CRITICAL THINKING IN SECOND LANGUAGE WRITING:
CONCEPT, THEORY AND PEDAGOGY

by

YANNING DONG

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Abstract

Recognizing the reciprocal connection between critical thinking (CT) and writing, many second language (L2) instructors attempt to infuse CT in their writing classrooms but encounter great challenges due to the fact that teaching CT in a specific subject requires a “substantial reconstruction of a teacher’s model of how to teach a discipline” (Nosich, 2005, p. 65). To facilitate this reconstruction, this study is designed to provide the needed conceptual, theoretical and pedagogical supports. Based on a clarification of the concept of CT in L2 writing and the establishment of a theoretical framework that draws insights from Skill Acquisition Theory and Constructivism, I developed a CT-oriented L2 writing approach that included both explicit CT instruction and CT-oriented writing activities. The effectiveness of this approach was evaluated in actual teaching practice that involved 44 second-year L2 undergraduates in a Chinese university. Employing a mixed method research design, the study involved a pre-study questionnaire survey, a quasi-experiment and a post-study interview. After the study, the participants’ pre-test and post-test CT and L2 writing scores were analyzed. The results of the statistical analyses indicate that the CT-oriented L2 writing approach was effective for improving students’ CT and L2 writing scores and that there was a significant high positive relationship ($r=0.89$, $p<.01$) between students’ CT and L2 writing scores. The analysis of the post-study interview and the participants’ essays and worksheets reveals that the CT-oriented L2 writing approach has facilitated students’ learning of both CT and L2 writing by connecting the abstract CT theories and practical interactive activities and naturally infusing the instruction of CT into that of L2 writing. The development of the CT-oriented brainstorming worksheet and peer review checklist, as well as the “criteria for evaluating CT in L2 writing” facilitated the teaching, learning and assessment of CT in L2 writing in the present study. Exploring the effectiveness of
an approach to CT in L2 writing, the study provides pragmatic supports for L2 researchers and instructors who wish to cultivate their students to become not only proficient language users for effective written communication, but also independent critical thinkers for their life-long learning.
Preface

This dissertation is original, unpublished, independent work by the author, Yanning Dong.
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Chapter 1. Introduction

Being considered as playing important roles in a learning process, writing and critical thinking (CT) have gradually drawn attention from researchers in both domains to the possibility of integrating the teaching of both. According to Bean (2011), writing is not only a process of doing CT but also a product that communicates the results of CT. The inherent connection between writing and CT leads to a commonly accepted belief that teaching CT in writing will benefit the imparting of both skills (e.g., Bean, 2011; Hatcher, 1999; Kovalik & Kovalik, 2007). The possibility of improving students’ writing and CT competence in one writing course also attracts the attention from researchers of second language (L2) writing. Recognizing the importance and necessity of teaching CT in L2 writing, many L2 writing instructors attempt to infuse CT in their L2 writing classrooms but encounter great challenges. The present study is designed to explore an effective approach to teaching CT in L2 writing. Presenting the background of the study, this chapter introduces the problems in the current teaching and research of CT in L2 writing, presents the purpose of the study and raises three research questions. At the end of the chapter, there is an overview of the organization of the dissertation.

1.1 Background of the study

A number of L2 researchers (e.g., Barnawi, 2011; Moghaddam & Malekzadeh, 2011; Rao, 2007) have advocated the connection between L2 writing and CT, based on which they emphasize the importance of teaching CT in L2 writing. Indicating that L2 writing not only impels learners to organize their ideas and develop their ability to summarize, analyze and criticize, but also reinforces their reflection on the learning of L2, Rao (2007) points out that a writing process requires the use of both cognitive and linguistic strategies. With recognition of the difficulty of managing one’s thoughts in a logical and consistent manner, Moghaddam and
Malekzadeh (2011) suggest that researchers should turn to explore outside of the realm of linguistic elements and consider the solution of improving L2 writing through better CT skills. CT will, as Barnawi (2011) believes, enable L2 writers to “analyze facts, produce and organize ideas, maintain opinions, make comparisons, judge arguments, and solve problems by the use of existing information, previous knowledge, experience, and world knowledge when writing” (p. 191).

In recent years, an increasing number of Chinese L2 writing researchers have shown great enthusiasm for exploring effective ways to teach CT in their L2 writing courses (e.g., Arju, 2010; Fahim & Mirzaii, 2014; Li, 2010; Liang, 2011; Moghaddam & Malekzadeh, 2011; Sun, 2011; Zeng, 2012; Zheng, 2011). This enthusiasm is indeed a result of deep concern of L2 writing researchers who have found from their students’ English essays such problems like vague content and inappropriate reasoning, which have not only led to an averagely low English writing score, but also revealed the problems in students’ CT competence (Sun, 2011). According to Sun (2011), the teaching of CT in L2 writing is considered to be not only important but also imperative. However, as a domain-specific approach usually entails an explicit instruction of CT in the context of specific subjects, the teaching of CT in L2 writing brings great challenges to L2 writing teachers. It requires a reconceptualization of teachers’ understandings of both CT and its connection to L2 writing pedagogy.

Echoing the increasing attention to CT in L2 writing, a Summit Symposium on the Teaching of L2 Writing was held at the end of 2010 in Beijing, China, to explore possible ways to integrate the teaching of CT into L2 writing curriculum. Being an L2 instructional designer who has been highly involved in L2 curriculum reforms and who has been keeping in close touch with L2 teachers and researchers, I was invited to the symposium. Sitting in the auditorium, I
strongly sensed their deep concern about the inefficiency of the current teaching approaches to promoting students’ CT competency. The summit did not result in a widely applicable CT-oriented L2 writing approach, due to the fact that there was not yet a shared understanding of the concept of CT and that the teachers showed a lack of confidence in providing explicit instruction on CT in their writing classrooms. As a member of this community of L2 teachers and researchers, I felt obligated to join them for the exploration of effective ways to understand CT, and through that understanding, to infuse the teaching of CT into the existing teaching practices.

1.2 Statement of the problems and purpose of the study

Although agreement has been reached on the importance and necessity of teaching CT in L2 writing, there exist some problems concerning the understanding of CT, the theoretical foundations for teaching CT and effective CT-oriented approaches in L2 writing context, especially in China where these problems have become obvious obstacles to the exploration of a widely applicable infusion approach in actual teaching practice.

The first issue concerns the concept of CT. Despite the widespread recognition of the importance of CT in education (Brookfield, 1987; Facione & Facione, 2007; Paul & Elder, 2005), there is a notable lack of consensus regarding the understanding of CT. For example, CT is often referred to as a variety of related concepts such as creative thinking, problem solving, being able to challenge the authority or to think from more than one perspective (e.g., Liang, 2011; Liu, 2005). Furthermore, the commonly used translated version of CT in Chinese, pi pan si wei (which literally means thinking to criticize), is inclined to mislead people to a rather negative reaction to CT.

The second issue concerns the theoretical foundation for teaching CT. As Garrison (2011) points out, “it is by making explicit the theoretical elements that we reveal our educational ideals
that will have a profound influence on practice” (p. 9). The teaching of CT requires a steady theoretical foundation that will inform not only what to teach, but also how to teach. However, as Ruan (2012) indicates, there have been few studies so far on the development of theoretical frameworks for teaching CT in L2 education.

