he shared that as he had decided to study abroad in his second year in high school, he had stopped preparing for the National College Entrance Exam since then. Instead, he spent most of his time learning English and preparing for TOEFL and SAT. He had no experience in doing research papers in high school, and all the argumentative writings he had to do did not require citations and references. As a result, the academic writing assignments he had after he came to the U.S. were challenging for him.

C. felt that, although the inadequate English proficiency might be a disadvantage for him in English academic writing, the mastery of Chinese gave him more flexibility in searching for information online. In addition, his social-cultural background enabled him to look at things differently compared to the local students.

> "I look at things from a different perspective. I have a different world view, and I think it is an advantage. The multicultural background gives me a more diverse and comprehensive view. Compared to the mono-cultural people, I can see deeper and broader. It is a plus, in my opinion."

VI. International Chinese undergraduate students' English academic writing in the digital age: a mediated activity

A. Perceived challenges and the role of different resources

The discussion in each of the following subsection, as well as in Section VII, is given to address the six research questions listed in Section II one by one. The main findings about the identified challenges in students' academic writing largely corroborated those in the literature. The data from the survey and the multiple case study provided evidence for participants' perceived writing challenges. While basic matters such as "punctuation" and "spelling" were seen as least difficult by respondents, issues requiring more extensive language and culture learning, higher-level thinking, as well as better understanding and knowledge of subject matters were considered the most challenging by respondents. That was exactly what was revealed by numerical evidence representing ratings for challenges like idiomatic expressions, background information, and content ideas.

In regard to other frequent topics in second language writing discussions such as writing conventions, grammar, and sentence patterns, most respondents neither dismissed them as "not difficult at all" nor thought that they were difficult to the level of hindering the progress of writing. This might probably be explained by the intensive training of sentence patterns and grammar they had normally received in the past in language classes and during exam preparation, as well as the basic practices and instructions they had before related to writing conventions. In terms of the issue about composition organization, while it could be another major issue found in second language academic writing based on previous studies, considering the fact that the research subjects of this study were all first-year undergraduate students and they were usually given a fairly fixed and clear structural template for their

assignments, it was usually not regarded as one of the major obstacles. However, two of the case study subjects did mention the confusion they sometimes had due to the misfit between the argumentative style they were more used to and the current expectations towards academic writing regarding the organization of ideas.

An interesting discrepancy was found between the survey and the interview responses in what stood out as the most challenging part in writing. On one hand, participants usually did not see "content" as the biggest challenge in their survey responses, but very often reported it as the most time-consuming and challenging part during the interview. For instance, in the multiple case study, both X. and S. described coming up with content ideas as the most difficult part in the current assignment. In addition, the survey data indicated that using digital resources and consulting the instructor or TA were the most popular strategies tackling this challenge. Apparently, these two methods were in fact either not very efficient or straight-forward, so students may report "content ideas" during the interviews as the biggest challenge instead of those they had selected earlier in the survey. Furthermore, the screen recordings suggested that research subjects often did not really look much beyond the given digital course materials or the most obvious online resources such as the online course book or the video clip of the TV episode. As a result, the help from these materials for their coming up with ideas could be very limited. Given the time required for critical thinking and brainstorming, indirect accessibility of external help and support, and strict time constraints due to the procrastination habit many students have, it is understandable why students would single out "content" as the most challenging issue in their writing during the interviews.

On the other hand, although most of the survey respondents believed that "knowing idiomatic expressions in English" was challenging, it may be an issue more easily and

directly addressed by using digital resources compared to coming up with content ideas. The screen recordings indicated that students frequently used online dictionaries or search engines to look up translations or explanations for words and phrases. Although they often did not spend much time carefully reading through sample sentences, they were indeed able to glance over a few of them to get an idea of the most common connotations and collocations. While learning idiomatic expressions in a language is far more complicated than knowing about specific words and phrases, students might not find it the most immediate obstacle for completing their current academic writing assignment, especially when modern technology had made it easy and quick for them to find something to use.

Another thing to note was that students did not equate "knowing idiomatic expressions in English" with "being able to clearly and fully expressing ideas". For instance, both Y. and her instructor considered clarity in expression as one of her biggest writing challenges. While Y. mainly attributed it to her inadequate second language proficiency, as was discussed previously, it could be a more general issue related to linguistic, cognitive, and rhetorical factors. In addition, while another research subject, C., also reported that expressing thoughts in mind was the most important but difficult part in writing, he did not see it as a matter only related to language proficiency. Instead, he believed it was a more general and complicated issue in academic writing, regardless of the language in use.

In order to achieve the goal of successfully completing an academic writing assignment, the students in the current study utilized different types of resources. Among all the resources included in the survey, library resources and digital ones stood at the two ends of the continuum in terms of frequency of use. Consistent with findings in the literature (McClure & Purdy, 2013), most survey respondents did not feel very comfortable with

doing research in the library, especially when they associated it with using the online library catalog to locate most relevant books or hard-copy journals, finding them on the shelves, and checking them out from the library. In addition, "consulting a librarian" was shown as the least favorable strategy for addressing writing challenges. The more in-depth multiple case study indicated similar results. Except for X. and S., the other three subjects gave low ratings for their level of comfort in using library resources. In addition, although students' experiences with the library resources were highly individualized, M., X., and S. specifically complained about the irrelevance of search results and the unsatisfactory accessibility of resources of the university library databases. As McClure and Purdy (2013) put it, "we are very much an 'instantaneous' generation" (p.359), the research subjects' lack of success using the resources and features on the library website had probably discouraged them from going back to the library and reinforced their reversion to other generic websites and search engines.

As a contrast, respondents not only felt very comfortable using digital tools for writing, but also often see digital resources as their first choice in problem-solving during their writing process. A further discussion of students' use of digital resources would be given in the next section. When it came to other major types of strategies, although it seemed natural that students would often choose to rely on their past writing experience or ESL training, based on the survey responses, they were not as reluctant to ask their instructors or teaching assistants for help as they were often assumed to be. In fact, a considerable proportion of the respondents reported that they would turn to their instructors or teaching assistants regarding writing requirement and expectations, conventions, background information, as well as proper ways of doing citations. The same phenomenon was found in case study subjects' interview responses. In addition to common challenges mentioned above, X., S. and C. also

found help from them for issues such as expanding ideas, idiomatic expressions, and grammar.

In addition, although Selber (2004) argued that "students often believe computers can solve ill-defined problems that require interpretation, anticipation, judgment, intuition, creativity, novelty, or improvisation or that are steeped in ambiguity" (p.47), the data analysis in this study suggested something different. While digital tools and web-enabled content may seem to be the most convenient and favorable resources in the research subjects' academic writing process, so far, they are not able to address all challenges students have, and the students are cognizant of this.

Furthermore, instructors and teaching assistants are the most important community members in the bounded activity system of these students, and they are the main social others these students interacted with and were influenced by in their academic writing. They are regarded as a reliable source of information and guidance, and their perceptions and expectations towards these students play a key role in the students' decision-making process. Other potential members of the system such as friends and peers, librarians, and staff of the campus learning support center seem to be more peripheral at this stage. The research subjects either did not feel the need of interacting with them, or had reservation about the efficiency of seeking help from them. In addition, these community members do not usually take the initiative to reach out to the students nor directly influence their writing process.

B. The use of digital technology in academic writing

In this digital age, the contemporary writing context now offers an extensive array of networked artifacts (Park & Kinginger, 2010). The use of these artifacts is prevalent in students' academic writing, and their mediating effect was clearly shown in the current study.

The common networked artifacts found in the screen recordings included web-enabled pre-installed digital dictionary, online dictionary websites, search engines, course management system, multimedia content sharing websites, social-networking websites, and other information content websites. Another important digital artifact was the Microsoft Office word processing program. Considering the fact that the said program has been one of the most established digital artifacts in the writing context, it is not included in the discussion of the current study. The survey responses indicated that using digital resources was the most frequent and favored strategy for this group of students, and the screen-recordings revealed a more detailed picture of the mediating effect of these tools.

Each multiple case study subject who had submitted their screen recordings (Y., M., X., S.) had dozens of transactions (ranging from twenty-six to seventy-two) throughout their writing process. The time these switching back and forth between the networked artifacts and the students' word processors accounted for a substantial proportion of their authoring time, from at least one-eighth of it to almost one-third. In other words, these short-term motive-directed operations permeated through the students' entire authoring process, and all these mediated operations contributed to the realization of the research subject's current goal -- completing the writing assignment.

In addition, while these students might have spent some time doing braining storming and planning for their writing, they mostly revised while they were authoring and did not

seem to allot much time specifically for revision at the end. It may be because they were not able to do so, given the fact that many of them finished their assignments or writing drafts in one lengthy sitting. Even if they did have a specific revision process, like Y., there were no transactions recorded during that stage.

Furthermore, the significant impact of subjects' second language proficiency level was apparent in the mediating process of the digital tools. The screen recordings showed that these four first-year international Chinese students spent about half of their transactions on language-related operations. This means they paused their writing at least a dozen to almost three dozen times to turn to digital tools for help with a word or a phrase. While they might have got used to such a severe interruption to the flow of their writing, the impact was real and faithfully captured by the screen recordings.

Additionally, patterns of language-related operations found in the data also provided a hint about the different language proficiency levels of the research subjects and their desire of learning and using a more enriched language. At least three types of operations were found in this regard. The first one was simply typing in the Chinese and picking an English translation from the list to use; the second one was double-checking the selected English equivalent by using it as a keyword for a second search; the last one was looking up a synonym for an English word or phrase without using Chinese in the first place. From a CHAT perspective, students' second language proficiency levels influenced the way they used digital resources, and the related operations represented a specific stage in their language development trajectory over time.

Although the transactions seemed to keep interrupting the case study subjects' writing, they did help to address various challenges and keep the writing going until it was

completed. The data analysis suggested that students used these web-enabled tools to look for words and expressions, read and reread course materials and writing requirements, look for inspirations and content ideas, and learn about proper citation formats. Due to the nature of each specific writing assignment and research subjects' current stage in their academic program, there were not as many transactions related to the use of search engine and wikis as other studies had found. However, the data analysis indicated similar findings regarding the students' reliance on "the same few tried and true resources" (McClure & Purdy, 2013, p.xii).

Additionally, just as Prabha, Connaway, Olszewsk, and Jenkins (2007) described in their study, once undergraduates' needs are satisfied, they would stop their searches. These needs could be reaching the requirements of the assignment, and having enough material to write the assignment. The data of the current study not only presented the limited toolbox students were using in completing their writing assignment, but also revealed their unwillingness to further explore what was available in the plethora of web sources and rich information resources beyond what they deemed necessary. For instance, almost all of the case study subjects shared that they did not feel the need to go to the library or communicate with the librarian, or the need to exchange ideas with their local peers regarding the writing assignments. X. even thought that looking up information further beyond the course materials would get herself confused and make the writing less manageable.

In addition, when the subjects did use search engines like Google, they demonstrated similar behavior both through the screen recordings and their interview responses as what was found in the literature. As long as they thought the links looked trustworthy, the first five were usually what they would click on. They normally would not pay much attention to

the second-level links nor tend to go back and reread any sources. Given the very short average duration of each transaction, these students' digital behavior had the characteristics of "power browsing" used by other researchers (Bohn & Short, 2009; Hargittai, Fullerton, Menchen-Trevino, & Thomas, 2010). As a result, their level of engagement with resources during their writing process can often only be described as functional.

In terms of the languages used, every case study subject used their first language Chinese in the transactions, but the frequencies varied from as low as 11.5% (M.) to the highest 63.9% (S.). Most Chinese uses were seen in language-related transactions, and some were related to the searching and reading that took place on a Chinese social networking service website (Y.). The use of Chinese in the language-related transactions seemed to be associated with research subjects' second language proficiency level and the patterns of searching that were previously discussed.

C. Representation of students' multiliteracies

In additional to the discussion of the digital tools' mediational process that was directly observable in the data, a more in-depth examination of the process was conducted under the multiliteracies framework (Lankshear & Knobel, 2006; Selber, 2004). Cultural historical activity theory emphasizes the two-way interaction between human beings and the cultural-historical context, the tools and the community. The investigation of how students' functional, critical, and rhetorical literacies (Lankshear & Knobel, 2006; Selber, 2004) were represented or influenced during the process of their using the digital tools in academic writing not only adds to our understanding of their digital behavior and decision-making process, but also urges us to further examine how their actions were social-cultural-historically situated.

McClure and Purdy (2013) believed that the almost universal access to search engines means that finding information is now rarely a problem. In the current study, 86% of the respondents who had answered Section 1 in the survey felt "very comfortable" or "extremely comfortable using networked tools in doing academic writing, whereas only about 29% felt the same way about using library resources for the same purpose. In addition, the multiple case study subjects did not report or seem to have much difficulty in navigating around the web-enabled tools and locating what they need. Despite the frequent transactions they had during their writing, each transaction was usually short and direct, and did not contain many trials and failures. Based on what was shown in the screen recordings, research subjects seemed to know almost instantaneously what operations to take in accordance with each specific motive. They knew what tools to switch to, how to get to or activate the tool, and how to locate the information they needed. Although some of them mentioned the disadvantages regarding finding authentic English resources as second language learners, none of them considered that as an obstacle too big to be overcome.

Selber (2004) cautioned researchers and educators not to overpromise the effects of computer technologies. He believed that although functionally literate students may be equipped for effective computer-based work, "such work will remain obsequious and underdeveloped without the richly textured insights that critical perspectives can provide" (p.73). Furthermore, Kuutti (1996) contended that, from a CHAT perspective, the tool can be both enabling and limiting. While it empowers the subject in the transformation process, "it also restricts the interaction to be from the perspective of that particular tool or instrument only; other potential features of an object remain 'invisible' to the subject"(p.14). When it comes to students' use of web-enabled tools, their critical literacy has often been at the center of discussion in the literature. While many different aspects can be fore-grounded

in the investigation of students' critical literacy, the current study specifically examined how the research subjects decided what websites to visit and what information to trust and use in their academic writing.