Finally, there is a lack of an effective CT-oriented L2 writing approach. Although an increasing number of researchers have been actively trying to adjust their current approaches so as to encourage CT in their L2 writing classrooms, these worthy attempts fall short of the mark for achieving wider applicability due to the fact that teaching CT in a specific subject requires more than simply adding some thought-provoking activities, but a “substantial reconstruction of a teacher’s model of how to teach a discipline” (Nosich, 2005, p. 65).

This study is designed to provide such needed conceptual, theoretical and pedagogical supports to facilitate the reconstruction of existing approaches to teaching CT in L2 writing. Through efforts for the clarification of the concept of CT in L2 writing and the establishment of a theoretical framework, this study aims to design a CT-oriented L2 writing approach, and to evaluate the effectiveness of this approach in actual L2 writing teaching practice.

1.3 Research questions

This study is premised on the reciprocal effects between CT and L2 writing and the belief that teaching CT in an L2 writing course will contribute to the improvement of both CT and L2 writing. Hypothesizing that students have not received much explicit instruction on CT in their L2 writing courses, I consider it necessary to explore students’ background knowledge of CT, based on which new perceptions will be constructed later. To evaluate the effectiveness of the proposed CT-oriented L2 writing approach, it requires an investigation of its impact on the scores of both CT and L2 writing after the instructional intervention compared with a group with
no instructional intervention. To enhance the understanding of the effectiveness of the CT-oriented approach, the study also looks into the aspects in which the approach affects students’ learning of CT and L2 writing. Concerning all these issues, this study is designed to answer the following three research questions:

1. What are students’ perceptions of CT and its connection to L2 writing?
2. Does a CT-oriented L2 writing approach help improve students’ CT and L2 writing scores?
3. How does the CT-oriented L2 writing approach used in the present study affect students’ learning of CT and L2 writing?

1.4 Organization of the dissertation

The dissertation is organized into eight chapters. Chapter One introduces the current problems in the teaching of CT in L2 writing. To explore an effective way of integrating CT in an L2 writing course, the study is designed to answer three research questions that focus on students’ prior knowledge of CT, the effectiveness of a CT-oriented L2 writing approach and how the approach affects students’ learning of CT and L2 writing.

In Chapter Two, a theoretical framework for teaching CT in L2 writing is established based on the exploration of the concept of CT and two related theories: Skill Acquisition Theory and Constructivism. Understanding CT as including both CT skills and CT dispositions, I propose two approaches: a skill acquisition approach that is focused on CT skills and a constructivist approach that is focused on CT dispositions. The proposed theoretical framework clarifies the understanding of CT and its connection to L2 writing, establishes a theoretical foundation for the design of CT-oriented L2 writing approaches, and provides pragmatic strategies and tools to facilitate actual teaching practice. Based on the established theoretical framework, I have
designed a CT-oriented L2 writing approach that has been employed in the present study for promoting students’ CT as well as L2 writing.

Chapter Three reviews some previous studies on teaching CT in L1 and L2 writing, which reveals the reasons that have propelled researchers and instructors to integrate CT in their writing courses, their methods of CT instruction and their assessment of CT. The review of these studies highlights the encouraging outcomes as a result of different strategies for promoting students’ CT in writing. Meanwhile, some gaps concerning concepts, theories, and pedagogies are also revealed, which make the present study a timely supplement to the efforts for the exploration of effective ways to teach CT in L2 writing.

Chapter Four documents the research methods that were used to conduct this study. With an illustration of the mixed methods research design for the present study, I report the research site, the participants, the pilot study and the instruments. The procedure of data collection and methods of data analysis are also presented in this chapter.

Chapters Five, Six and Seven present and analyze the data collected, with discussions of the findings for each of the three research questions. Chapter Five discusses the findings for the first research question that is designed to find out students’ perceptions of CT and its connection to L2 writing. According to the result from the pre-study questionnaire survey, I found that CT was not a new term for the participants, who had, however, an incomprehensive understanding of the concept due to a lack of formal and explicit training. In spite of their limited understanding of CT, the majority of the participants believed that there was a positive relationship between CT and L2 writing.

Chapter Six reports and discusses the findings for the second research question, which aims to identify whether the CT-oriented L2 writing approach used in the study helped to improve
students’ CT and L2 writing scores. First of all, an ANOVA analysis was conducted to compare the post-test results of the two groups. Secondly, a Pearson correlation analysis was conducted to examine the relationship between the participants’ CT and L2 writing scores. The results indicate that the students in the experimental group achieved significantly higher CT and L2 writing scores than their peers in the control group after following the CT-oriented L2 writing approach, and that there was a significant high positive relationship ($r=0.89, p<.01$) between the participants’ CT and L2 writing scores.

Chapter Seven reports and discusses the findings for the third research question, which aims to explore how the CT-oriented L2 writing approach (particularly the CT-oriented brainstorming and peer review) has led to significant improvement in the experimental group’s CT and L2 writing scores as reported in Chapter Six. To answer this research question, I first analyzed the post-study interview transcripts to identify the participants’ experience of following the CT-oriented L2 writing approach, and then reviewed participants’ pre-test and post-test essays and relevant worksheets to identify further textual evidence related to the participants’ learning of CT and L2 writing. The results indicate that the CT-oriented brainstorming and peer review activities worked effectively as a bridge to connect the abstract CT theories and practical interactive activities, as well as a way to naturally infuse the instruction of CT into that of L2 writing.

The last chapter, Chapter Eight, summarizes the findings and contributions of the present study, and then discusses its implications for the teaching and assessment of CT in L2 writing. With the objective of providing an effective approach to teaching CT in L2 writing, the present study provides insights for the teaching of CT in L2 writing in terms of concept, theory and pedagogy. First of all, the study contributes to the perception of CT in an L2 writing context. Secondly, the study lays down a theoretical foundation for the design of effective approaches to
CT in writing. Thirdly, with the development of the CT-oriented brainstorming worksheet, CT-oriented peer review checklist, and the “criteria for evaluating CT in L2 writing”, the study provides pragmatic supports for the teaching, learning and assessment of CT in L2 writing in the present and future studies. Finally, by employing a mixed methods approach, the study also provides some methodological insights for evaluating the effectiveness of CT-oriented approaches.
Chapter 2. Towards a theoretical framework for teaching CT in L2 writing

While exploring effective ways to infuse CT in L2 writing courses, a fundamental premise is to have a commonly recognized theoretical framework that will ensure a shared understanding of CT and the teaching of CT in an L2 writing context. Although it is considered to be beneficial to the development of a common framework that are applicable to every discipline (Moseley, 2005), I consider it critically important to take account of the specific needs and characteristics of learners in different disciplines. Towards establishing such a theoretical framework for guiding the teaching of CT in L2 writing, first of all, the concept of CT is explicitly discussed and clarified in this chapter. In addition, theories that inform the teaching of CT either as skills or as dispositions are also discussed in this chapter. Based on the theoretical framework, I design a CT-oriented L2 writing approach which is employed in the present study with an aim to improve students’ CT and L2 writing.

2.1 The concept of CT

The term critical thinking is used so widely that it seems to have become an academic jargon that “has evolved to an ineffective umbrella term to subjugate the classic building blocks used as grounded foundations for effective thinking” (Minter, 2010, p. 33). The variety of labels for CT (such as reflective thinking, problem solving skills, higher order thinking, rational thought, etc.) result in a confusion of the concept of CT among both researchers and practitioners. As Petress (2004) claims, the concept of CT is seldom clearly or comprehensively defined. Furthermore, it also seems to be perceived differently in various cultural contexts (Jenkins, 2011). Researchers from a variety of fields have identified the potential benefits of developing a consensus in the definition of CT so as to promote unity in a discipline, simplify evaluation and facilitate the research on CT (Jenkins, 2011).
2.1.1 The definitions of CT

Any study on CT must begin with the task of defining it. Without a consensus in the definition of CT, it would be impossible for teachers to determine what to teach (Wright, 2002). Mindful of the limitations in the process of defining such a complex concept as CT, Paul, Binker, Adamson, and Martin (1989) suggest that it would be more desirable to retain a host of definitions so as to “maintain insight into the various dimensions of critical thinking that alternative definitions highlight”, and to “escape the limitations of any given definition” (p. 352). Therefore, the discussion in this section is not to decide on one definition, but to depict a holistic view of the nature of CT by making comparisons and contrasts of the existing definitions.

CT is not a new term. The intellectual roots of CT can be traced back about 2,400 years ago to the teaching practice of Socrates who emphasized the importance of questioning, which is now referred to as Socratic questioning, a strategy for teaching CT (Paul, 1985). The agenda set by Socrates for the tradition of CT is to “reflectively question common beliefs and explanations, carefully distinguish those beliefs that are reasonable and logical from those that lack adequate evidence or rational foundation” (Paul & Elder, 2001, p. 375). Socrates’ practice was followed by Plato, Aristotle and the Greek skeptics who value the importance of seeing through the delusive appearances to the deeper realities of life. The tradition of CT extends across centuries until the CT movement in the early 1980s when there was an explosion of studies regarding CT in the fields of philosophy, psychology and education (Fasko, 2003).

The approaches to defining CT in the fields of philosophy, psychology and education are different (see Table 2.1). The philosophical approach focuses on the application of formal rules of logic (Lewis & Smith, 1993), and emphasizes the qualities and standards of thinking. It assumes the best performance of thought that may not correspond to reality (Sternberg, 1986).
While philosophers focus more on “the use of logical reasoning and perfections of thinking to decide what to believe and do”, psychologists’ interests lie in the mental process and how this process can “help people make sense out of their experience by constructing meaning and imposing structure” (Lewis & Smith, 1993, p. 132). Based on classroom experience and learning observations, educators also participate in the defining of CT. Different from the philosophical concept that specifies what people can do, and the psychological concept that specifies what people actually do, an educational concept of CT is often the mixture of the two (Sternberg, 1986). However, as Sternberg also indicates, the concept of CT in the domain of education is not clear enough for providing guidance in instruction and assessment, because (1) it is vague concerning the epistemological status; and (2) it has not been tested as vigorously as those developed in the domain of philosophy or psychology.
Table 2.1

Definitions of CT in Philosophy, Psychology and Education

<table>
<thead>
<tr>
<th>Philosophy</th>
<th>Psychology</th>
<th>Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Act persistent and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it tends. (Dewey, 1938, p. 9)</td>
<td>• The extension of evidence in accord with that evidence so as to fill up gaps in the evidence. (Bartlett, 1958, p. 75)</td>
<td>• Analysis, synthesis, and evaluation. (Bloom, 1956)</td>
</tr>
<tr>
<td>• The propensity and skill to engage in an activity with reflective skepticism. (McPeck, 1981, p. 8)</td>
<td>• An active process involving a number of denotable mental operations such as induction, deduction, reasoning, sequencing, classification and definition of relationships. (Sigel, 1984, p. 118)</td>
<td>• An investigation whose purpose is to explore a situation, phenomenon, question, or problem to arrive at a hypothesis or conclusion about it that integrates all available information and that can therefore be convincingly justified. (Kurfiss, 1988, p. 2)</td>
</tr>
<tr>
<td>• Reasonable reflective thinking that is focused on deciding what to believe or do. (Ennis, 1985, p. 45)</td>
<td>• The mental processes, strategies, and representations people use to solve problems, make decisions, and learn new concepts. (Sternberg, 1986, p. 3)</td>
<td>• Making reasoned judgements. (Beyer, 1995, p. 8)</td>
</tr>
<tr>
<td>• Skillful, responsible thinking that facilitates good judgement because it 1) relies upon criteria, 2) is self-correcting, and 3) is sensitive to context. (Lipman, 1988, p. 39)</td>
<td>• A set of processes whereby people assemble, use and revise internal mental symbols. (Gilhooly, 1996, p. 1)</td>
<td>• The propensity and skills to engage in activity with reflective skepticism focused on deciding what to believe or do. (Halonen, 1995, p. 76)</td>
</tr>
<tr>
<td>• Purposeful, self-regulatory judgement which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or conceptual considerations upon which that judgement is based. (Facione, 1990, p. 3)</td>
<td>• The use of those cognitive skills or strategies that increase the probability of a desirable outcome. (Halpern, 1998, p. 450)</td>
<td>• Take new information and interrelate and/or rearrange and extend this information to achieve a purpose or find possible answers in perplexing situations. (Lewis &amp; Smith, 1993, p. 136)</td>
</tr>
<tr>
<td>• Disciplined, self-directed thinking that exemplifies the perfections of thinking appropriate to a particular mode or domain of thought. (Paul, 1992, p. 9)</td>
<td>• Seeing both sides of an issue, being open to new evidence that disconfirms your ideas, reasoning dispassionately, demanding that claims be backed by evidence, deducing and inferring conclusions from available facts, solving problems, and so forth. (Willingham, 2007, p. 8)</td>
<td>• Skills which enable individuals to solve problems for which they have no ready-made procedures or solutions. (Steele, 1997, p. 6)</td>
</tr>
</tbody>
</table>
2.1.2 CT skills and CT dispositions

Despite the differences among the three perspectives for the definition of CT, there reveals some commonalities. First, researchers tend to identify certain skills as germane to the concept of CT. Second, researchers agree that CT involves not only skills abut also dispositions. It requires a further exploration into the existing definitions to identify the specific CT skills and CT dispositions and the relationship between them.

2.1.2.1 CT skills

A general conceptualization of CT relates it to a set of cognitive skills. To be more precise, CT skills are usually referred to as higher order cognitive skills (Halpern, 2007), which require a higher level of complexity of thinking abilities. In order to make a more explicit explanation of what skills are required in terms of CT, researchers like Bloom, Ennis, and Facione have devoted great efforts to providing taxonomies of CT skills (see Table 2.2).

Table 2.2

Taxonomies of CT Skills

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>• Analysis</td>
<td>• Focusing on a question</td>
<td>• Interpretation</td>
</tr>
<tr>
<td>• Synthesis</td>
<td>• Analyzing arguments</td>
<td>• Analysis</td>
</tr>
<tr>
<td>• Evaluation</td>
<td>• Asking and answering questions of clarification and/or challenge</td>
<td>• Evaluation</td>
</tr>
<tr>
<td></td>
<td>• Judging the credibility of a source</td>
<td>• Inference</td>
</tr>
<tr>
<td></td>
<td>• Observing and judging observation reports, criteria</td>
<td>• Explanation</td>
</tr>
<tr>
<td></td>
<td>• Deducing and judging deductions</td>
<td>• Self-Regulation</td>
</tr>
<tr>
<td></td>
<td>• Inducing and judging inductions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Making value judgments</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Defining terms, and judging definitions in three dimensions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Identifying assumptions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Deciding on an action</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Interacting with others</td>
<td></td>
</tr>
</tbody>
</table>
In 1956, Bloom and his colleagues identified a hierarchical learning taxonomy in the cognitive domain which categorizes six levels of thinking from lowest to highest in terms of complexity: knowledge, comprehension, application, analysis, synthesis, and evaluation. The top three levels—analysis, synthesis, and evaluation—are considered to be the higher levels of cognition that are frequently associated with CT (Ennis, 1992). Referred to as “Bloom’s Taxonomy”, it is widely used and remains “a standard reference for discussions of testing and evaluation, curriculum development and teaching and teacher education” (Anderson & Sosniak, 1994, p. vii). However, Ennis (1993) disagrees with this way of defining CT, as he indicates that the three levels are interdependent rather than hierarchical. Bloom’s Taxonomy has also been questioned for oversimplifying the nature of thought and its relationship to learning (Furst, 1994).