Unlike in the more traditional paper-pencil environment, in the digital age, young people seem to have more freedom in exercising their agency to determine about the authoritativeness and integrate what they believe or have learned from the past into their present decision. Meanwhile, the multiple layers of complexities and constraints are making the task more challenging for them. For the research subjects in this study, the complexities may include the innate credibility issues of online resources associated with their ubiquity and anonymity, the inadequate transparency of online content production, as well as the often misleading or even deceiving ways of information presentation and layout design of the web-enabled tools. The constraints, on the other hand, may include second language proficiency levels, students' understanding of the writing requirements and expectations, their past and present writing experiences, the related instructions they had received, their experiences with web-enabled resources, and the time limits. In the face of these complexities and constraints, the research subjects' description of strategies or the decision-making process often sounded brief and simple.

Like what was found in the previous literature (Rowlands et al., 2008), when using online search engines, most of research subjects normally only clicked through the first five links on the result list. In deciding what to trust, their description of criteria could be summarized into two main categories: whether the resources were recommended by the instructors and how they personally "feel" about the resources. These students had a lot of trust towards their teachers and teaching assistants and took their recommendations and

suggestions very seriously. In terms of their personal feelings, although they talked about it all the time, a closer examination of their interview responses revealed that there were actually multiple factors contributing to the formation of their "feelings" about the reliability of the resources.

The common factors included the nature of the websites based on their domain suffixes, the information about the website owner, the layout, the presentation of content, and other information displayed, the genre of the online articles, the profile information of the authors, whether the idea looked like a common view or a personal opinion, and whether it coincided with the student's viewpoint. Some of these factors were hard to describe in details in a short time during the interviews or too vague to be put into words, and the knowledge of them was gradually developed throughout all these years in formal and informal education environments through instructional activities and students' learning and practices. As a result, when being asked how they decided whether a source was credible, they would most likely resort to the rather general and flexible term "feelings".

Nonetheless, neither the screen recordings nor the interview responses suggested that research subjects would normally spend much time pondering over the issue about resource credibility and subjectivity. Like Y. mentioned, unless it was something that she decided to cite in her writing, she would not worry too much about the credibility issue, especially when she was only looking for inspirations. However, although there were indeed students who might trust and use whatever they could find online without differentiation in their academic writing as what C. had mentioned during the interview, the participants in this study did seem to be able to think critically and make decisions regarding the trustworthiness of the digital resources.

Kern (2015) asserted that each choice a student make "entails subsequent decisions about the particular mediational tools and techniques to be used, and the most appropriate styles and forms of language to employ. These decisions matter, because modes, technologies, and language are not neutral conduits" (P.212). Although Kern's remarks were for digital production in a broader sense, they also succinctly summarized the cultural-historically situated nature of students' academic writing activities in the current study.

In addition, according to the students' self-evaluation of their proficiency in using digital resources, they were cognizant of the developing stage they were on in their multiliteracies development. Although concepts in Selber's (2004) critical literacy approach such as design cultures, contextual forces in computing infrastructures and curricular requirements, and popular representations of computers in the public imagination were no doubt highly important and instrumental for the design of a multiliteracy curriculum, they seemed to be a bit far-fetched and not suitable when it came down to the discussion and evaluation of students' goal-oriented actions in finishing an academic writing assignment. Given their current stage in the undergraduate program and the requirements of their writing assignments, within this specific context, the research subjects' critical literacies regarding the use of digital resources did not seem to lag too far behind the expectations of the instructors.

In addition to the discussion of students' critical skills in evaluating the trustworthiness of resources, this digital generation's understanding of authorship is another popular topic in the multiliteracies research. Knowing what to cite and how to cite is considered highly important in students' knowledge about the conventions of academic writing, making their writing credible and persuasive, and promoting it as a form of social action.

Researchers found that college students mostly utilized four source-use techniques, namely, copying, patch-writing, paraphrasing, and summarizing (Howard, Serviss, & Rodrigue, 2010). There was no obvious copying found in the present study based on the screen recording data. In deciding authorship and whether citation was necessary, similar to the way they evaluated the credibility of digital sources, participants relied on teachers' instructions as well as their own judgment. While X. had received specific training and practices about writing research papers and doing citations, the other case study subjects did not feel that they had had adequate instructions or practices in this regard.

The basic criteria participants were using to decide whether citation was needed or appropriate included the following: whether it was from a scholarly article or at least a longer and more organized writing instead of a brief review or comment found in an online chat-room or forum; whether the article or source was found on a professional website; whether it was used directly in the writing or if it only facilitated the brainstorming process; whether it was closely related to the thesis the student was trying to develop; whether the author profile information could be easily found; whether the author seemed to be an important figure in the field; whether the idea seemed to be a common view or just the author's own opinion; whether it seemed to coincide with the writer's own idea; and whether the current writing assignment focused on a review of the existing works or on the author's own ideas.

Furthermore, as several of the research subjects specifically mentioned in their interviews, the participants' citation decision was also influenced by the strictness of their instructors towards this issue and the potential consequences of plagiarism. However, in addition to instructors' strict policies, more specific guidance and practices dedicated to

doing citations in academic writing are needed to help students develop genuine understanding of authorship and academic integrity. Just as X. shared in the interview, "I feel that if someone had not told me about it and it was my first time doing a research paper, I would have had very serious problems regarding citations."

In addition, Hyland (2005) believed that, when the identities supported by the local discourse and practices are very different from those international students bring with them from their home cultures, students often find it hard to communicate appropriate integrity and commitments, which, in turn, "undermine their relationship to readers" (p. 178). And this is exactly what many international Chinese students are dealing with. Coming from a collectivist society, unless there was clear indication of authorship, information circulating online was often regarded by the students as public assets or common knowledge to be used freely in their work. Moreover, with the development of technology and the distributed nature and prevalence of online resources, the issue of authorship is getting more and more complicated. As a result, further research and clarification about this issue is needed, especially in the field of academic writing.

D. Students' interaction with social others

Writing is a social and rhetorical activity. Kern (2015) asserted that literacy "is about becoming socialized (and socializing others) into particular cultural practices"(p.221). Students' academic writing activity not only takes place in a social-historical context with specific social purposes, but also involve multiple social others. Hart-Davidson (2007) pointed out that "composition is typically influenced by or directly involves the efforts of many people, even when a writer is working 'alone' or is perceived to be the sole author"(p.156). In this study, the interaction between the case study subjects and other

community members was explored. The findings seemed to contradict some of the commonly-held assumptions or reveal the other side of the story.

For instance, as what was discussed earlier, the instructors and teaching assistants seemed to be the most involved social others in participants' academic writing activity. While many people may be under the impression that international Chinese students do not like or try to avoid interaction with authoritative figures like teachers, all the case study subjects seemed to have no problem reaching out to their teachers and teaching assistants for help. Consulting the instructors and TAs was also recognized as a preferable strategy by many survey respondents. Moreover, the teachers' instructions, requirements, and expectations were among the major factors influencing or determining students' decision-making processes throughout their technologically and socially mediated academic writing process.

Also, although research indicated that international students usually had a strong bond with their co-nationals and liked communicating with one another in and outside the academic context (Chapdelaine & Alexitch, 2004), the situation seemed to be different in regards to academic writing. Based on the survey responses, not many students thought peers and friends were helpful for addressing the writing challenges. Most case study subjects believed that communicating with other students was neither necessary nor efficient, especially when others were not working on the same assignment or topic.

In addition, students were more used to the idea that writing is an individual work. Although collaborative writing is gaining popularity in recent years, these students still preferred working alone in their writing task to collaborating with others. And students' previous educational background may play a role in this. Some of the research subjects

mentioned that they did not have much experience in working in group projects or collaborative writing, and individual work had been receiving much more attention in schools in China. As a result, compared to instructors and TAs, peers and friends were not always as involved and influential in these students' academic writing activities.

Nonetheless, some students did express their desire of having more interaction with other groups of students inside and outside the classrooms. C. specifically shared his concerns about the lack of intersection between different student "circles", which he believed created more challenges for international students in their academic and social development. Moreover, for students who did like exchanging ideas with their peers regarding their writing assignments, like S. and C., the participation of their peers in the process can be beneficial, especially in aspects such as clarifying writing requirements, brainstorming, and expanding ideas. Additionally, although the research subjects seemed to interact even less with local American students, once they did, as in M's case, the interaction may have unexpectedly positive and lasting effect on them.

However, when someone was seen frequently interacting with local students, the potential negative reaction from some co-nationals, like what C. had mentioned during the interview, was thought-provoking. Some researchers argued that identity should be seen as less a phenomenon of private experience than a desire for affiliation and recognition in particular social networks (Shotter & Gergen, 1989). Although the influence of the struggle of identity may not be directly observable from the current research data, the double pressure from "fitting in" and "maintaining group membership" no doubt added to the socialization challenges for international students and the complicatedness of the issue of identities in the academic context. And this issue certainly warrants further research.

Responses regarding students' interaction with other potential community members such as librarians and other campus learning assistance providers were solicited in both the survey and the interviews. Only a few survey respondents would consider consulting a librarian for academic writing, and none of the case study subjects had ever interacted with one unless it was a class requirement. Instead, students seemed to find the CLAS peers more approachable and accessible. For instance, Y. liked utilizing this on-campus resource from time to time to help with expression clarity, the biggest challenge she saw in her own writing. Although the other subjects might have reservations about using the resource, they did not rule out the possibility of reaching out to it in the future when necessary. Also, like the role of many other academic support resources on the campus, although that of the librarians and CLAS peers is not as active and influential in students' academic writing process, these community members could still be important social others in the target activity system with their services influencing and being influenced by the students.

In addition, although most writing assignment submissions would only be read by a very limited number of people, with the help of the institution and the dedicated educators, some did have the opportunity to reach the wider public. The writing program of the university has had a publication called *Starting Lines* for over a decade to validate students' writing experience through publication of their outstanding work. It now has both the online and the print edition to include the writing of Writing 1, Writing 2, and linguistics students. The writings published have been used as models for student writing in writing classes, for the training program for teaching assistants, and for inspiring instructors. X. shared excitedly on her Wechat Moments recently that one of her writings from her Writing 2 class was published on the *Starting Lines*, and her self-confidence in writing was greatly elevated.

Although the online edition of the publication does not have a reader feedback function to allow more convenient reader-author interaction at this moment, the potential of bringing in more readers to students' academic writings can still be highly encouraging and promising, especially for students at the early stage of their college life, whose works would otherwise be left unread by anyone other than the author and the instructor.

Knowing that their writings might be read by more people and have a bigger impact may profoundly influence the way how students work on their assignments and practice their multiliteracies during the process, which may also help to bridge the gap between students' academic and non-academic writing in regards to the exercise of creativity and manifestation of writer identities. In this sense, it will also be helpful for getting students out of the mindset of merely completing a writing assignment, if the instructors of disciplinary subject classes can remind them or even demonstrate to them that a class assignment has the potential of being refined and developed into a publishable work to reach more readers and exert a bigger social and academic influence.

E. The influence of cultural historical and educational backgrounds

"Tools provide a historical record of the relationship between actors and the object of their activity" (Foot, 2014, p.14). Therefore, it is timely to examine how the use of digital resources mediated students' academic writing, a field that struggles between traditional established norms and undeniable new challenges and changes accelerated by the development of information technology. In addition, Cultural-historical Activity Theory emphasizes the essential role of the cultural aspects and the historical trajectory of development in understanding mediated activities. In recent years, scholars start to attach more importance to incorporate the examination of identity in CHAT studies (Roth, 2007).

In this section, discussion would be focusing on the research question regarding how students' academic writing activities were mediated by their cultural historical and educational backgrounds and how their identities were enacted during the process.

With the huge advances in the infrastructure of Internet and other ICTs in China, the digital generation in this country has undergone a dramatic transformation, from learners of basic computer skills to avid users of network-enabled applications and devices in almost every aspect of life. As a result, there was no surprise in finding almost all survey respondents and case study subjects feeling very comfortable in using digital tools for writing assignments. While there was certainly room for improvement in their multiliteracies practices according to their self-perception and the analysis of the case study data, the seemingly underdeveloped skills and areas (Conroy, 2010) were more likely to be temporary and developmental. Also, based on findings in the literature and from the current study, except for the language-related operations, there seemed to be no fundamental differences in the multiliteracies practices between different student groups, such as international Chinese students and local American students. In addition, the research subjects did not appear to be troubled by their developing digital research skills, and they demonstrated confidence in acquiring more advanced skills and becoming better writers as they moved forward in their undergraduate program study.

Nonetheless, cultural, educational, and linguistic specifics can certainly be useful in understanding some of the findings in the current study. For instance, to further explain the reason why M. and S., or many other international Chinese students experienced challenges in L2 composition organization and idea elaboration, an examination of the argumentative style that these students may be more familiar can be informative. In traditional Chinese

academic writing practices, although there usually should be a topic sentence in each paragraph, the topic can be explicitly or inexplicitly placed in every possible part in the paragraph. "Jia2xu4jia2yi4" (narration interspersed with comments) is a common style for Chinese argumentative writing. In addition, there is a Chinese proverb "shui3dao4qu2cheng2" (literal translation: When water flows, a channel is formed) best describing what many Chinese students believe would happen: when all the evidence or thinking has been presented, they would fall into one place, namely, the point of the paragraph or the paper. As a result, a clear hierarchical or linear structure is often considered not necessary by these students.

Another potential factor at work is the different cultural-specific communication style. According to the concept of high-versus low-context culture rooted in the work of Edward T. Hall (1976), different cultures can be manifested through people's use of languages based on how explicit the messages exchanged are and how much the context means in certain situations. In a higher-context culture, the way words are said is more important than the words themselves, and the receivers of the messages are expected to rely on the context of the moment and the culture as a whole to impart meaning. On the contrary, in a lower-context culture, it is very important for the message sender to be explicit in order to be fully understood. Traditionally, Chinese is considered to reflect a higher-context culture, while English represents a lower-context culture (Chen, 1995; Kim, Pan, & Park, 1998). As a result, people from China tend to expect readers to understand their points without feeling the pressure to state their points explicitly, especially at the beginning of the paper or a paragraph. On the other hand, English native-speakers might be more used to clear articulation of main points at the beginning, followed by supporting evidence in a more discernible order. This is particularly true when it comes to academic writing.