In addition, Ennis (1987) expresses some doubts about the usefulness of Bloom’s taxonomy as a detailed approach to CT, because the concepts in the taxonomy are vague and lack of the criteria for evaluating both teaching and learning.

Viewing CT as “reasonable reflective thinking that is focused on deciding what to believe or do” (Ennis, 1985, p. 45), Ennis believes that CT reflects the practical side of higher order thinking although the idea itself seems to be quite vague. With efforts over a number of years, Ennis has developed a taxonomy of 12 CT skills, which fall into four categories of abilities that are involved in the process of deciding what to believe or do: clarity-related abilities (focusing on a question, analyzing arguments, asking and answering questions of clarification and/or challenge, defining terms, and judging definitions in three dimensions, identifying assumptions), inference-related abilities (deducing and judging deductions, inducing and judging inductions, making and judging value judgements), abilities related to establishing a sound basis of inference (judging the credibility of a source, observing and judging observation reports, criteria), and
problem-solving abilities (*deciding on an action, interacting with others*). Providing a list of detailed abilities/skills that are involved in an abstract decision-making process makes Ennis’ taxonomy a great attempt for conceptualizing CT, and establishes a practical foundation for the teaching and assessment of CT. Nevertheless, the number of broad categories and their sub-categories make it somewhat “daunting to apply” (Moseley, 2005, p. 156). Furthermore, it seems that the categorization of the CT abilities in Ennis’ taxonomy to some extent mixes up CT skills with the standards for CT. For example, the “clarity-related abilities” (such as analyzing *arguments* and identifying *assumptions*) actually require the cognitive skills that not only meet the standard of clarity but also other standards such as accuracy or precision, etc.

Another highly recognized CT taxonomy is generated from a two-year, multi-round, strict-method Delphi research project (Facione, 1990), which provides a consensus interpretation of the core CT skills (*interpretation, analysis, evaluation, inference, explanation* and *self-regulation*) and sub-skills (such as assessing claims/arguments under the category of *evaluation*). Although the identification of these core CT skills and sub-skills transcends the boundaries between disciplines, Facione (1990) also indicates that the learning and application of these skills require domain-specific knowledge that includes the understanding of methodological principles and the competence to engage in the norm-regulated practices in specific contexts. Although using a different methodology and involving a larger number of researchers with a variety of disciplinary backgrounds, Facione’s taxonomy approaches CT in a similar manner as Bloom and Ennis, and focuses on identifying the cognitive skills essential to judgement and decision making. On the one hand, these skills and sub-skills crystalize the vague concept of CT and help facilitate the setting of educational objectives; on the other hand, as Facione (1990) notes, these skills do not “exhaust the concept of CT in either breadth or detail” (p. 14).
Although the number of skills and the ways in which the skills are categorized in these taxonomies are different, they provide us with a more concrete conceptualization of CT by presenting a list of skills involved in the abstract thinking process that are not only teachable, but also observable and assessable. If we take a bird view of all these definitions and taxonomies, it is not hard to identify several skills that are highly valued by a majority of researchers, whether from the philosophical, psychological or educational background. These skills, as listed in Table 2.3, include making judgement or decision, reasoning, evaluating, and analyzing. It may not be conclusive to claim that these are all the most important CT skills. However, the agreement reached concerning these skills implies a commonly accepted perception that CT is an application of skills such as reasoning, evaluating or analyzing, to one’s thinking, which is aimed to improve the quality of thinking in the process of making judgments and solving problems.

Table 2.3

<table>
<thead>
<tr>
<th>Some Core CT Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Making judgement/decision</td>
</tr>
<tr>
<td>Ennis (1985, 1987); Facione (1990);</td>
</tr>
<tr>
<td>Moore &amp; Parker (1994); Rudd (2007);</td>
</tr>
<tr>
<td>Seifert (2010); Smith (1990);</td>
</tr>
<tr>
<td>Willingham (2007).</td>
</tr>
<tr>
<td>Reasoning</td>
</tr>
<tr>
<td>Ennis (1987); Facione (1990); Paul</td>
</tr>
<tr>
<td>(1992); Rudd (2007); Stahl &amp; Stahl</td>
</tr>
<tr>
<td>(1991); Willingham (2007).</td>
</tr>
<tr>
<td>Evaluating</td>
</tr>
<tr>
<td>Bloom (1956); Brookfield (1987);</td>
</tr>
<tr>
<td>Facione (1990); Graham (2011);</td>
</tr>
<tr>
<td>Siegel (1988).</td>
</tr>
<tr>
<td>Analyzing</td>
</tr>
<tr>
<td>Bloom (1956); Ennis (1987); Facione</td>
</tr>
<tr>
<td>(1990); Paul (1992); Smith (1990).</td>
</tr>
</tbody>
</table>

2.1.2.2 CT dispositions

Along with the agreement on the notion that CT includes a set of cognitive skills, there is a growing consensus among researchers that CT also involves dispositions, which are, as Facione (2000) defines, “consistent internal motivations to act toward or respond to persons, events, or circumstances in habitual, yet potentially malleable ways” (p. 64). The Delphi research experts
caution that those who are proficient in CT skills but are not able to use them appropriately are not good critical thinkers (Facione, 1990). As Halpern (1999) declares:

Critical thinking is more than the successful use of the right skill in an appropriate context. It is also an attitude or disposition to recognize when a skill is needed and the willingness to exert the mental effort needed to apply it. (p. 72)

Dated back to about eighty years ago, the importance of attitudes has already been stressed by John Dewey (1933) who indicates the fact that people have the tendency to believe what is in harmony with their desires without examination because of personal attitudes. He advocates for the cultivation of attitudes by saying that: “If we were compelled to make a choice between these personal attributes and knowledge about the principles of logical reasoning together with some degree of technical skill in manipulating special logical processes, we should decide for the former” (p. 34). When it comes to the teaching of CT in an educational context, CT dispositions are especially stressed as being indispensable for the understanding of teaching CT (Facione, Facione, Sánchez, & Gainen, 1995), and as the ultimate purpose for teaching CT (Paul & Elder, 2006).

As Ennis (1985) indicates, the ability to think critically is distinct from the disposition to do so. Researchers from different domains of knowledge have tried to describe the dispositions that an ideal critical thinker should have. Dewey (1933) names three personal attitudes that are essential constituents of a general readiness to think in a thoughtful way: open-mindedness, whole-heartedness, and responsibility. The Delphi research project (Facione, 1990) provides a detailed description of an ideal critical thinker:

The ideal critical thinker is habitually inquisitive, well informed, trustful of reason, open-minded, flexible, fair minded in evaluation, honest in facing personal biases, prudent in
making judgments, willing to reconsider, clear about issues, orderly in complex matters, 
diligent in seeking relevant information, reasonable in the selection of criteria, focused in 
inquiry, and persistent in seeking results which are as precise as the subject and the 
circumstances of inquiry permit. (p. 3)

Based on this conceptualization of dispositions toward CT, the California CT Disposition 
Inventory (CCTDI) (Facione & Facione, 1992) is designed to measure CT dispositions from 
seven scales: inquisitiveness, open-mindedness, systematicity, analyticity, truth-seeking, CT self-
confidence, and maturity.

Many other researchers (e.g., Bailin, Case, Coombs, & Daniels, 1999b; Baron, 1985; Ennis, 
1987; Halpern, 1998; Lipman, 1991; Paul & Elder, 2001) who advocate for an emphasis on CT 
dispositions have also offered their lists of CT dispositions. Like what happens to CT skills, 
although there is no agreement on an exhausted or complete list of CT dispositions, a number of 
intellectual traits are highly valued for being a critical thinker, such as open-mindedness, fair-
mindedness, inquisitiveness, propensity to seek alternatives, and respect for reason (Table 2.4). 

Table 2.4

<table>
<thead>
<tr>
<th>Some Core CT Dispositions</th>
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</thead>
<tbody>
<tr>
<td><strong>Open-mindedness</strong></td>
</tr>
<tr>
<td><strong>Fair-mindedness</strong></td>
</tr>
<tr>
<td><strong>Inquisitiveness</strong></td>
</tr>
<tr>
<td><strong>Propensity to seek alternatives</strong></td>
</tr>
<tr>
<td><strong>Respect for reason</strong></td>
</tr>
</tbody>
</table>

It is interesting to find that these most highlighted dispositions, to some extent, are 
overlapping in essence. For example, open-mindedness, as Dewey (1933) defines, is “freedom
from prejudice, partisanship, and such other habits as close the mind and make it unwilling to consider new problems and entertain new ideas” (p. 30). It conveys a meaning of being fair-minded, which is defined by Paul and Elder (2001) as being unbiased and unprejudiced. Dewey also indicates that open-mindedness includes an active desire to listen to more than one side, to give attention to alternative possibilities and to recognize the possibility of errors in one’s own beliefs and the alert curiosity and spontaneous outreaching for the new. In this sense, it also encompasses such dispositions as having the propensity to seek alternatives, and being inquisitive. Nevertheless, it does not mean CT dispositions come down to open-mindedness, because it does not entail all the virtues that a critical thinker should have. What I intend to conclude from all these arguments is that the essence of being a critical thinker does not mean being picky or rigorous, but rather being alert, of the mistakes one and others may make, of the diversity of possible solutions, and of the ways to achieve fair outcomes.

Taking the dispositions into consideration as an important component of CT indicates a fact that CT should be viewed not only as a set of thinking skills, but also the awareness of why, and how to use the skills and the willingness of using them in appropriate circumstances. This recognition reminds us that, on one hand, CT only occurs when people apply it; on the other hand, a crucially important objective of teaching CT is to cultivate students’ CT dispositions.

2.1.3 The relationship between CT skills and CT dispositions

The review of the definitions of CT identifies the two essential aspects of CT and reveals the fact that a comprehensive understanding of CT should include both the skills and dispositions. Facione et al. (1995) hypothesize that CT skills and CT dispositions mutually reinforce each other. However, the linkage between CT skills and CT dispositions is not a one-to-one relationship, which means a skill-focused curriculum would not lead learners to be both willing
and able to think critically, because “being skilled does not assure one is disposed to use CT, and being disposed toward CT does not assure that one is skilled” (Facione, 2000, p. 81).

The relationship between CT skills and CT dispositions reveals two principles concerning what and how to teach CT. First, the teaching of CT involves both the development of CT skills and the nurturing of CT dispositions so that learners are not only able but also willing to use CT skills in appropriate circumstances. Second, although the teaching of CT skills and CT dispositions should not be separated, skills and dispositions are two separate things (Facione, 2000). Therefore, different approaches should be employed concerning the nature of each aspect.

2.1.4 Paul and Elder’s (2001) CT model

The exploration of the perception of CT reveals the complexity of the concept, which implies the potential challenges to infuse CT in a classroom context. As to actual teaching practice, what teachers need is more than a definition but rather a proven model that may provide a set of tools to facilitate the teaching and learning of CT both within and across disciplines (Jones & Haydon, 2012).

Viewing CT as “the art of analyzing and evaluating thinking with a view to improving it”, (Paul & Elder, 2006, p. 2), Paul and Elder provide a three-dimension model of CT that includes not only CT skills and CT dispositions, but also the standards that evaluate the quality of thinking. Based on the belief that “critical thinkers routinely apply the intellectual standards to the elements of reasoning in order to develop intellectual traits” (Paul & Elder, 2001, p. 50), Paul and Elder provide three components in their CT model (Table 2.5): (1) elements of thought; (2) intellectual standards; and (3) intellectual traits.
Table 2.5

Paul and Elder's (2001) CT Model

<table>
<thead>
<tr>
<th>Elements of thought</th>
<th>Intellectual standards</th>
<th>Intellectual traits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose</td>
<td>Clarity</td>
<td>Fair-mindedness</td>
</tr>
<tr>
<td>Question at issue</td>
<td>Accuracy</td>
<td>Intellectual humility</td>
</tr>
<tr>
<td>Information</td>
<td>Precision</td>
<td>Intellectual courage</td>
</tr>
<tr>
<td>Interpretation and inference</td>
<td>Relevance</td>
<td>Intellectual empathy</td>
</tr>
<tr>
<td>Concepts</td>
<td>Depth</td>
<td>Intellectual integrity</td>
</tr>
<tr>
<td>Assumptions</td>
<td>Breadth</td>
<td>Intellectual perseverance</td>
</tr>
<tr>
<td>Implications and consequences</td>
<td>Logic</td>
<td>Confidence in reason</td>
</tr>
<tr>
<td>Point of view</td>
<td>Significance</td>
<td>Intellectual autonomy</td>
</tr>
<tr>
<td></td>
<td>Fairness</td>
<td></td>
</tr>
</tbody>
</table>

2.1.4.1 Elements of thought

Different from the researchers who have attempted to specify the skills that are essential to CT, Paul and Elder (2001) have scrutinized the process of thinking, and identified the essential dimensions of reasoning as well as a general logic to the use of thinking. Believing that thinkers can improve the quality of their thinking by “skillfully taking charge of the structures inherent in thinking and imposing intellectual standards upon them” (Paul & Elder, 2001, p. xx), Paul and Elder provide the “elements of thought” (also called the “universal structures of thought”) that include eight elements: purpose, question at issue, information, interpretation and inference, concepts, assumptions, implications and consequences, and point of view. Paul and Elder (2001) indicate that these eight elements are interrelated in a thinking process:

Whenever you are reasoning, you are trying to accomplish some purpose, within a point of view, using concepts or ideas. You are focused on some question, issue, or problem, using information to come to conclusions based on assumptions, all of which has implications. (p. 53)
This description seems to examine thinking under a microscope so that we find out how these elements work together to affect the process and result of thinking. The interrelationship and interdependence among these elements of thought direct special attention to the inner logic of thinking in nature. It also reminds thinkers the fact that only when each element of thought is given careful consideration, will it be possible for them to achieve the improvement of their thinking process and result. The ability to identify these elements of reasoning, as Paul and Elder (2001) indicate, is an important ability in CT.