While this issue has existed long before the rapid development of digital technology, and few survey respondents and case study subjects thought digital tools could be of help in this regard, considering the fact that people's cross-cultural reading and writing activities are increasingly distributed and prevalent, the influence of digital environment on people's way of thinking and sense of logic is definitely something worth exploring. While the mediating effect of technology on academic writing rhetoric and organization may not be directly observable and perceptible in a short term, change is on the way (Purdy & Walker, 2010; Eyman & Ball, 2015).

Students' linguistic background and attitude towards the influence of their first language also affect other aspects of their academic writing. Although the research subjects were all aware of the interruptions of their writing due to all the language-related transactions, they were used to it and did not see it as an insurmountable obstacle. In fact, they believed that the knowledge of another language gave them more flexibility in locating useful resources and addressing various challenges in their study. For instance, Y. could search for reviews about the Chinese movie she was analyzing on popular Chinese social-networking websites to help with her brainstorming process; S. would sometimes look for the Chinese edition of a scholarly book or other online resources in Chinese to ensure that she could understand the most important concepts or abstract notions before she returned to the English version.

Another example can be found in these students' reservations towards collaborative writing and communicating with other students about writing assignments. Although previous research indicated that international students generally like socializing with their co-nationals and having frequent communications with one another in and outside the academic context, most of the case study subjects mentioned that they did not like

discussing with their peers and friends about writing assignments. On one hand, they believed it was neither time-efficient nor necessary; on the other hand, it may be because that they were trained to see academic writing as more of an individual work. Growing up in China, they were more accustomed to the notion that personal endeavor is the most important thing for academic success. Moreover, many of them had not been exposed to much collaborative work in academic writing before.

The influence of students' social-cultural background was also seen in other aspects of their writing processes. Research showed that people from cultures attaching great importance to the authoritative image of instructors are likely to be influenced more heavily by the instructors, and Eastern students preferred to have more direction from their teachers (Liang & McQueen, 1999; Warden et al., 2005). This can probably explain why students in the current study preferred seeking help directly from their teachers and teaching assistants regarding writing assignments and demonstrated great trust towards the digital resources recommended by them. Although some other studies suggested that, coming from a Confucian-heritage culture, Chinese learners felt intimidated by the idea of interacting with their instructors when encountering difficulties in learning (Yi, 2013), many of the survey respondents and the case study subjects in this study did not seem to have this problem. Even if they did, they still seemed to be able to gather their confidence and courage to reach out to these people who they believed could provide more efficient and reliable help.

The trust of authoritative figures also extended to the online world. One of the criteria the case study subjects reported for determining citation, especially when the resource was found on a random website, was that if the author of the article appeared to be an important person in the field. Although this technique is no doubt overly-simplistic and may not be

feasible when there was actually not much profile information about the author provided, the use of this technique may have implications for digital resources design and therefore should not be overlooked.

However, commonalities do not rule out idiosyncrasies, especially in the context of second language academic writing, which can be a highly individualized activity (Cumming, 2001). As mentioned earlier in the summary of main findings in the literature, while the generalizations about Chinese students can be helpful for understanding these students as a group, the results of the data analysis of the current multiple case study indicated that their backgrounds were by no means homogenous. Although educational background was not among the selection criteria when the five case study subjects were recruited from the target student group, despite some similarities, they each happened to represent very different educational experiences, especially during their high school years in China.

For instance, although Y. and C. both graduated from a regular high school before they started their undergraduate study in the U.S., Y. took additional preparational classes outside the school to learn more about life on campus in a foreign country. However, they both barely had any experience in doing research papers and using digital resources for academic purposes. M. graduated from the international division of a regular high school, of which the design of the curriculum meant to prepare students for their overseas study life. Still, she felt that she had not been well-prepared for her study in the U.S., and the teachers in the program did not actually provide guidance on how to conduct research and write academic papers. S. went to an international school and gained comparatively more experience in doing research papers. As a result, she did not have as much difficulty in adjusting to the requirements of English academic writing as her other Chinese peers in the U.S.. Among all

the case study subjects, X. had the most intensive training in English academic writing across disciplines. The International Baccalaureate program she took provided specific instructions on topics related to doing research papers, such as online or offline data collection, and citations. As a result, she seemed to be most comfortable in handling her writing assignments, and even got her work published on the university writing program journal mentioned earlier.

Following the trend of Chinese young people going abroad to study, test preparation centers, international schools and other related educational programs are burgeoning. However, these programs are often of varying quality in curriculum design, teacher qualifications, and educational resources and facilities. For many of these programs, the main purpose was still to prepare students for the two important exams for their application to the foreign institutions, namely TOEFL or IELTS and SAT. Consequently, the courses often focused on the improvement of students' English proficiency, and the teaching and learning activities were still exam-oriented. How to conduct academic research digitally and non-digitally was not always an integral part of the program. As a result, after students successfully got enrolled in a university, many of them still found the academic writing a daunting task.

Another distinct difference lay in students' second language proficiency levels. This difference was demonstrated not only in the frequencies of the language-related transactions recorded on the screen, but also in how both Chinese and English were used in those transactions, as well as the steps taken to locate the correct word or phrase to be used. In addition, it may also have affected the likelihood of students turning to digital resources in Chinese for finishing their English writing assignments, although the availability and

accessibility of English resources may be the main determinant, depending on the topic of a specific writing task. Moreover, while multiple factors contribute to students' second language proficiency, their different learning experiences during the high school years may also play a part. After all, the subjects' description of the focus of language learning in their early school years and the related findings in the literature did not seem to diverge. All the case study subjects went to regular junior high schools, and the English language curricula for regular primary schools and junior high schools were basically the same across the country, in which grammar-translation remained as the primary language teaching method.

Furthermore, literacy is "about expressing identity and affiliation through writing and sharing texts"(Kern, 2015, p.221). Just like other young people in the world, international Chinese students possess multiple identities and have to negotiate constantly between these identities and between their past and the present in their decision-making process. They are experiencing contradictions and mismatches intellectually and psychologically on a daily basis. These internal contradictions are manifested through the process of their academic writing as well as the way they use digital resources and practice their multiliteracies. They respect their instructors and TAs, take their suggestions seriously. Meanwhile, they value independent thinking and prefer working alone on their writing instead of discussing it with their peers and other people. They may not think communicating with students of other national origins necessary for academic writing, but they believe a more embracing multicultural environment would be beneficial for idea exchange and sharing. They consider opinions held by the public and techniques taught in classes important in deciding authenticity and credibility of online resources and linguistic expressions, but they also follow their instinct and incorporate personal judgment in making decisions. They like the idea of having an essay template so that they would not deviate from the English writing

conventions regarding format and organization, but they may still unconsciously think and organize their ideas with a cultural-specific argumentative logic. They recognize the challenges they have as second language learners, but they are also confident in making progress in their language proficiency and proud of their different social-cultural backgrounds.

International Chinese students' academic writing activities are not only influenced by students' past, but also by the present social-cultural and academic context they are in. Selber (2004) argued that, "there are profound social, political, and economic factors within and without the academy that impinge upon instructional spaces in a direct way" (p.94). Higher education in the U.S. is undergoing immense changes nowadays, including shifts in student demographics. As one of the fastest growing student groups on the U.S. campuses, international Chinese undergraduate students are all inexorably involved in intertwining activity systems that are nested in larger structures and characterized by the battle between new and old powers and the unstoppable influence of modern technology. Albeit small, these students' second language academic writing and their use of the digital resources provide a unique lens for examining the situated everyday student practices in the said historical context.

VII. Emerging contradictions in academic writing in the digital age

Cultural-historical Activity theory considers contradictions emerging from CHAT research as a source for development. Contradictions can be misfits, imbalances, breakdowns, gaps, and tensions, and they are ongoing changing phenomena which could exist anywhere. They can be found in and between different elements and in different levels and layers within the bounded system or across systems (Kuutti, 1996). In this section,

discussion would be given on the contradictions found in the current study that may provide implications for pedagogy and curriculum development and student academic support, as well as discussion of the challenges for and the positioning of academic writing in the digital age.

The first gap was found in the different perceptions of the objectives of academic writing between instructors and students. As discussed earlier, instructors normally see each writing assignment as an integral part of the curriculum. On one hand, for writing program instructors, the design of each assignment is associated with their instructional objectives of the course, so they often consider the writing assignment not only as a practice of what is taught in class, but also as a point of a continuum where knowledge and skills can be transferred and accumulated over time. For instructors of disciplinary content classes, the writing assignments are tools to examine students' learning outcomes such as their critical thinking about the course materials. Students, on the other hand, are more likely to see each writing assignment as a more temporary and stand-alone task in their study. For first year international Chinese students, without explicit guidelines or instructions, it may be difficult for them to realize the interconnectedness between writing assignments in a writing class or the significance of doing a final essay paper for a disciplinary content class.

This difference in the perception of activity objectives may result in students' misunderstanding of the writing requirements and expectations, instructors' disappointment in seeing skills emphasized in the previous assignments not successfully carried over to the present work, and frustrations on both sides over learning outcomes. This gap also contributes to another more observable phenomenon in the data of the current study, namely, the issue of time allotment for the writing assignment. While instructors normally leave

enough time for students and expect that they can take more time to digest what has been taught in class or the disciplinary content knowledge by going through class notes or reading materials and do more research and planning before they write, and spread out their writing activities across a wider time frame, many students would wait until just a few days or even the night before the due date to actually work on the assignment and finish it within several hours at a stretch.

Although students are still able to meet the perceived goal of finishing the assignment, the limited allotted time often prevents them from doing more thorough planning, extensive research, and careful revision for their academic writing. In this sense, the feeling that "looking for more scholarly research resources or academic support is not necessary" that many students have is more of a matter of expediency due to the time constraint than a sensible choice. In this study, Y. expressed regret of the limited time she had left for her current writing assignment after she took it to the CLAS for advice. She shared that she should have been able to submit a better paper with more fully developed ideas based on the writing tutor's advice if she had left herself more time before it was due. Another research subject, M., seemed to be doing better in terms of working step-by-step towards her final draft because of the way the writing assignment was designed and laid out for the students. Nonetheless, M. still experienced difficulty in correctly understanding the assignment requirements about what she was expected to do in different working drafts and the relationship between them.

In addition, the gap between different perceptions of objectives is an inherent issue in public education, and it is definitely not new in the field of academic writing. In this digital age, this gap still exists and remains as one of the most fundamental challenges. With the

development of information technology, new manifestations of such a gap emerge. Take the use of digital resources as an example. Instructors expect students to practice critical and independent thinking in their writing, including the process in which students search for, evaluate, and use digital resources. Such an expectation is often reflected through their strict policy regarding plagiarism, one that was mentioned multiple times by the research subjects in this study. While the strict policy can be effective for setting the rule, it is not enough for students to obtain a genuine understanding regarding authorship and the importance of critical and independent thinking in academic writing. Instead, clear communications of expectations and teaching plans, explicit instructions about requirements and ways to transfer acquired knowledge and skills, tactical design of writing assignments, as well as setting up effective student feedback channels are essential in helping to close this gap.

A second gap was also related to instructors' expectations and assumptions regarding students' multiliteracies skills. Littlejohn, Beetham, and McGill (2012) pointed out that there was confusion around learners' ability to use technologies for information handling and their capabilities in technology-mediated learning. As a result, there are two seemingly opposite phenomena co-existing on today's college campuses. In the first phenomenon, some instructors or program directors may think that writing assignment topics of any kind would not be challenging for students anymore as there is massive information available online. In the case of international students, once they are enrolled in the U.S. colleges, they are often seen and treated the same as local students. Instructors may tend to think that the difference between international and local students' ability in locating resources for academic writing tasks has diminished when unlimited information is at the students' fingertips. However, it is not always so.

In the current study, although the research subjects generally expressed confidence in their functional literacy and ability to learn over time, some of them did expressed frustration in more specific challenges such as coming up with appropriate keywords for information searching. And most of them believed that their local counterparts were at a more favorable situation in this regard. Also, most case study subjects still identified finding ideas, information, and brainstorming for unfamiliar topics as the biggest challenges for finishing academic writing assignments. Therefore, the ample supply of digital resources alone is not able to fully address the said challenges and to change the disadvantageous position of international students in the current academic context.

In the second phenomenon, some other instructors may underestimate international Chinese students' multiliteracies skills and the complexity of their educational backgrounds. On one hand, based on the literature and research subjects' interview responses, there seemed to be no big difference between Chinese international students' digital literacies or online search behavior and those of the local American students; on the other hand, the perceived difficulty Chinese students sometimes have in locating quality resources online for their academic writing may not be a result of poor research skills or the so-called under-developed multiliteracies, and it may simply be due to other reasons, such as second language proficiency, time constraints, and mismatching of expectations. In addition, as the research subjects and survey respondents in this study were all first-year students, without receiving much systemic writing instructions here in the U.S., their writing strategies were no doubt heavily influenced by their past practices and educational background. However, international Chinese students are quick learners, and they are flexible and open-minded. Many of them are avid users of new technologies. They have a rich past to rely on and converse with, and they are also very adaptive to new norms and environments. Therefore,

an accurate assessment of these students' current academic writing and multiliteracies skills, as well as their actual needs, is never a simple task, and it is also the exact reason why cultural-historical approach fits the current study.

In addition to gaps found in relation to system elements such as the subject, the objective, and the community members, tensions involving other elements were also discovered in the system. They include the tension between comparatively fixed requirements and expectations in traditional academic writing and the required room for the demonstration of creativity, and the tension between convention conformity and students' affiliations and identities. These tensions are exacerbated in the digital era. For example, in the field of publication, there has been heated discussion over digital scholarship and what should be seen as a typical standard publishable work (Ball, 2004; Eyman & Ball, 2015; Purdy & Walker, 2010). For young people like college students, although there have been some studies on their digital writings for identity development as previously reviewed, most of these studies centered on data collected in non-academic contexts.

In recent years, researchers uphold the view that education should empower students by acknowledging their backgrounds and values, and believe that the more associations that students could make between their old and new knowledge, the more easily they could acquire that new knowledge (Selber, 2004). In addition, McClure and Purdy (2013) argued that "the more we can break away from old, print based, curricular patterns, the better we will be serving our students" (p.311). However, there has not been much change in the general requirements and expectations for academic writing in universities, hence the design of writing assignments and the related grading rubrics.