2.1.4.2 Intellectual standards

Like any other skills, there are standards that people strive to achieve and standards that assess the level that people have achieved. Considering skilled thinkers as those who are able to meet the relevant criteria for good reasoning, Bailin et al. (1999a) highly value the role of relevant standards for the teaching of CT. As abstract cognitive skills, however, CT is not easily evaluated as behavioral skills such as riding a bicycle or swimming. One of the most prominent features of Paul and Elder’s (2001) CT model is to provide the “intellectual standards” that can be used to not only assess CT, but also “guide us to consistently excellent thinking” (Elder & Paul, 2008, p. 3). All together nine intellectual standards (Table 2.6) are suggested as both evaluation criteria and goals for learners to aim at: clarity, accuracy, precision, relevance, depth, breadth, logic, significance, and fairness.

The nine standards, or criteria, are expressed in daily used language and thus make it easy for users to conceptualize them and make connections with their subject area. According to Elder and Paul (2008), these standards are “necessary for making sound judgements or for reasoning well, for forming knowledge, for intelligent understanding, for thinking rationally and logically”, and “are essential to functioning as reasonable, fair-minded persons” (p. 16). By indicating that
every academic discipline is a mode of thought and to learn a subject is to learn how to think within that specific discipline according to its essential logic, Elder and Paul claim that the “intellectual standards” are applicable to all disciplines.

Table 2.6

*Paul and Elder’s (2001) “Intellectual Standards”*

<table>
<thead>
<tr>
<th>Intellectual Standards</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clarity</td>
<td>Understandable, the meaning can be grasped; free from confusion or ambiguity, without obscurities.</td>
</tr>
<tr>
<td>Accuracy</td>
<td>Free from errors, mistakes or distortions; true; correct.</td>
</tr>
<tr>
<td>Precision</td>
<td>Exact to the necessary level of detail, specific.</td>
</tr>
<tr>
<td>Relevance</td>
<td>Bearing upon or relating to the matter at hand; implying a close logical relationship with, and importance to, the matter under consideration.</td>
</tr>
<tr>
<td>Depth</td>
<td>Containing complexities and multiple interrelationships, implying thoroughness in thinking through the many variables in the situation, context, idea, question.</td>
</tr>
<tr>
<td>Breadth</td>
<td>Encompassing multiple viewpoints, comprehensive in view, wide-ranging and broadminded in perspective.</td>
</tr>
<tr>
<td>Logic</td>
<td>The parts make sense together, without contradictions; in keeping with the principles of sound judgment and reasonability.</td>
</tr>
<tr>
<td>Significance</td>
<td>Having importance, being of consequence; having considerable or substantial meaning.</td>
</tr>
<tr>
<td>Fairness</td>
<td>Free from bias, dishonesty, favoritism, selfish-interest, deception or injustice.</td>
</tr>
</tbody>
</table>

2.1.4.3 Intellectual traits

The third dimension of Paul and Elder’s (2001) CT model emphasizes the dispositions of a critical thinker. As many other researchers (e.g., Bailin et al., 1999b; Dewey, 1933; Ennis, 1985; Facione, 1990; Facione, Facione, Sánchez, & Gainen, 1995; Halpern, 1999; Lipman, 1991) who have emphasized the importance of being disposed to use CT skills, Paul and Elder extend the notion by bringing up the idea of weak-sense and strong-sense critical thinkers. They indicate that CT skills can be used to serve two incompatible ends: self-centeredness or fair-mindedness.
Weak-sense critical thinkers use CT skills in a selfish or unethical manner so as to achieve their own interest or to make their opponents’ thinking look bad. On the contrary, strong-sense critical thinkers use their intellectual skills in an ethically responsible manner and avoid using the skills to gain advantage over others. Advocating the importance of being a fair-minded critical thinker, Paul and Elder highlight the ethical aspect of CT which should not be neglected in the teaching of CT. Indicating that a fair-minded thinking requires a family of interrelated and interdependent states of mind, Paul and Elder provide a list of eight intellectual traits that are highly valued for being a strong-sense critical thinker: *fair-mindedness, intellectual humility, intellectual courage, intellectual empathy, intellectual autonomy, intellectual integrity, intellectual perseverance*, and *confidence in reason.*

Taking account of skills, dispositions and standards, Paul and Elder’s (2001) CT model provides a holistic description of CT and is believed to be applicable to any subject matter (Moseley, 2005). A recently published book (Jones & Haydon, 2012) has reported the application of this model to the teaching in various disciplines and the encouraging results that have been achieved. However, the field of L2 writing has not seen much of the application of this model yet. It seems to the author that Paul and Elder’s (2001) CT model not only offers a guideline for an approach to teaching CT in writing, but also invites L2 writing researchers and teachers to reconsider the ultimate purpose of L2 writing courses and to reconstruct their approaches to cultivating not only proficient L2 writers who are able to present good reasoning and logic in their writing, but also competent critical thinkers who are capable of making reasonable judgements and solving problems in their life.
2.1.5 A definition for CT in L2 writing

Although CT is required across disciplines, it is perceived differently in each discipline according to their specific objectives and standards (Barnett, 1997). To provide a working definition for the purpose of the present study which deals with CT in an L2 writing context, I consider it important to entail the characteristics of L2 writing in the process of defining CT. Based on Paul and Elder’s (2001) CT model, I would define CT in L2 writing as *a mindful application of a structured mode of thinking which aims to improve the quality of thinking to achieve intellectual standards of excellence in L2 written communication*. This definition establishes a connection between CT and L2 writing by highlighting the purpose of applying CT to L2 writing. Including the three essential aspects of CT (i.e., CT skills, CT dispositions and CT standards), it comprehensively includes the core essence of CT and will serve as a working definition of CT that guides the design of the present study as well as the teaching and evaluation of CT in L2 writing in this study. Although the definition is developed for the present study that focuses on academic writing, I believe it has a broader sense in its applicability for writing in general.

2.2 Theories related to the teaching of CT

As CT is considered to be inclusive of both skills and dispositions, the teaching of CT should aim at the improvement of both aspects. When teaching CT skills, teachers should focus more on training the habits of action. However, when teaching CT dispositions, teachers should pay more attention to the shaping of the habits of mind. Although the teaching of CT skills and CT dispositions is inseparable, the approaches to them have to be different. With a full recognition of the difference, I would propose a combination of two approaches to CT: a skill
acquisition approach that is focused on CT skills and a constructivist approach that is focused on CT dispositions.

Research has shown that there is great similarity in the development of a wide variety of skills (Dekeyser, 2007). According to Skill Acquisition Theory, the acquisition of a skill is a development process from the initial acquisition of knowledge through changes in behavior to the eventual well performed skill performance. CT is considered to be a learnable skill (English, 2006). If students receive explicit instruction on CT skills and engage themselves in relevant practice, as suggested by Skill Acquisition Theory, they will be led through the different stages, until the “skills” change from the declarative knowledge to “a ready-made chunk to be called up in its entirety each time the conditions for that behavior are met” (Dekeyser, 2007, p. 98).

As something related to the habits of mind or attitudes, CT dispositions are not to be taught the same way as CT skills. It requires a careful consideration of the learners, whose prior knowledge and interactions, according to Constructivism, play a significant role in their learning process. Highlighting a learner-centered approach, a constructivist learning environment will prepare students with all they need to perceive a deeper understanding of what it means to become critical thinkers.

2.2.1 Skill Acquisition Theory

Before the early 1960s, research into skill acquisition went through a period when there were no clear directions, theories or results, and the studies were almost exclusively focused on motor skills (Speelman & Kirsner, 2005). It was not until the cognitive revolution during the 1960s that cognitive performance was to be considered in skill acquisition research. An increasing number of skill acquisition studies concerning why practice leads to performance improvements and how the acquired skill can be transferred in other situations gradually
converge into a theory of skill acquisition that accounts for people’s progress in learning a variety of skills from the initial learning to the eventual proficiency.