Furthermore, during the interviews in this study, the research subjects never mentioned about receiving a different form of academic writing assignments, let alone those that would allow multimodal expressions. Although some instructors had made great efforts in incorporating digital writing in their class activities and assessment system, many had not. M. mentioned that students who previously took the same writing class used to do a blog as part of the assignments, but the class she was taking had stopped doing that for some unknown reason. Additionally, unlike the university's writing program which may use writing portfolios for assessment, instructors of other disciplinary courses often rely only on what could be directly assessed from one or two writing assignments. And all the subjects in this study seemed to passively accept the fact that the single-modal writing that came with rather fixed format and requirements was the norm and it did not allow other forms of expression nor leave much room for identity articulation. However, students' not explicitly questioning or challenging the existing norms in academic writing assignments and assessment does not necessarily mean that these norms can stand the test of time and the current challenges of globalization and technology development.

Moreover, while the educators are perplexed by what is happening in the classrooms and how we could better educate and prepare students for the future, today's college students, international students in particular, are also in an awkward situation. As discussed above, although technology is transforming our life and the world is shrinking into a global village, the assessment of college academic writing is still to a large extent governed by traditional norms regarding scholarly work, and international students' English writing is still deeply influenced by their identities as foreigners and second language learners. McCambridge (2015) described a dilemma in which, on one hand, teaching a set of normative standards "runs the risk not only of foreclosing students’ agency in their writing, but also of

reinforcing a global academia in which perceived Anglophone-centre writing practices are idealized. On the other hand, if expectations for writing are left vague, students in this super-diverse setting may find themselves with an even more obscure mystery to solve than those studying in L1 Anglophone dominant contexts" (p.186). Although the dilemma was investigated in the English as a Lingua Franca (ELF) context in McCambridge's work (2015), it is also to some extent applicable to the current study. In the face of the changing student demographics and the development of modern technology, the fate of existing norms and standards is for sure an important research topic.

Instructors may also face another dilemma associated with the decision on the topics for writing assignments. On one hand, instructors may want to make the topics relevant to students' school and social life so that students can make meaningful associations between their past and the present; on the other hand, the nature of the disciplinary content classes often determines the topics for writing assignments. What is more, it is often the unfamiliarity of topics that can actually help to broaden students' horizons and give international students the experiences they look for in their life abroad.

Under this circumstance, there are some potential solutions. For instance, if possible, instructors could consider giving a range of topics for students to choose from. Although it would no doubt place higher demands on the instructors and increase their workload (Cox & Zawacki, 2014), it can be beneficial to the students and ultimately help to better achieve learning objectives. Also, when an unfamiliar topic is given, a suggestive list of key words for research might be helpful. Still, how to strike a balance between making writing assignment topics social-culturally responsive and having them serve the course objectives is a challenge for many instructors and an important topic for further exploration.

Furthermore, although some scholars argued that digital spaces and technologies impair students' ability to read, complete tasks, and think(Carr, 2011), there are more educators who are eager to leverage students' multilingual and multiliterate competencies across different spaces. However, while many teachers are cognizant of students' frequent online digital writing practices, they "have yet to acknowledge and adequately address in their curricula the information behaviors and research practices students have developed on it. The continuing prevalence of the one-shot library instruction session in first-year writing pedagogy is as incongruent as it is ineffective" (McClure & Purdy, 2013, p.26-27). Moreover, studies showed that students would rather relegate their multiliteracies competencies in order to conform to institutional expectations in academic writing (Marshall, Hayashi, & Yeung, 2012).

In this study, when being asked if they would often write in English in non-academic contexts such as posting on social networking platforms like miniblogs, Wechat, and Facebook, none of the research subjects gave an affirmative answer. Although many of them were indeed using these digital communication tools and practicing their informal writing all the time, they often only used Chinese and interacted with their co-nationals. Although C. mentioned that he would like to start using those tools more often to practice his English writing, it may also be helpful if the design of academic writing assignments could be more diversified and inclusive, so that more space is provided for potential healthy transfer of students' multiliteracies, agency, and creativity, as well as their linguistic and cultural assets.

To this end, the effort of individual instructors or writing programs is not enough. Just as what Zawacki and Cox (2014) proposed, "given the multilingualism and multiculturalism of today’s students, we believe that the vision of linguistically and culturally inclusive writing

courses, curricula and programs is a worthy goal" (p.34). Putting this vision in the digital era, adding the adjective "technologically-responsive" may make it more complete. However, when considering curriculum design and transformation, McClure and Purdy (2013) reminded educators that "the research habits of the new digital scholar must be proactively counterbalanced with a curriculum that deliberately seeks to foster deep research, writing, and learning" (p.99). With the increasing level of technology penetration in the traditional education system, the redefinition of academic writing and reshaping of the writing curricula seem to be inevitable for this ancient field that has long parted with its paper-and-pencil days in the face of the unprecedented challenges in the digital era.

In addition to the gaps and tensions emerged from the data analysis, other mismatching was discovered in the students' writing activity. For instance, there was mismatching between advisable time allotment and students' actual practice in completing an academic writing assignment. As discussed earlier, despite teachers' reasonable expectations, students' waiting until last minute to start working on the writing assignment is not a rare phenomenon. The negative impact of the limited time that students left for completing a writing assignment was reflected not only in the writing product itself, but also in the decisions students made during the writing process. Both the current study and the literature suggested that students often opt for the most convenient and time-saving ways to address various writing challenges. Such a product-oriented way of doing was more or less a result of the insufficient writing time allotted.

Also, the importance of planning ahead was apparent in the findings of the current study. The screen recordings indicated that students' writing was frequently interrupted by the transactions, language-related ones in particular, between digital resources and the writing

drafts. It can be instrumental if students had a clear outline of ideas before the authoring stage to ensure coherence of ideas and smoothness of transitions. Therefore, it is important to provide instructions and practice opportunities to students regarding different stages in writing and time management.

Maybe a more direct solution for this matter is to divide a writing assignment into different tasks and have students submit each task separately. The different working drafts M. was asked to turn in was an example. Although it may not be feasible for many disciplinary content classes, and again would add to the already heavy workload of the instructors, researchers are looking at other alternatives. For instance, the emerging writing across disciplines (WAC) research and programs in recent years provide many helpful insights and suggestions for the design of writing assignments (Cox & Zawacki, 2014) in this regard.

The issue of writing across disciplines also calls into attention a misfit found in the design of the curriculum. Take the university in which the research subjects studied as an example. While the sequences of the language classes or writing classes are carefully laid out, and students are required to take them based on potentially effective assessment of their language and writing proficiency levels, they are taking disciplinary content classes with research writing assignments at the same time or even before taking the required writing classes.

The influx of international students in recent years and the game changing influence of technology further complicated the situation. On one hand, the instructors of subject classes have not been well prepared for these changes; on the other hand, many international students have to immediately work on research writing assignments from disciplinary

content classes without adequate prior training in academic writing and getting themselves familiarized with the local academic discourse, not to mention the vastly different writing conventions and available digital resources between disciplines.

McClure and Purdy (2013) believed that "intervention early in students' research-writing processes is key. The topics about which they write and the sources they consult significantly shape what they learn and what they produce" (p.370). Under such circumstances, students have strong need for direct instructional support. However, setting aside class time for specific writing and research instructions is not very practical for many disciplinary classes. In this case, other alternatives should be considered. For instance, X. shared that the instructor of her philosophy class provided very helpful instructions in the writing rubrics about the basic conventions of philosophy papers and his expectations towards students' work. As a result, although X. was not very familiar with this discipline, she did not feel at a total loss when working on her philosophy writing assignment.

Another misfit relevant to the current study lies between the increased popularity of collaborative learning and international Chinese students' current preference of individual work. While writing is no doubt a social practice operating in a social system, collaborative writing is not necessarily a preferable choice for many international students. As discussed earlier, Chinese students usually see writing as a solitary behavior, and many of them are not used to working on team projects and having group discussions. As second language learners, when they are asked to work in teams, without instructors' careful planning and design of the collaborative tasks, they are often placed in a more disadvantaged and silent position compared to that of other team members. In addition, depending on the team dynamics and coordination demand, collaborative writing can be time-consuming and not

very effective for students in developing their independent thinking ability. Besides, in terms of the potential benefit of peer interaction and support, due to the matter of familiarity and their natural trust in authorities, these students might be more willing to consult their instructors or teaching assistants instead.

However, this issue should be examined dialectically. Students learn through social interactions (Vygotsky, 1978), and collaborative learning and writing resonate with this principle. In addition, while there were multiple factors contributing to Chinese students' refraining from interacting with local students or students of other national origins, they did not seem to resist the opportunities of interactions. In fact, like C., many of them may actually long for meaningful cross-cultural interactions. As they might have difficulty in taking the first step, collaborative learning and writing tasks may indeed be able to provide such opportunities for much needed social interactions for international students, as long as these tasks are designed to be motivating and culturally responsive.

Moreover, among the limited number of existing studies on Chinese students' use of digital resources in the academic context, none was found with a research design involving both subjective data such as students' self-reported perceptions and evaluation and objective data collected through real-time screen recordings. Through capturing what students are actually doing and triangulating it with other layers of data, things may start to look a little different, and new questions emerge.

For instance, at a first glance, the findings seem to concur with the previous literature in that international students may have difficulties knowing when and how to cite (Zhao &Mawhinney, 2015). Even participants reported so in the interviews. However, a closer examination revealed additional part of the story. Instead of having difficulties in knowing

how to cite, according to the real-time screen recording and responses solicited through the interviews, the participants did not struggle much over this issue but instead seem to have their own understanding of authorship and what should be cited based on what the instructors had taught in class and their own judgment. Such a judgment was deeply rooted in their social-cultural practices and beliefs, and it may not always align with the traditional notion of authorship in the local context. So the question becomes what is really difficult here in the students' eyes? Is learning the rules difficult? Or is conforming to local expectations of academic writing difficult? Or is it because the rules and checklists are not able to catch up with the emerging challenges, it is difficult to decide what to do when new forms of resources are used? This is just one of the examples that demonstrate the importance of instructors' true understanding and careful analysis of the students' needs.

Accordingly, in order to provide effective guidance for this group of students regarding proper citations, simple and straight-forward "dos" and "don'ts" may not be sufficient for students to see what the real challenges are and understand why they should do so. In other words, rather than simply telling students what to do, instructors should help students understand "why doing so would ultimately improve their research experience and the intellectual product of their efforts" (McClure & Purdy, 2013, p.344). In addition, new challenges are created each day by new technologies and new forms of information communication. Rather than keep expanding the checklists of rules for students, it may be more effective to engage students in discussions and reflection of the digital resources and their situated literacies practices to deepen their understanding of the digital world, students themselves, and the expectations.

Moreover, the gap found between students' unwillingness to explore beyond the immediate needs in finishing the assignment at hand and the unlimited amount of resources available online and offline can also inspire teachers in thinking about designing tasks and instructional activities like those proposed by Selber (2004), which specifically aim at having students practice more advanced research and sophisticated multiliteracies skills in the face of the new challenges. Therefore, learning activities or resources such as those developed by Henderson and Whitelaw (2013) should be designed to help students develop their academic literacies and see the potential of the internet as a learning space for academic growth instead of merely a toolbox for finishing assignments, and to encourage them to seek knowledge voluntarily in the digital environment.

At last, with the dramatic development of modern technology such as Internet of Things and artificial intelligence, it is hard to predict what changes it would bring to traditional schooling in the future decades. As a result, people start to have concerns about the positioning of classroom instruction and teachers' function in the digital age. However, the research data clearly indicated that using digital resources was not a silver-bullet, and students cannot address all challenges with purely self-help methods. In addition, the accumulation of knowledge through formal and informal education is absolutely essential for improving academic writing, although such a process is often too dispersed to describe or measure. Elements such as careful pedagogical planning, classroom instruction, instructors' feedback, and teacher-student interaction are more observable and no doubt indispensable in helping students realize their academic writing objectives. While changes are needed and inevitable in updating obsolete norms and practices, teachers and classroom instruction remain as the most trustworthy resources for students in the new era.

From a cultural-historical activity theory perspective, gaps and tensions are sources of change and development. They provide important implications for the rethinking of the definition of academic writing, for the development of writing curricula and programs, for the positioning of classroom instructions, and for future studies in the field of academic writing. Although the above discussion is by no means exhaustive, and the potential solutions and interventions mentioned cannot close all the gaps or eliminate every tension, and even well-intended interventions can introduce new tensions (Yamagata-Lynch, 2010), they can serve as helpful starting points for further investigation of students' academic writing in the digital age.

VIII. Limitations and future studies

There are several limitations in this study. First, due to reasons that are beyond the scope of the current discussion, all the case study subjects who had submitted their screen recordings were female students. The only male student recruited for this part of study was not able to conduct the screen recording of his writing process because of an unforeseen high level of perceived stress when using the recording program. Although the analysis of the survey data indicated that there may not be significant differences between male and female students in methods used to address writing challenges, it is preferable to have a gender balance in participant selection for more informative findings.

Second, there are some other relevant types of data that have not been included in this study. For example, the instructors' and teaching assistants' perceptions of the students' use of digital resources in academic writing and their multiliteracies practices were not included. Although the instructors' written feedback was used in order to triangulate the findings regarding the writing challenges for the research subjects, the feedback itself was usually too

brief and specified to one particular assignment submission to provide a more comprehensive or in-depth picture of the situation.

Third, the data collection and analysis based on research subjects' finishing one writing assignment limit the potential of finding important differences between their writing across different subjects and topics for writing classes or disciplinary classes. Also, all of the writing assignments reported and analyzed in this study happened to be from social sciences and humanities classes. It may have yielded more interesting findings if there were writing assignments from the STEM field.

Fourth, as an innate characteristic of case studies, the settings and analysis of each case are highly contextualized. While generalizability is not the main pursuit, the current study does intend to provide some helpful observations and insights for educators and researchers who are interested in the academic performance and multiliteracies development of this student group through portraying several individual's situated practices mostly from the perspective of their "personal plane" (Rogoff ,1995). In addition, as the foci of investigation were the research subjects' current activity and its relationship with their cultural-historical background and social interactions, not much discussion was given to other current relevant social-academic happenings, such as the changing institutional and online power relationships.