2.2.1.1 Three stages

Fitts (1964) provides an early description of the three stages involved in the acquisition of a skill, which becomes the first exploration towards the establishment of Skill Acquisition Theory. According to Fitts, the initial stage is \textit{cognitive stage} when a learner acquires the knowledge about the skill and develops performance strategies. Then after only a few trials, the learner comes to the intermediate stage, the \textit{associative stage}, when the knowledge about the skill turns into behavior and the strategies are refined and strengthened on the basis of feedback and practice. At the same time, specific stimulus cues are associated with appropriate responses. Then slowly comes the final stage, the \textit{autonomous stage}, when the skill is performed with fluency and spontaneity.

The three stages described by Fitts (1964) suggest a hierarchical process of skill acquisition, which is acknowledged by later skill acquisition researchers who phrased them in slightly different terms, such as \textit{declarative stage}, \textit{procedural stage}, and \textit{automatic stage} (Anderson, 1982, 1993; Anderson et al., 2004), or \textit{presentation stage}, \textit{practice stage}, and \textit{production stage} (Byrne, 1986).

2.2.1.2 Two factors

In the three-stage skill acquisition process, two factors are crucially important concerning the efficiency of acquisition. One factor concerns the “power law of learning” (Dekeyser, 2007, p. 99) that stresses the effect of practice in decreasing both the reaction time and error rate, and in leading a learner to the gradual automatization stage of the skill. The other important factor, as Anderson, Fincham, and Douglass (1997) state, is the combination of abstract rules and concrete
examples, which are necessary for guiding learners to pass the declarative threshold into proceduralization and gradually to the eventual acquisition of the skill.

2.2.1.3 Teaching CT as skills

Skill Acquisition Theory, rooted in various branches of psychology, informs not only the acquisition of psychomotor skills, but also cognitive skills, such as CT skills. With the belief that skills can be acquired through a multi-stage process, Skill Acquisition Theory not only allows teachers and researchers to understand that the teaching of CT skills will go through a hierarchical process, but also provides pedagogical guidance for different acquisition stages.

As Fitts (1964) indicates, learners, no matter adults or little children, begin the acquisition of a new form of skill from the background of many existing skills. Thus when L2 learners begin to learn CT skills, the initial stage is an already highly organized system with their language skills, thinking skills, and their conceptualization of such skills. Just like learning to swim, a skill is learned against a complex background of existing habits (Fitts, 1964). Therefore, at this early stage of skill acquisition, teacher’s explicit instruction and appropriate demonstration play an extremely important role in allowing learners to reconceptualize the meaning of CT, and to reflect on their own thinking habits.

Next comes the stage of acting on CT. Students turn the concepts and rules they have learned about CT at the first stage into their thinking activities. They recall the structure of thinking and try to meet the intellectual standards. They practice CT skills in their writing tasks and use writing to evaluate the level of their thinking. The first stage might be short concerning the time it takes for learners to understand the concepts and fundamental rules. However, it requires a long period of practice to go through the other two stages, especially when students are learning such abstract and complex cognitive skills. Furthermore, as skill acquisition is a
continuous process, there are no distinct lines between the three stages but rather gradual shifts from initial learning to advanced proficiency. Only when the concept and rules of CT are naturally applied to students’ thinking process and gradually become the habitual guidance of their own mode of thinking, will they finally acquire these CT skills.

2.2.2 Constructivism

Constructivism is a theory about knowledge and learning (Fosnot, 2005). The ideas underlying Constructivism can be traced back to Socratic and Platonic practices. Constructivism draws heavily on the work of two scholars: Piaget (1977) who focuses more on the individual but at the same time recognizes the importance of social interaction, and Vygotsky (1978) who has laid the foundation for a social constructivist approach to education. As Karagiorgi and Symeou (2005) assert, “... in a world of instant information, Constructivism can become a guiding theoretical foundation and provide a theory of cognitive growth and learning that can be applied to several learning goals” (p. 24). It is not possible to provide an exhaustive review of Constructivism due to the fact that there is “no single constructivist theory” (Johansson & Gardenfors, 2005, p. 15). However, the general goals of Constructivism that encourage learners to develop active meaning construction and to become self-regulated learners are congruent with the goals of CT instruction.

As a broad principle, Constructivism emphasizes that knowledge is actively constructed by learners through active and meaningful social interactions. This indicates that, on the one hand, it is impossible to acquire new knowledge without having some previous experience or prior knowledge structure; on the other hand, learning is a social process: Effective and lasting learning takes place in social interactions with others (Pritchard & Woollard, 2010).
2.2.2.1 Constructivist learning environment

Studies reveal that deep approaches to learning are associated with learning environments (Watkins, 2001). Constructivist learning environments, as Jonassen (1994) summarizes, are embedded with the following characteristics:

- provide multiple representations of reality;
- avoid oversimplification and represent the complexity of the real world;
- emphasize knowledge construction instead of knowledge reproduction;
- emphasize authentic tasks in a meaningful context rather than abstract instruction out of context;
- provide learning environments such as real world settings or case-based learning;
- encourage thoughtful reflection on experience;
- enable context and content-dependent knowledge construction;
- support collaborative construction of knowledge through social negotiation among learners.

Constructivist approaches strive to create such learning environments where the roles of both learners and teachers are different from those in traditional learning environments that highlight a passive process of knowledge transmission. In constructivist learning environments, learners are actively engaged in interpreting the external world and reflecting on their interpretations (Jonassen, Carr & Yueh, 1998).

2.2.2.2 Role of students

From a constructivist perspective, learners are at the center of a learning process who actively construct meaning through experience and interactions. As Von Glasersfeld (1989) indicates, learning is not a passive acceptance of knowledge from the teachers. He explains that
“verbally explaining a problem does not lead to understanding” (p. 136). Karagiorgi and Symeou (2005) also hold the view that knowledge cannot be imposed or transferred intact from the mind of one knower to the mind of another. As Nunan (1995) suggests, “it is the learner who must remain at the center of the process, for no matter how much energy and effort we spend, it is the learner who has to do the learning” (p. 155).

An active learning process involves both learner’s understanding of and interactions with their background knowledge. Constructivist theories indicate that the construction of meaning is influenced, to a large extent, by learners’ prior (existing) knowledge (Matthews, 1994). The emphasis on background or prior knowledge originates from a constructivist epistemology of knowledge and truth, which is not transmitted or discovered, but “constructed by learners as they attempt to make sense of their experiences” (Driscoll, 2000, p. 376). This notion highly recognizes learners as active organisms who have existing beliefs, attitudes and knowledge that impact their learning process.

The recognition of learners’ background knowledge corresponds to a learner-centered constructivist learning approach, claiming that learning occurs best when students are: (1) actively engaged in cognitive thinking processes and self-responsible for their cognitive efforts, actions, and consequences; (2) actively integrating their prior knowledge with new learning; and (3) working together to solve problems jointly (Brooks & Brooks, 1999).

2.2.2.3 Role of teachers

The emphasis on the active role of students in building their own understanding of knowledge and engaging in active interactions with both teachers and other students also result in a change of teachers’ roles from knowledge distributors to facilitators who create and maintain
an environment in which students’ learning needs are fully taken care of, their opinions are
highly valued and their interactions are strongly encouraged.