Accordingly, future research designed to investigate the above-mentioned limitations or research topics left unexplored would be valuable. In addition, based on the current findings, some other future studies would also be interesting. For example, although students may not be well-versed at the moment in advanced information searching skills, but they are aware of the inadequacies and are quick to learn. This study focused on the first-year international

Chinese undergraduate students. They were still at an early stage in their program, and most of the disciplinary courses they were taking were introductory courses which did not usually contain research paper assignments that required students to do research topic selection and refinement, give thorough literature reviews, and collect data from multiple resources beyond the course materials. So the question would be: would their academic writing activity and multiliteracies practices change as they move forward in their undergraduate program and take upper-level courses with more sophisticated writing requirements? Therefore, studies on international students at different stages in their academic program are needed to fill in the puzzles. Longitudinal studies, in particular, would help to demonstrate the development process of students' multiliteracies and research skills, and how such a process is influenced by factors such as second language and academic writing development, technological development, and the change of cultural-historical contexts.

Also, in response to the undeniable impact of second language proficiency on students' academic writing, continuous effort has been put into investigating methods to help ESL students get over the linguistic hurdle, so that they could focus more on other important challenges. However, what alternatives and resources should be made available and accessible in terms of academic writing support and assessment in the face of technology development and globalization is a profound question that has not been fully answered.

In addition, as quite a few major challenges identified by students in their academic writing in this study were not satisfactorily addressed by the use of digital resources, what would be the most appropriate and effective way to assist students in dealing with these challenges in the digital era is yet another area to explore.

Moreover, although students' multiliteracies skills seemed to suffice in meeting the perceived temporary action goal at the moment and move them along in their undergraduate program, it does not mean that their multiliteracies do not need to expand and develop in a higher and broader scope like those listed in Selber's work (2004). Writing classes and potential WAC programs may be in the best position to help students in this regard. As the skills and literacies students acquire through academic writing are very likely to be transferred into their writing and designs in other spaces, both online and offline, the impact of such a development is far-reaching. As a result, the question of how to look beyond the current bounded activity system and extend its influence to other systems in different levels warrants more research.

Other potential research topics also include differences in terms of resources used between students who have a better planning and enough time for their writing and those who have to finish the assignment at one sitting, and the influence of research subjects' perceived anxiety on writing studies related to the use of modern data collecting tools such as screen recording, keystroke logging, and eye-tracking programs. In addition, there is still much to be explored regarding the multiliteracies practices of learners from different cultures. More studies focusing on different learner groups would be helpful in getting a fuller picture of the development of multiliteracies of ESL learners in and outside the academic context.

VIIII. Conclusion

Driven by the desire to expand and deepen the understanding of the academic performance and multiliteracies development of international Chinese undergraduate students, and the current scarcity of research on the said topic, this study examined first-year

international Chinese students' academic writing process, and how this process was situated in the cultural- historical context, and mediated by students' use of web-enabled resources and the their interaction with the social others. This research project comprised two parts, namely, a survey study and a multiple case study, each serving its specific purposes in different stages of the research and providing multiple layers of data for analysis and discussion.

The most common challenges and strategies in academic writing for this group of students were investigated. While using digital resources and relying on past ESL training and writing experience were unsurprisingly chosen as the most convenient strategies, asking the instructors and teaching assistants for help was also found popular among the respondents. The latter finding was somewhat opposite to the hidden assumption about international Chinese students in previous studies on their social and academic performances, in which they were seen as a group that tried to avoid communicating with the instructors. Another related finding regarding the participants' social interaction was also different from the commonly held assumption that they tended to seek help and support from their co-nationals in and outside of the academic contexts. Many of the survey respondents and case study subjects in this study did not seem to opt for this strategy. In addition, the participants were aware of the fact that, so far, digital tools were not able to solve all the challenges they encountered in academic writing, and the challenges were the result of an intricacy of influencing factors.

The screen recordings collected in the multiple case study contributed valuable empirical evidence of the way students' writing process was mediated by the web-enabled resources. The motives, operations, types of digital resources, length of transactions, frequencies of

transactions, and use of first or second language presented a real-time picture of students' technology-mediated writing and multiliteracies practices. The data revealed findings mostly corroborating those in the literature regarding students' digital literacies and power-browsing behaviors (Conroy, 2010; Littlejohn, Beetham, & McGill, 2012; Marshall, Hayashi, & Yeung, 2012; Sharpe, 2010; Stapleton, 2003; Stapleton, 2005).

However, rather than using "underdeveloped" to describe their multiliteracies like many of the studies did, "developing" should be considered as a more accurate and appropriate adjective for depicting the special stage this group of students were at. Students did not demonstrate highly advanced skills in searching for resources and determining their credibility and authorship, and they did not seem to be bothered much by the frequency of all the transactions during the writing process and were generally happy with what they could find at their fingertips for achieving the short-term goal of finishing the academic assignment. Meanwhile, they were able to articulate a series of strategies and criteria to illustrate their basic multiliteracies skills, and they were cognizant of the inadequacy of their multiliteracies, and were ready to learn and make improvement.

These students interacted with various social others within the bounded system, and were influenced by and influencing others during this process. They were aware of the opportunities of interacting with other potential community members and determined whether to utilize them based on perceived necessity. They generally preferred working alone and thinking independently on their writing assignments, but they also wished for clearer instructions and communications of requirements and expectations from the instructors and more opportunities to exchange views and ideas with other student groups in a truly open and engaging environment.

These students' academic writing and multiliteracies practices were deeply situated in their cultural, historical, and educational backgrounds, as well as the current social-academic context. Their decision-making process in relation to writing strategies and digital resources use embodied their constant negotiation with their multiple identities evolving from the past into the present. They considered their first language and social-cultural background more as assets than baggage. While many of the previous findings about the characteristics of these students' social interactions and academic performances are still valid and applicable, the situation is rapidly changing with the current reforms and development in different facets in the Chinese society. For example, opposite to the assumption that international Chinese students come with a rather homogenous educational background, they often have very different experiences regarding second language writing and research in their high school years. However, just as a diploma or a certificate from an international high school or program does not guarantee sufficient preparation for study life overseas, graduation from a regular high school does not necessitate lower expectations from the instructors. Besides, as Weissberg (2005) put it, "there are few, if any, universals in L2 writing" (P.97), there is never a simple and one-fit-all interpretation in regards to these students' academic writing and multiliteracies practices.

In addition to verifying previous research findings and filling gaps in the literature, identifying the emerging contradictions was another objective of this study. Gaps and misfits found in different levels and among different components in the bounded system provided implications for pedagogy and curriculum development and student academic support, and were expected to inspire further exploration of the related issues in future academic writing and multiliteracies studies.

Furthermore, while "dancing in fetters" may not be an appropriate term in describing students' academic writing activity, this metaphor helps to illustrate the process in which the research subjects, in the face of various constraints, exercised their agency in achieving the goal and objective of their activity through the interaction with other components in the bounded activity system. Being in the midst of transitions, from their home country to the U.S. and from a more traditional learning environment to an increasingly technology-driven one, these first-year undergraduate students sometimes get confused and frustrated, but they more often remain confident and adaptive. With a better understanding of these students' literacies activities and decision-making process, the universities would be able to take a step forward towards making more informed decisions about policies and curricula, for preparing not only international students, but also domestic students to be worthy global citizens in the digital age.

References

Adam, P. S., Quinn, S., & Edmonds, R. (2007). *Eyetracking the news: a study of print and online reading*. Poynter.

Addison, J. (2007). Mobile technologies and a phenomenology of literacy. *Digital writing research: Technologies, methodologies, and ethical issues*, 171-183.

Angelil-Carter, S. (2000). Stolen language. London: Longman.

Atkinson, D. (2005). Situated qualitative research and second language writing. *Second language writing research: Perspectives on the process of knowledge construction*, 49-64.

Baker, E.A., Pearson, P.D., & Rozendal, M.S. (2010). Theoretical perspectives and literacy studies: An exploration of roles and insights. In Baker, E. A. (ed.). *The new literacies: Multiple perspectives on research and practice* (pp.1-22). New York: Guilford

Bakhtin, M. M. (1993). *Toward a philosophy of the act*. Austin: University of Texas Press.

Ball, C. E. (2004). Show, not tell: The value of new media scholarship. *Computers and Composition*, *21*(4), 403-425.

Bean, J., Eddy, R., Grego, R., Irvine, P., Kutz, E., Matsuda, P. K., ... & Lehner, A. (2003). Should We Invite Students To Write in Home Languages? Complicating the Yes/No Debate. *Composition Studies*, *31*(1), 25-42.

Beckett, G. H. (2005). Academic language and literacy socialization through project-based instruction: ESL student perspectives and issues. *Journal of Asian Pacific Communication*, *15*(1), 191-206.

Black, R. W. (2009). Online fan fiction, global identities, and imagination. *Research in the Teaching of English*, 397-425.

Bloch, J. (2008). From the special issue editor. *Language Learning & Technology*, *12*(2), 31-48.

Bohn, R. E., & Short, J. E., 2009. *How Much Information? 2009 Report on American Consumers*. UC, San Diego: Global Information Industry Center.

Braine, G. (2002). Academic literacy and the nonnative speaker graduate student. *Journal of English for academic purposes*, *1*(1), 59-68.

Brine, J., & Franken, M. (2006). Students' Perceptions of a Selected Aspect of a Computer Mediated Academic Writing Program: An Activity Theory Analysis. *Australasian Journal of Educational Technology*, *22*(1), 21-38.

Buchanan, G., & Loizides, F. (2007). Investigating document triage on paper and electronic media. *Lecture Notes in Computer Science, 4675, 416-427*. Retrieved from: http://www.springerlink.com/content/5504627j2r287766/?MUD=MP

Burton, V. T., & Chadwick, S. A. (2000). Investigating the practices of student researchers: Patterns of use and criteria for use of Internet and library sources. *Computers and Composition*, *17*(3), 309-328.

Carr, N. (2011). *The shallows: What the Internet is doing to our brains*. WW Norton & Company.

Carroll, J., & Oxford Centre for Staff Development. (2002). *A handbook for deterring plagiarism in higher education*. Oxford: Oxford Centre for Staff and Learning Development.

Casanave, C. P. (2005). Uses of narrative in L2 writing research. *Second language writing research: Perspectives on the process of knowledge construction*, 17-32.

Chapdelaine, R., & Alexitch, L. R. (2004). Social skills difficulty: model of culture shock for international graduate students. *Journal Of College Student Development*, *45*(2), 167-184.

Chen, G. M. (1995). Differences in self-disclosure patterns among Americans versus Chinese: A comparative study. *Journal of Cross-Cultural Psychology*, *26*(1), 84-91.

Coffin, C., Curry, M. J., Goodman, S., Hewings, A., Lillis, T., & Swann, J. (2005). *Teaching academic writing: A toolkit for higher education*. Routledge.

Coffin, C., & Goodman, S. (2003). Academic writing in an electronic environment. In: Coffin, Caroline; Curry, Mary Jane; Goodman, Sharon; Hewings, Ann; Lillis, Theresa and Swann, Joan eds. *Teaching Academic Writing: A Toolkit for Higher Education.* London, UK: Routledge, pp. 130–157.

Cohen, L., Manion, L., & Morrison, K. (2000). Naturalistic and ethnographic research. *Research methods in education*, *5*, 137-157.Spradley, J. P. (1979). Ethnography and culture. *The ethnographic interview*. *Holt, Rinehart, and Winston: Florida*.

Cole, M. (1985). The zone of proximal development: Where cultural and cognition create each other. In J. Wertsch (Ed.), *Culture, Communication, and Cognition* (pp. 146–161). New York: Cambridge University Press.Selber, S. (2004). *Multiliteracies for a digital age*. SIU Press.

Cole, M. (1996) *Cultural Psychology: a once and future discipline.* Cambridge, MA, Harvard University Press.

Cope, B. and Kalantzis, M. (eds.). (2000). *Multiliteracies: Literacy Learning and the Design of Social Futures,* Routledge, London.

Conroy, M. (2010). Internet tools for language learning: University students taking control of their writing. *Australasian Journal of educational technology*,*26*(6), 861-882.

Cumming, A. (2001). Learning to write in a second language: Two decades of research. International Journal of English Studies, 1, 1-23.

Cummins, J., & Yee-Fun, E. M. (2007). Academic language: What is it and how do we acquire it? *International handbook of English language teaching* (pp. 797-810). Springer US.

Daniels, H. (2004) Activity theory, discourse and Bernstein, Educational Review, 56:2, 121-132, DOI: 10.1080/0031910410001693218

Davydov, V. V. (1999). The content and unsolved problems of activity theory. In Y. Engeström, R. Miettinent & R.-L. Punamaki (Eds.), *Perspectives on activity theory* (pp. 39–52). New York, NY: Cambridge University Press.

DePalma, M. J. (2014). Adaptive transfer, writing across the curriculum, and second language writing: implications for research and teaching. *WAC and second language writers: Research towards linguistically and culturally inclusive programs and practices*, 43-68.

DePalma, M.J. & Ringer, J. M. (2011). Toward a theory of adaptive transfer: Expanding disciplinary discussions of "transfer" in second-language writing and composition studies. Journal of Second Language Writing, 20(2), 134-47.Canagarajah, A. S. (2003). Practicing multiliteracies. *Journal of second language writing*, *12*, 151-179.

Drury, H. (2005). 13 Teaching academic writing on screen: a search for best practice. *Analysing academic writing: Contextualized frameworks*, 233.

Du, Q. (2014). Bridging the gap between ESL composition programs and disciplinary writing: The teaching and learning of summarization skill. *WAC and second language writers: Research towards linguistically and culturally inclusive programs and practices*, 113-128.

Duff, P. A. (2007). Second language socialization as sociocultural theory: Insights and issues. *Language Teaching*, *40*(04), 309-319.

Duff, P. A., & Anderson, T. (2015). Academic language and literacy socialization for second language students. *The handbook of classroom discourse and interaction*, 337-352.

Edwards, A. & Daniels, H. (2004) Editorial, Educational Review, 56:2, 107-111, DOI: 10.1080/0031910410001693191

Engeström, Y. (1987). *Learning by expanding: An activity-theoretical approach to developmental research*. Helsinki: Orienta-Konsultit Oy. Retrieved November 30, 2009, from http://lchc.ucsd.edu/MCA/Paper/Engestrom/expanding/toc.htm.

Engeström, Y. (1990). *Learning, working and imagining: Twelve studies in activity theory*. Helsinki: Orienta-Konsultit.

Eyman, D., & Ball, C. (2015). Digital humanities scholarship and electronic publication. *Rhetoric and the digital humanities*, *65*.

Eyring, J. L. (1989). Teacher experiences and student responses in ESL project work instruction: A case study. Unpublished doctoral dissertation. University of California at Los Angeles.

Fang, Y. (2010). Perceptions of the Computer-Assisted Writing Program among EFL College Learners. *Educational Technology & Society*, *13*(3), 246-256.

Farver, J. A. M. (1999). Activity settings analysis: A model for examining the role of culture in development. In A. Göncü (Ed.), *Children's engagement in the world: Sociocultural perspectives* (pp. 99–127). Cambridge, MA: Cambridge University Press.

Fawley, N. (2011). Addressing academic integrity: Perspectives from Virginia Commonwealth University in Qatar. In P. A. Jackson, & P. Sullivan (Eds.), *International students and academic libraries: Initiatives for success*. Chicago, Ill.: Association of College and Research Libraries. (pp. 151–164).

Ferris, D. R. (1993). The design of an automatic analysis program for L2 text research: Necessity and feasibility. *Journal of Second Language Writing*,*2*(2), 119-129.

Ferris, D. R. (1994). Rhetorical strategies in student persuasive writing: Differences between native and non-native English speakers. *Research in the Teaching of English*, 45-65.

Ferris, D., Brown, J., Liu, H., Eugenia, M., & Stine, A. (2011). Responding to L2 students in college writing classes: Teacher perspectives. *Tesol Quarterly*, 207-234.

Fischer, K. (Nov. 17, 2014). International-Student Numbers Continue Record-Breaking Growth. The Chronicle of Higher Education. https://www.chronicle.com/article/International-Student-Numbers/150049

Flinn, J, Z.(1987). Case studies of revision aided by keystroke recording and replaying software. *Computers and Composition*, 5(1), 31-44.

Flowerdew, J. (2002). Ethnographically inspired approaches to the study of academic discourse. In J. Flowerdew, *Academic discourse* (pp. 235–252). Harlow, UK: Longman.

Foot, K. A. (2014). Cultural-historical activity theory: Exploring a theory to inform practice and research. *Journal of Human Behavior in the Social Environment*, *24*(3), 329-347.

Gallimore, R., & Tharp, R. (1990). Teaching mind in society: Teaching, schooling, and literate discourse. *Vygotsky and education: Instructional implications and applications of sociohistorical psychology*, 175-205.

Gallimore, R., & Goldenberg, C. (2001). Analyzing cultural models and settings to connect minority achievement and school improvement research. *Educational Psychologist, 36,* 45–56.

Galloway, F. J., & Jenkins, J. R. (2009). The adjustment problems faced by international students in the United States: a comparison of international students and administrative perceptions at two private, religiously affiliated universities. *Naspa Journal (Online), 46*(4), 661-673.

Galperin, P. I. (1992). The problem of activity in Soviet psychology. *Journal of Russian and East European Psychology*, *30*(4), 37–59.

Gee, J. P. (1989). Literacy, discourse, and linguistics: Introduction. *The Journal of Education*, *171*(1), 5-176.

Gee, J. P. (1996). Social linguistics and literacies: Ideology in discourses (2nd ed). London: Taylor & Francis.

Gee, J. P. (1998). What is literacy? Negotiating academic literacies:Teaching and learning across languages and cultures. Mahwah, New Jersey: Lawrence Erlbaum.

Geisler, C., Bazerman, C., Doheny-Farina, S., Gurak, L., Haas, C., Johnson-Eilola, J., ... & Yates, J. (2001). IText future directions for research on the relationship between information technology and writing. *Journal of Business and Technical Communication*, *15*(3), 269-308.

Geisler, C., & Slattery, S. (2007). Capturing the activity of digital writing: Using, analyzing, and supplementing video screen capture. *Digital writing research: Technologies, methodologies, and ethical issues*, 185-200.

Gipps, C. (1999). Chapter 10: Socio-cultural aspects of assessment. *Review of research in education*, *24*(1), 355-392.

Giridharan, B. (2012). Identifying Gaps in Academic Writing of ESL Students. *US-China Education Review*, *6*, 578-587.

Gilquin, G., & Paquot, M. (2008). Too chatty: Learner academic writing and register variation. *English Text Construction*, *1*(1), 41-61.

Gilster, P. *Digital literacy*. New York: Wiley, 1997.

Gonzales, H. (2011). The acculturative stress experience of international students: acculturative stress experience of Chinese and Indonesian international students. *Journal of the Australian & New Zealand Student Services Association*, (37), 95-96.

Goodfellow. R. & Lea. M.R. (2007). Challenging E-Learning in the University: A Literacies Perspective. McGraw Hill/ Open University, Maidenhead & NewYork, NY.

Grabill, J. T., & Hicks, T. (2005). Multiliteracies meet methods: The case for digital writing in English education. English Education, 37(4), 301-311.

Grant, L., & Ginther, A. (2000). Using computer-tagged linguistic features to describe L2 writing differences. *Journal of second language writing*, *9*(2), 123-145.

Gregg, J. (1986). Comments on Bernard A. Mohan and Winnie Au-Yeung Lo's" Academic Writing and Chinese Students: Transfer and Developmental Factors". A Reader Reacts. *TESOL Quarterly*, *20*(2), 354-358.

Greenholz, J. (2003). Socratic teachers and Confucian learners: Examining the benefits and pitfalls of a year abroad. *Language and Intercultural Communication*, *3*(2), 122-130.

Guth, S., & Helm, F. (2012) Developing multiliteracies in ELT through telecollaboration. *ELT Journal: English Language Teachers Journal*, 66(1): 42-51. https://doi.org/10.1093/elt/ccr027

Gutiérrez, K. D., & Rogoff, B. (2003). Cultural ways of learning: Individual traits or repertoires of practice? *Educational Researcher, 32*, 19–25.

Hall, E. T. (1976). *Beyond Culture*. New York: Anchor Press –Doubleday.

Hammersley, M., & Atkinson, P. (1995). Insider accounts: Listening and asking questions. *Ethnography: Principles in practice*, 124-156.

Handayani, N. S. (2012). Examining the Writing Phases and Revision Patterns in Online Collaborative Writing: What Can We Learn from Them?.*Malaysian Journal of Distance Education*, *14*(2), 39-62.

Hargittai, E., Fullerton, L., Menchen-Trevino, E., & Thomas, K. Y. (2010). Trust online: Young adults' evaluation of web content. *International journal of communication*, *4*, 27.

Hart-Davidson, W. (2007). Studying the mediated action of composing with time-use diaries. *Digital writing research: Technologies, methodologies, and ethical issues*, 153-170.

Hartley, J., Howe, M., & McKeachie, W. (2001). Writing through time: Longitudinal studies of the effects of new technology on writing. *British Journal of Educational Technology*, *32*(2), 141-151.

Hawisher, G., & Selfe, C. (2012). Studying literacy in digital contexts: Computers and composition studies. *Exploring composition studies: Sites, issues, and perspectives*, 188-198.

Hegelheimer, V., & Fisher, D. (2006). Grammar, writing, and technology: A sample technology-supported approach to teaching grammar and improving writing for ESL learners. *CALICO journal*, 257-279.

Henderson, F., & Whitelaw, P. A. (2013). Academic literacy and cultural familiarity: developing and assessing academic literacy resources for Chinese students. *Interdisciplinary Journal of E-Learning and Learning Objects, 9,* 13-27.

Hewlett, L. (1996). How can you discuss alone?: Academic literacy in a South African context. In

Holmes, P. (2004). Negotiating differences in learning and intercultural communication ethnic Chinese students in a New Zealand university. *Business Communication Quarterly, 67*(3), 294-307.

Howard, R. M., Serviss, T., & Rodrigue, T. K. (2010). Writing from sources, writing from sentences. *Writing and Pedagogy*, *2*(2), 177-192.

Hyland, K. (2005) Digging up texts and transcripts: confessions of a discourse analyst. In T. Silva and P. Matsuda (Eds.) Second Language Writing: Perspectives on the Process of Knowledge Construction. Lawrence Erlbaum. pp 177-189

Internet Live Stats. (July 1, 2016). China Internet Users. Retrieved from: http://www.internetlivestats.com/internet-users/china/.

Ives, L., Leahy, E., Leming, A., Pierce, T., & Schwartz, M. (2014). “I don't know if that was the right thing to do": cross-disciplinary/ cross-institutional faculty respond to L2 writing. *WAC and second language writers: Research towards linguistically and culturally inclusive programs and practices*, 211-232.

Jones, J. (2008). Patterns of revision in online writing a study of Wikipedia's featured articles. *Written Communication, 25*(2), 262-289.

Jones, S., & Lea, M. R. (2008). Digital literacies in the lives of undergraduate students: Exploring personal and curricular spheres of practice. *Electronic Journal of E-learning, 6*(3), 207-216.

Kahn R. & Kellner D. (2005) Reconstructing technoliteracy: a multiple literacies approach. E-Learning 2, 238–251.

Kalantzis, M., Cope, B., & Cloonan, A. (2010) A multiliteracies perspective on the new literacies. In Baker, E. A. (ed.). *The new literacies: Multiple perspectives on research and practice* (pp.61-87). New York: Guilford.

Kandra, K. L., Harden, M., & Babbra, A. (2012). Power Browsing: Empirical Evidence at the College Level. In *National Social Science Proceedings Volume 50 Lake Tahoe Summer Seminar, 2012* (p. 60).

Kanno, Y., & Cromley, J. G. (2013). English language learners' access to and attainment in postsecondary education. *TESOL Quarterly, 47*(1), 89-121.

Kanno, Y., & Harklau, L. (Eds.). (2012). *Linguistic minority students go to college: Preparation, access, and persistence.* New York, NY: Routledge.

Kennedy, P. (2002). Learning cultures and learning styles. In J. Cribbin & P. Kennedy (Eds.), *Lifelong learning in action: Hong Kong practitioners' perspectives* (pp. 71-92). Hong Kong: Hong Kong University Press.

Kern, R. (2000). *Notions of literacy*. In R. Kern (Ed.), *Literacy and language teaching* (pp. 13- 41). New York: Oxford University Press.

Kern, R. (2015). *Language, literacy, and technology*. Cambridge University Press.

Kim, D., Pan, Y., & Park, H. S. (1998). High-versus low-Context culture: A comparison of Chinese, Korean, and American cultures. *Psychology & Marketing*, *15*(6), 507-521.

Knobel, M., & Lankshear, C. (2006). Discussing new literacies. *Language Arts*, *84*(1), 78.

Kozma, R. B. (1991). The impact of computer-based tools and embedded prompts on writing processes and products of novice and advanced college writers. Cognition and instruction, 8(1), 1-27.

Kress, G. (2003). *Literacy in the new media age*. Psychology Press.

Kress, G. (2005). Gains and losses: New forms of texts, knowledge, and learning. *Computers and composition*, *22*(1), 5-22.

Kurek, M., & Hauck, M. (2014). Closing the "digital divide" – a framework for multiliteracy training. In: Pettes Guikema , Janel and Williams, Lawrence eds. *Digital Literacies in Foreign and Second Language Education: Research, perspectives, and best practice*. CALICO Monograph Series (12). San Marcos, TX: CALICO.

Kubota, R., & Shi, L. (2005). Instruction and reading samples for opinion writing in L1 junior high school textbooks in China and Japan. *Journal of Asian Pacific Communication*, *15*(1), 97-127.

Kuteeva, M. (2011). Wikis and academic writing: Changing the writer–reader relationship. *English for Specific Purposes*, *30*(1), 44-57.

Kuutti, K. (1996). Activity theory as a potential framework for human-computer interaction research. In Nardi, B.A. (Ed.). *Context and consciousness: Activity theory and human-computer interaction*. MIT Press.

Lam, W. S. E. (2000). L2 literacy and the design of the self: A case study of a teenager writing on the Internet. *Tesol Quarterly, 34*(3), 457-482.

Lam, W. S. E. (2006). Re-envisioning language, literacy, and the immigrant subject in new mediascapes. *Pedagogies, 1*(3), 171-195.

Lam, W. S. E. (2009). Multiliteracies on instant messaging in negotiating local, translocal, and transnational affiliations: A case of an adolescent immigrant. *Reading Research Quarterly, 44*(4), 377-397.

Lankshear, C. & Knobel M. (2008) Introduction. In Digital Literacies (eds C. Lankshear&M. Knobel), pp. 1–16. Peter Lang, NewYork, NY.

Lankshear, C. and Knobel, M. (2013). Introduction: Social and cultural studies of new literacies from an educational perspective. In Lankshear, C. and Knobel, M. (eds) (2013). *A New Literacies Reader: Educational Perspectives*. New York: Peter Lang. 1-22.

Lazarev, V. S. (2004). The crisis of "the activity approach" in psychology and possible ways to overcome it. *Journal of Russian and East European Psychology, 42*(3), 35–58.

Lea, M.R., & Street, B.V. (1998). Student writing in higher education: An academic literacies approach, Studies in Higher Education, 23:2, 157-172, DOI:10.1080/03075079812331380364

Leont'ev, A. A. (1974). *Psycholinguistik und Sprachunterricht* [Psycholinguistics and language education] (G. Schulz & G. Seyfahrt, Trans.). Stuttgart, Germany: Kohlhammer.

Li, X., & Casanave, C. P. (2005). Introduction: Multiple perspectives on L1 and L2 academic literacy in Asia Pacific and diaspora contexts. *Journal of Asian Pacific Communication*, *15*(1), 7-13.

Lea, M. R. and Street, B. (1998) Student writing in higher education: an academic literacies approach. *Studies in Higher Education* 23(2): 157–172**.**

Lea, M.R., & Stierer, B. (Eds.). (2000). Student writing in higher education: New contexts. Buckingham: Society for Research into Higher Education and Open University Press.

Lea, M. R., & Jones, S. (2011). Digital literacies in higher education: exploring textual and technological practice. *Studies in Higher Education*,*36*(4), 377-393.

Leki, I., & Carson, J. G. (1994). Students' perceptions of EAP writing instruction and writing needs across the disciplines. *TESOL quarterly*, *28*(1), 81-101.

Leki, I., & Carson, J. (1997). "Completely different worlds": EAP and the writing experiences of ESL students in university courses. *TESOL quarterly*, *31*(1), 39-69.Ercegovac, Z., & Richardson, J. V. (2004). Academic dishonesty, plagiarism included, in the digital age: A literature review. *College & Research Libraries*,*65*(4), 301-318.

Leedham, M. (2015). Chinese Students' Writing in English: Using visuals and lists. *English Teaching in China (ETiC)*, *6*, 16-20.

Leki, I. (1995). Coping strategies of ESL students in writing tasks across the curriculum. *TESOL quarterly*, 235-260.

Leki, I., & Carson, J. G. (1994). Students' perceptions of EAP writing instruction and writing needs across the disciplines. *Tesol Quarterly*, *28*(1), 81-101.

Leki, I., & Carson, J. (1997). “Completely different worlds”: EAP and the writing experiences of ESL students in university courses. *TESOL quarterly*, *31*(1), 39-69.

Lei, X. (2008). Exploring a sociocultural approach to writing strategy research: Mediated actions in writing activities. *Journal of Second Language Writing*, *17*(4), 217-236.

Liu, Z. (2005). Reading behavior in the digital environment: Changes in reading behavior over the past ten years. *Journal of Documentation, 61,* 700-712. doi: 10.1108/00220410510632040.

Cai, G. (1993). Beyond bad writing: Teaching English composition to Chinese ESL students. Paper presented at the College Composition and Communication Conference, San Diego CA.

Lantolf, J. P. (Ed.). (2000). *Sociocultural theory and second language learning*. Oxford, UK: Oxford University Press.

Lantolf, J. P. (2006). Sociocultural theory and L2: State of the art. *Studies in Second Language Acquisition, 28*, 67–109.

Lave, J. (1988). *Cognition in practice: Mind, mathematics, and culture in everyday life*. New York: Cambridge University Press.

Leijten, M., & Van Waes, L. (2013). Keystroke logging in writing research using Inputlog to analyze and visualize writing processes. *Written Communication*, *30*(3), 358-392.

Lea, M. R., & Street, B. V. (1998). Student writing in higher education: An academic literacies approach. *Studies in higher education*, *23*(2), 157-172.

Li, X. (2005). Composing culture in a fragmented world: The issue of representation in cross-cultural research. *Second language writing research: Perspectives on the process of knowledge construction*, 121-131.

Li, X., & Pearson Casanave, C. (2005). Introduction: Multiple perspectives on L1 and L2 academic literacy in Asia Pacific and diaspora contexts.*Journal of Asian Pacific Communication*, *15*(1), 7-13.

Liang, A., & McQueen, R. J. (1999). Computer assisted adult interactive learning in a multi-cultural environment. *Adult Learning*, *11*(1), 26-29.

Leki, I. (1995). Coping strategies of ESL students in writing tasks across the curriculum. *TESOL quarterly*, *29*(2), 235-260.

Leu, D. J., Kinzer, C. K., Coiro, J. L., & Cammack, D. W. (2004). Toward a theory of new literacies emerging from the Internet and other information and communication technologies. *Theoretical models and processes of reading*, *5*(1), 1570-1613.

Lillis, T., & Scott, M. (2007). Defining academic literacies research: Issues of epistemology, ideology and strategy. *Journal of applied linguistics*, *4*(1), 5-32.

Littlejohn, A., Beetham, H., & McGill, L. (2012). Learning at the digital frontier: a review of digital literacies in theory and practice. *Journal of Computer Assisted Learning*, *28*(6), 547-556.

Marshall, S., Hayashi, H., & Yeung, P. (2012). Negotiating the multi in multilingualism and multiliteracies: Undergraduate students in Vancouver, Canada. *Canadian Modern Language Review*, *68*(1), 28-53.

Martin A. & Grudziecki J. (2006) DigEuLit: Concepts and Tools for Digital Literacy Development in ITALICS, Innovation in Teaching And Learning in Information and Computer Sciences Vol 5 Issue 4, Dec 2006.

Matsuda, P. K., Saenkhum, T., & Accardi, S. (2013). Writing teachers' perceptions of the presence and needs of second language writers: An institutional case study. *Journal of Second Language Writing, 22*(1), 68-86.

McCambridge, L. (2015). Academic writing in an elf environment: standarization, accommodation, or transformation? *Working With Academic Literacies: Case Studies Towards Transformative Practice*, 185.

McClure, R., & Purdy, J. P. (2013). *The New Digital Scholar: Exploring and Enriching the Research and Writing Practices of NextGen Students*. Information Today, Inc. 143 Old Marlton Pike, Medford, NJ 08055.

Merriam, S. B. (2009). Qualitative Research: a guide to design and interpretation. *San Francisco: Jos-sey-Bass*.Michael, D. C., Nettesheim, C., & Zhou, Y. (2012). China's Digital Generations 3.0: The Online Empire. *Own the Future: 50 Ways to Win from the Boston Consulting Group*, 111-116.

Michael, D. C., & Zhou, Y. (2010). China's digital generations 2.0: Digital media and commerce go mainstream. *Boston Consulting Group*.

Mills, K. A. (2009). Multiliteracies: interrogating competing discourses. *Language & Education: An International Journal, 23*(2), 103-116. doi:10.1080/09500780802152762

Mina, L. (2014). Enacting identity through Multimodal narratives: a Study of Multilingual Students. *Digital Literacies in Foreign and Second Language Education*, 141-158.

Mohan, B. A., & Lo, W. A. Y. (1985). Academic writing and Chinese students: Transfer and developmental factors. *Tesol Quarterly*, 515-534.

Moody, R. H., & Bobic, M. P. (2011). Teaching the net generation without leaving the rest of us behind: How technology in the classroom influences student composition. *Politics & Policy*, *39*(2), 169-194.

Mu, C., & Carrington, S. B. (2007). An investigation of three Chinese students' English writing strategies. *Teaching English as a Second or Foreign Language-EJ, 11*(1), 1-23.

Nam, M., & Beckett, G. H. (2011). Use of Resources in Second Language Writing Socialization. *TESL-EJ*, *15*(1).

New London Group. (1996). A pedagogy of multiliteracies: Designing social futures. *Harvard Educational Review*, *66*(1), 60–92.

Odo, D. M., & Yi, Y. (2014). Engaging in Computer-Mediated Feedback in Academic Writing: Voices from L2 Doctoral Students in TESOL. *English Teaching*, *69*(3).

Olivas, M., & Li, C. (2006). Understanding stressors of international students in higher education: What college counselors and personnel need to know. *Journal of Instructional Psychology, 33*, 217-222.

Park, K., & Kinginger, C. (2010). Writing/thinking in real time: Digital video and corpus query analysis. *Language Learning & Technology*, *14*(3), 31-50.

Patton, M. Q. (2002). Qualitative interviewing. *Qualitative research and evaluation methods*, *3*, 344-347.

Pecorari, D. (2003). Good and original: Plagiarism and patchwriting in academic second-language writing. *Journal of second language writing*,*12*(4), 317-345.

Perrin, D. (2003). Progression analysis (PA): Investigating writing strategies at the workplace. *Journal of Pragmatics*, *35*(6), 907-921.

Peters, M., & Frankoff, M. (2014). New literacy practices and plagiarism: a study of strategies for digital scrapbooking. *Digital Literacies in Foreign and Second Language Education*, 245.

Petrić, B., & Czárl, B. (2003). Validating a writing strategy questionnaire. *System*, *31*(2), 187-215.

Prabha, C., Silipigni Connaway, L., Olszewski, L., & Jenkins, L. R. (2007). What is enough? Satisficing information needs. *Journal of documentation*, *63*(1), 74-89.

Prensky, M. (2001). Digital natives, digital immigrants part 1. *On the horizon*, *9*(5), 1-6.

Prior, P. (1998). Writing/disciplinarity. *A sociohistoric account of literate activity in the academy. Mahwah, NJ: Lawrence Erlbaum Associates*.

Purdy, J. P., & Walker, J. R. (2010). Valuing digital scholarship: Exploring the changing realities of intellectual work. *Profession*, *2010*(1), 177-195.

Rogoff, B. (1995). Observing sociocultural activity on three planes: Participatory appropriation, guided participation, and apprenticeship. In J. V. Wertsch, P. Del Rio, & A. Alvarez (Eds.), *Sociocultural studies of mind* (pp. 139–164). New York: Cambridge University Press.

Raimes, A. (1985). What unskilled ESL students do as they write: A classroom study of composing. *TESOL quarterly*, 229-258.

Ramanathan, V., & Atkinson, D. (1999). Individualism, academic writing, and ESL writers. *Journal of second language writing*, *8*(1), 45-75.

Ren, J., & Hagedorn, L. (2012). International graduate students' academic performance: what are the influencing factors? *Journal of International Students, 2*(2), 135-143.

Rinnert, C., & Kobayashi, H. (2005). Borrowing words and ideas: Insights from Japanese L1 writers. *Journal of Asian Pacific Communication, 15*(1), 15-29.

Rorty, R. (1991). *Objectivity, relativism, and truth: Philosophical papers (Vol. 1)*. Cambridge, UK: Cambridge University Press.

Roscoe, R. D., Snow, E. L., Allen, L. K., & McNamara, D. S. (2015). Automated detection of essay revising patterns: applications for intelligent feedback in a writing tutor. *Technology, Instruction, Cognition, and Learning*,*10*, 59-79.

Roth, W. M. (2007). Emotion at work: A contribution to third-generation cultural-historical activity theory. *Mind, culture, and activity, 14*(1-2), 40-63.

Roth, W. M., & Lee, Y. J. (2007). "Vygotsky's neglected legacy": Cultural-historical activity theory. *Review of educational research, 77*(2), 186-232.

Roth, W.M., Tobin, K., Elmesky, R., Carambo, C., McKnight, Y., & Beers, J. (2004). Re/making identities in the praxis of urban schooling: A cultural historical perspective. *Mind, Culture, and Activity, 11*, 48–69.

Rowlands, I., Nicholas, D., Williams, P., Huntington, P., Fieldhouse, M., Gunter, B. … Tenopir, C. (2008). The Google-generation: The information behaviour of the researcher of the future. *Aslib Proceedings, 60*(4), 290-310. doi: 10.1108/00012530810887953

Rowsell, J. & Walsh, M. (2012). Rethinking Literacy Education in New Times: Multimodality, Multiliteracies, and New Literacies. *Brock Education, 20*(1), 53-62.

Sarkodie-Mensah, K. (1998). International students in the U.S.: trends, cultural adjustments, and solutions for a better experience. *Journal of Education for Library & Information Science*, *39*(3), 214-222.

Sauro, S. (2009). Computer-mediated corrective feedback and the development of L2 grammar. *Language Learning & Technology*, *13*(1), 96-120.

Sawchuk, P. (2003). *Adult learning and technology in working-class life*. New York: Cambridge University Press.

Scarcella, R. (2003). Accelerating academic English: A focus on the English learner. Oakland, CA: Regents of the University of California.

Selber, S. (2004). *Multiliteracies for a digital age*. SIU Press.

Shi, L. (2004). Textual borrowing in second-language writing. *Written communication*, *21*(2), 171-200.

Silva, T. (1993). Toward an understanding of the distinct nature of L2 writing: The ESL research and its implications. *Tesol Quarterly*, *27*(4), 657-677.

Singhal, M. (2004). Academic writing and generation 1.5: Pedagogical goals and instructional issues in the college composition classroom. *The Reading Matrix*, *4*(3).

Smith, B. (2012). Eye tracking as a measure of noticing: A study of explicit recasts in SCMC. *Language Learning & Technology*, *16*(3), 53-81.

Stake, R. (1998). Case studies. In N. Denzin & Y. Lincoln (Eds.), *Strategies of Qualitative Inquiry* (pp. 86–109). Thousand Oaks, CA: Sage Publications.

Staley, D. J., & Trinkle, D. A. (2011). The changing landscape of higher education. *EDUCAUSE Review*, *46*(1), 16-32. Retrieved from http://search.proquest.com/docview/964191668?accountid=14522

Stapleton, P. (2003). Assessing the quality and bias of web-based sources: implications for academic writing. *Journal of English for Academic Purposes*,*2*(3), 229-245.

Stapleton, P. (2005). Evaluating web-sources: Internet literacy and L2 academic writing. *ELT journal*, *59*(2), 135-143.

Stapleton, P. (2005). Using the web as a research source: Implications for L2 academic writing. *The Modern Language Journal*, *89*(2), 177-189.

Stapleton, P., Helms-Park, R., & Radia, P. (2006). The Web as a source of unconventional research materials in second language academic writing. *The Internet and higher education*, *9*(1), 63-75.

Sharpe R. (2010) Conceptualizing Differences in Learners' Experiences of E-Learning: A Review of Contextual Models: Report of the Higher Education Academy Learner Difference (HEALD) Synthesis Project. Available at: http:// www.heacademy.ac.uk/assets/EvidenceNet/

Shotter, J., & Gergen, K. (1989). Texts of identity. Newbury Park, CA.: Sage.Chen, C., & Uttal, D. H. (1988). Cultural values, parents' beliefs, and children's achievement in the United States and China. *Human Development*, *31*(6), 351-358.

Starfield, S. (2007). New directions in student academic writing. In *International handbook of English language teaching* (pp. 875-890). Springer US.

Street, B. (2004). Academic literacies and the 'new orders': Implications for research and practice in student writing in higher education. Learning and Teaching in the Social Sciences, 1, 9–20. http://dx.doi.org/10.1386/ltss.1.1.9/0

Strobl, C. (2014). Affordances of Web 2.0 technologies for collaborative advanced writing in a foreign language. *Calico Journal*, *31*(1), 1.

Sun, Y. C. (2007). Learner perceptions of a concordancing tool for academic writing. *Computer Assisted Language Learning*, *20*(4), 323-343.

Sutherland-Smith, W. (2005). The tangled web: Internet plagiarism and international students' academic writing. *Journal of Asian Pacific Communication (John Benjamins Publishing Co.)*, *15*(1).

Thomas, E. E., & Sassi, K. (2011). An ethical dilemma: Talking about plagiarism and academic integrity in the digital age. *English Journal*, 47-53.

Tuzi, F. (2004). The impact of e-feedback on the revisions of L2 writers in an academic writing course. *Computers and Composition*, *21*(2), 217-235.

Van Waes, L., Leijten, M., & Van Weijen, D. (2009). Keystroke logging in writing research: Observing writing processes with Inputlog. *GFL-German as a foreign language*, *2*(3), 41-64.

Vygotsky, L. S. (1978). *Mind in society: the development of higher psychological processes.* Cambridge, MA: Harvard University Press.

Wang, L. (2003). Switching to first language among writers with differing second-language proficiency. *Journal of Second Language Writing*, *12*(4), 347-375.

Wang, Q. (2007). The national curriculum changes and their effects on English language teaching in the People's Republic of China. *International handbook of English language teaching* (pp. 87-105). Springer US.

Wang, W., & Wen, Q. (2002). L1 use in the L2 composing process: An exploratory study of 16 Chinese EFL writers. *Journal of second language writing*, *11*(3), 225-246.

Warden, C. A., Chen, J. F., & Caskey, D. A. (2005). Cultural Values and Communication Online: Chinese and Southeast Asian Students in a Taiwan International MBA Class. *Business Communication Quarterly*, *68*(2), 222-232.

Warschauer, M. (2001). Millennialism and media: Language, literacy, and technology in the 21st century. *AILA Review*, *14*, 49-59.

Warschauer, M., & Ware, P. (2006). Automated writing evaluation: Defining the classroom research agenda. *Language teaching research*, *10*(2), 157-180.

Warschauer, M. (2007). Technology and writing. In *International handbook of English language teaching* (pp. 907-917). Springer US.

Mansell, W. (2011, February 7). Hidden tigers: why do Chinese children do so well at school? *The Guardian*. Retrieved from https://www.theguardian.com/education/2011/feb/07/chinese-children-school-do-well.

Weissberg, R. (2005). Talking about writing: Cross-modality research and second language speaking/writing connections. *Second language writing research: Perspectives on the process of knowledge construction*, 93-104.

Williams, M. (2007). Literacy practices: two Chinese students at university in England. *The East Asian Learner*, *3*(1), 21-38.

Winner, L. (1986). T/rc whulfc and the reactor: a seurch fix lirnit%s in an age qf high te~~na~ag~. Chicago: University of Chicago Press.

Wu, S. Y., & Rubin, D. L. (2000). Evaluating the impact of collectivism and individualism on argumentative writing by Chinese and North American college students. *Research in the Teaching of English*, 148-178.

Yamagata-Lynch, L. C. (2010). Understanding cultural historical activity theory. In *Activity systems analysis methods* (pp. 13-26). Springer US.

Yamagata-Lynch, L. C. (2010). *Activity systems analysis methods: Understanding complex learning environments*. Springer Science & Business Media.

Yi, Y. (2008). Relay writing in an adolescent online community. *Journal of Adolescent & Adult Literacy, 51*(8), 670-680.

Yi (Leaf), Z. (2013). Power distance in online learning: experience of Chinese learners in U.S. higher education. *International Review Of Research In Open & Distance Learning*, *14*(4), 238-254.

Yusoff, Z. S., Alwi, N. A. N., & Ibrahim, A. H. (2012). Investigating students' perception of using wikis in academic writing course. *3L; Language, Linguistics and Literature, The Southeast Asian Journal of English Language Studies.*, *18*(3), 91-102.

Zawacki, T. M., & Habib, A. S. (2014). Negotiating "errors" in L2 writing: Faculty dispositions and language difference. *WAC and second language writers: Research towards linguistically and culturally inclusive programs and practices*, 183-210.

Zawacki, T. M. & Michelle Cox, eds. 2014. Introduction. *WAC and Second Language Writing. Research Toward Linguistically and Culturally Inclusive Programs and Practices. Fort Collins, CO: WAC Clearinghouse*.

Zeek, C., Foote, M., & Walker, C. (2001). Teacher stories and transactional inquiry: Hearing the voices of mentor teachers. *Journal of Teacher Education*, *52*(5), 377–385. doi: 10.1177/0022487101052005004.

Zhao, J. C., & Mawhinney, T. (2015). Comparison of Native Chinese-speaking and Native English-speaking Engineering Students' Information Literacy Challenges. *The Journal of Academic Librarianship*, *41*(6), 712-724.

Zhao, N., & McDougall, D. (2008). Cultural influences on Chinese students' asynchronous online learning in a Canadian university. *The Journal of Distance Education, 22*(2), 59-80.

Zhuang, L. (2009). The challenges facing Sino-UK transnational education: An institutional experience. *Journal of Knowledge-based Innovation in China*, *1*(3), 243-255, Retrieved from http://0-www.emeraldinsight.com.library.vu.edu.au/Insight/viewPDF.jsp?contentType=Article&Filename=html/Output/Published/EmeraldFullTextArticle/Pdf/4040010305.pdf.

Appendix A

Survey on International Students' Academic Writing in the Digital Age

Basic demographic information
Age/年龄: _____ Gender/性别:_____ Major/专业:_____ Year in the university/年级:_____
Are you taking a writing class now? If yes, what is it?/你这学期有在上专门的写作课吗？如果有，是哪门课？ _____
Are you taking a disciplinary subject class with writing assignments now? If yes, what is it?/ 你这学期有在上需要完成写作作业的其他专业课程吗？如果有，是哪门课？
_____
Are you going to take a writing class next quarter (2017 Winter)? If yes, what is it?/ 你下个学期（2017冬季学期）准备上专门的写作课吗？如果准备上，是哪门课？ _____
Are you going to take a disciplinary subject class with writing assignments next quarter (2017 Winter)? If yes, what is it?/ 你下学期（2017冬季学期）准备上任何需要完成写作作业的其他专业课程吗？如果准备上，是那门课？
_____
What is your general TOEFL score in total (optional)? 请问你的托福总分是 （非必填项）？
_____

I. On a scale from 1-5 (5 meaning extremely comfortable), how comfortable are you in doing the following
1. Using a computer/laptop to complete an academic writing assignment;
2. Surfing the Internet or using various network-based apps on a digital device (computer/laptop, cell-phone, etc.);
3. Conducting research in the library (finding relevant information, consulting librarians, locating & checking out books, etc.).

II. What are the difficulties do you think you have when completing academic English writing assignments? Please choose on a scale from 1-5 according to the level of difficulty of the issue/请选择以下各项在你完成英文学术写作过程中的难易程度.

	1 Not difficult at all	2 Slightly difficult	3 Moderately difficult	4 Very difficult	5 Extremely difficult
Understanding the requirements and expectations of the writing assignments/理解					

写作作业的要求					
Knowing the Conventions of academic writing/了解学术写作规范					
Using appropriate vocabulary/使用恰当的词汇					
Spelling/拼写					
Using an adequate variety of sentence patterns/使用多种句法结构					
Knowing idiomatic expressions in English/了解英文地道表达法					
Using connectors and transitional phrases/使用恰当的连接及过渡语					
	1 Not difficult at all	2 Slightly difficult	3 Moderately difficult	4 Very difficult	5 Extremely difficult
Grammatical accuracy/使用准确的语法					
Having sufficient background information about the topic/掌握足够的相关背景材料					
Content (having sufficient ideas to write about)/有充足的写作内容					
Knowing how to organize a composition/知道如何组织一篇作文					
Punctuation/使用标点符号					
Proper citation/恰当的引述格式					

III. How do you usually try to address these difficulties/issues in your academic writing? Please check all that apply./ 你通常如何解决下列写作过程中可能碰到的困难呢 （多项选择）？

	Consult the instructor or teaching assistant/请教老师或助教	Discuss with classmates or friends/和同学或朋友讨论	Rely on past writing experience/根据以往写作经验（包括中文写作）作判断	Rely on current or past ESL writing training/根据当前或以往所接受的英语写作训练作判断	Consult a librarian/请教专业的图书馆馆员	Use digital tools (i.e., the Internet, apps, etc.)/使用电子资源（如网站，搜索引擎，电子辞典，数据库等）
Understanding the requirements and expectations of the writing assignments/理解写作作业的要求						
Knowing the Conventions of academic writing/了解学术写作规范						
Using appropriate vocabulary/使用恰当的词汇						
Spelling/拼写						
Using an adequate variety of sentence patterns/使用多种句法结构						
	Consult the instructor or teaching assistant/请教老师或助教	Discuss with classmates or friends/和同学或朋友讨论	Rely on past writing experiences/根据以往写作经验（包括中文写作）作判断	Rely on current or past ESL writing training/根据当前或以往所接受的英语写作训练作判断	Consult a librarian/请教专业的图书馆馆员	Use digital tools (i.e., the Internet, apps, etc.)/使用电子资源（如网站，搜索引擎，电子辞典，数据库等）
Knowing idiomatic expressions in English/了解英						

文地道表达法						
Using connectors and transitional phrases/使用恰当的连接及过渡语						
Grammatical accuracy/使用准确的语法						
Having sufficient background information about the topic/掌握足够的相关背景材料						
Content (having sufficient ideas to write about)/有充足的写作内容						
Knowing how to organize a composition/知道如何组织一篇作文						
Punctuation/使用标点符号						
Proper citation/恰当的引述格式						

IV. Are you interested in entering a raffle drawing for two ten-dollar Starbucks gift cards (one for each winner)? If yes, please leave your email or other contact info here/ 你是否愿意参与抽奖（十元 Starbucks 礼品卡两名）？如果愿意，请留下你的电邮:

V. Are you interested in participating in a follow-up study involving the use of a digital tool to gain a closer look at your academic writing process and be able to reflect on them? Each participant would receive a twenty-five-dollar gift card upon completion of the research process. There would be a random selection process if we have more interested participants than needed. If yes, please leave your email or other contact info here/ 你是否愿意参与一个旨在考察学生在学术写作过程中如何使用电子资源的后续研究？此阶段研究将涉及使用一种屏幕录制工具来记录写作的过程。每位参与者将获得二十五美元礼品卡一张。如愿意参与人数超出研究需要的预订人数，我们将采取随机抽取方式来进行选择。如果你愿意参与，请留下你的电邮或其他联系方式：

VI. If you have used digital tools, please list those you have used most frequently in your writing process. Please also indicate what language(s) these tools are in or you usually use when utilizing these digital

tools./ 如果你在英文写作过程中曾使用过电子资源，请列出相对以下各项内容你最常用的资源及语言。

	Websites (including websites with content information, or those with specific functions such as grammar check, translation, or spell check, etc.)/网站（包括各种信息资源网站及提供语法检查，翻译，拼写检查等特定功能的网站）	Search engines/搜索引擎	Computer/ cell-phone/tablet apps (Microsoft Word, digital dictionaries, etc.)/计算机/手机/平板应用程序（包括Word，电子词典等）	Online databases (digital libraries, academic journal databases, etc)/电子数据库（如电子图书馆，学术论文数据库等）	What language (s) is/are used?/这些电子资源使用何种语言？
Understanding the requirements and expectations of the writing assignments/理解写作作业的要求					
Knowing the Conventions of academic writing/了解学术写作规范					
Using appropriate vocabulary/使用恰当的词汇					
Spelling/拼写					
Using an adequate variety of sentence patterns/使用多种句法结构					
Knowing idiomatic expressions in English/了解英文地道表达法					
Using connectors and transitional phrases/使用恰当的连接及过渡语					
Grammatical accuracy/使用准确的语法					
Having sufficient background information about the topic/掌握足够的相关背景材料					
Content (having sufficient ideas to					

write about)/有充足的写作内容					
Knowing how to organize a composition/知道如何组织一篇作文					
Punctuation/使用标点符号					
Proper citation/恰当的引述格式					

Appendix B

Retrospective Interview Guide

Depending on the writing process recorded by the screen capture tool, questions may include:

1. What was the hardest thing in the process of completing this particular writing assignment? Why was it the most difficult for you? Was it always or usually the most difficult thing for you in writing or only for this specific writing assignment? Why?

2. How do you usually decide what type of resources to use in your writing process (printed materials, digital resources, human beings such as instructors, tutors)?

3. Why did you go to this website/app? How did you decide to go to this one instead of others? What did you look at on this website/app? Did you find what you needed?

4. How did you determine the relevance of the information? Did you have difficulty determining if information was credible? How do you usually determine the trustworthiness of a digital resource? Would you pay attention to other information on the same web-page?

5. Would you click on any of the second-level links on a webpage to look for further information? When you look up a word online, would you intentionally read through the sample sentences to learn about the word?

6. When you found something useful, how did you determine what to cite and what not to cite? Why?

7. Did you use any other digital/non-digital tools during the writing process which were not recorded by the screen capture tool? What were they?

8. Do you communicate outside the class on/offline with your instructors, peers, or other supporting services regarding your writing assignments and/or the use of digital resources?

9. Was there a tool or resource that you wished you had access to? What was it? Why?

10. Have you taken a writing class/ a disciplinary subject class with writing assignments? What are the biggest difference(s) between finishing these two types of writing assignments for you, especially in terms of the use of digital resources?

11. Have your first language, educational and cultural background influenced your writing in English for academic classes and how you utilize digital resources in any way? If yes, How?

a. Have you done a research paper in either Chinese or English before you came to study in the U.S.?

b. Do you think Chinese language is helpful for your writing in English and looking for relevant digital resources? In what way it is helpful or not helpful?

c. How do you think the previous language education curriculum (both Chinese and English) such as textbook use, types of exercises, assessment, and use of technology, etc., influence your academic writing here?

d. How do you think your cultural background influence the way you look for digital resources, determine the credibility of them, and decide whether to cite what you have found?

12. What do you think the university, writing program, or the instructors have been doing to help you with your writing digitally? Are they helpful and sufficient?

13. In what way do you think the university, writing program, or the instructors can provide you with better support digitally for your academic writing?

14. Did using the screen capture tool influence your writing in any way? Do you find seeing the replay of your writing helpful?

Appendix C

1. Spelling or part of speech
2. Synonym
3. Translation
4. Expression
5. Word meaning/ usage
6. Concept
7. Background information/content/ideas
8. Citation
9. Writing rubrics
10. Movie/TV episode
11. CMS (course management system)
12. Other
13. Lecture notes