Constructivism, particularly social Constructivism, highly values the role of others and all
forms of social interaction in learners’ meaning construction process. Perceiving knowledge as a
social product and learning as a social process, Vygotsky (1978) considers social interaction as a
fundamental aspect of successful cognitive and intellectual growth. In the Zone of Proximal
Development (ZPD), an area of understanding or cognitive development that is close to but just
beyond a learner’s current level of understanding (Vygotsky, 1978), scaffolding is considered to
be important for assisting a learner to move forward. To ensure effective scaffolding, the teacher
can take on different roles such as supporter, prompter, critical listener, or motivator, in order to:

- provide a secure framework and safe context where learners feel able to make
  suggestions and try out ideas;
- use questions to redirect the individual learner’s thinking or provide alternative or
  simpler language;
- give critical comment in a form which is understandable by the learner;
- break a problem into smaller manageable steps to be tackled by the learner;
- give appropriate encouragement at critical points in a process;
- point out aspects of a task or question which demand more attention than other less
  significant aspects;
- carry out a task or thinking aloud to demonstrate an approach or technique.

(Pritchard & Woollard, 2010, pp. 39-40)

The notion of ZPD highlights the potential for cognitive improvement through social
interactions. It also depicts an important role of teachers as scaffolders who not only identify
problems but also provide timely assistance in a learning process to ensure a natural progress of learning.

2.2.2.4 Teaching CT as dispositions

Paul and Elder (2001) have identified a set of eight intellectual traits that an ideal critical thinker should have, including *fair-mindedness, intellectual humility, intellectual courage, intellectual empathy, intellectual integrity, intellectual perseverance, confidence in reason,* and *intellectual autonomy.* These intellectual traits, as Paul and Elder indicate, are not commonly discussed, and are rarely taught. Neither are these intellectual traits identified in school curriculums, nor are they evaluated by standard testing. The reason might lie in the fact that the shaping of intellectual traits or CT dispositions in a person is influenced by mixed factors including not only the character that a person is born with, but also the environment with which the person interacts.

The characteristics of a constructivist learning environment imply a number of favorable factors for promoting the intellectual traits of ideal critical thinkers. In such a learning environment, students are highly encouraged to interact and collaborate with their peers. In an interactive and collaborative learning process, students are exposed to a variety of ideas, some of which may be different from or even opposite to their own opinions. To make decisions on accepting or opposing others’ ideas, students will be given chances to listen to others, to ask questions and to defend themselves. When they listen to others, they understand the possibility of different perspectives towards the same issue, and to a certain degree, are aware of the limits of their knowledge (*intellectual humility*). By asking questions, they identify the difference in various perceptions and therefore try to comprehend it from other people’s perspectives (*intellectual empathy*). When students try to defend their viewpoints, they need to use good
reasoning skills to convince others. The successful experiences gained will help them to build their *confidence in reason*. When students take an active role in their learning process, they learn to think and take responsibility for their own thinking (*intellectual autonomy*). When knowledge is actively learned rather than passively taught in an environment that represents the real world, students gain opportunities to seek truth and to perceive the reality based on a *fair-minded* standard, so that they are not likely to be blinded by any biased or prejudiced views.

To create such a constructivist learning environment, teachers’ responsibilities include not only promoting interactions and collaborations among learners, but also providing scaffolding during this process. Like what is suggested by Pritchard and Woollard (2010), teachers should “provide a secure framework and safe context where learners feel able to make suggestions and try out ideas” (p. 39). The *courage* for self-expression and for challenging the seemingly-right beliefs is thus gradually established. When teachers take careful consideration of learners’ background knowledge while designing learning tasks and classroom activities, it is very likely that learners gain more successful learning experiences which bring confidence in learners. Teachers’ value also reveals from the moment when they provide comments or suggestions for students to work through confusions, difficulties and frustrations (*intellectual perseverance*); and when they provide clear standards for students to understand that they should always hold themselves to the same standards they expect others to meet (*intellectual integrity*). As a role model, a teacher who acts as an example of a competent critical thinker will certainly show positive influence on the cultivation of students’ CT dispositions.

Like the acquisition of CT skills that goes through a hierarchical process, the shaping of CT dispositions cannot be achieved overnight. It not only takes time, but also requires efforts from both teachers and students. In this effortful process, a constructivist learning environment
constituting all the above favorable factors plays an irreplaceable role for promoting these intellectual traits, just like what an appropriate climate means to the growing of a plant.

2.3 Establishment of a theoretical framework

With the objective of providing a shared understanding for teachers and researchers to explore effective approaches to teaching CT in L2 writing, I propose a theoretical framework that clarifies the concept of CT through close attention to the epistemological assumptions and theoretical foundations related to the concept. Based on the perception that CT involves both skills and dispositions, and that the teaching of them requires different approaches, the theoretical framework is established that draws insights from both Skill Acquisition Theory and Constructivism which motivate a variety of principles and strategies for teaching CT. Addressing the interconnection between CT and L2 writing, the theoretical framework is developed to fulfill the purpose of a specific application to L2 writing. It is hypothesized that the framework will also be applicable to writing in general, because there is a similar reciprocal effect between CT and L1 writing (see for example, Bean, 2011; Hatcher, 1999).

2.3.1 The theoretical framework for teaching CT in L2 writing

The process towards such a theoretical framework is like doing a jigsaw puzzle. It involves efforts to find out all the pieces that are in connection with each other. At the meantime, it requires one to have the whole picture in mind all the time, so that not a single piece will be left out during the process. As shown in Figure 2.1, the “pieces” that build the proposed theoretical framework are: CT, L2 writing, Skill Acquisition Theory and Constructivism.
CT skills and CT dispositions are two interconnected and interdependent aspects in the cultivation of a critical thinker. The training of CT skills will allow learners to improve the quality of their thinking. While the cultivation of CT dispositions will implant a critical spirit in learners who will not only have the willingness to use CT skills in whatever they are doing, but also use these skills in a fair-minded rather than self-centered way. The cultivation of CT will only succeed when both aspects are included in the teaching process.

Although the teaching of CT skills and CT dispositions are inseparable, teachers should draw insights from two different lines of theories concerning the different traits of the two aspects. Skill Acquisition Theory directly sheds light on the ways to teach CT skills, which, on one hand, reminds teachers to provide explicit instruction on the skills as well as sufficient opportunities to practice using the skills, and on the other hand, stresses the awareness of a continuous and progressive learning process. The cultivation of CT dispositions will happen at the same time when students are learning CT skills. Highlighting the value of learners’ background knowledge and the interactions with peer learners and teachers, Constructivism
encourages the rethinking of the roles of teachers and students in a constructivist learning environment that is favorable for the cultivation of CT dispositions.

Like the interconnection and interdependence between the two aspects of CT, there is a similar relationship between CT and L2 writing. As writing can be used as a tool to train thinking, thinking can be used as a tool to improve writing as well. CT and L2 writing will reinforce each other in the learning process. The inseparability of writing and thinking makes the theoretical framework and its pedagogical applications feasible and meaningful.

2.3.2 The significance of the theoretical framework

Through a deep exploration of the conceptual, theoretical and pedagogical issues related to CT, the proposed theoretical framework contributes valuable theoretical and pragmatic insights to the understanding, learning and teaching of CT. Being a theoretical framework that is uniquely developed for the teaching of CT in an L2 writing context, it provides insights into the design of infusion approaches to teaching CT in L2 writing. It is of particular importance to those L2 educators and researchers who wish to infuse CT into their writing classrooms, but either have been hesitating to make the attempt because they are wary of the confusion surrounding the concept, or have made the attempt but failed because they are being held back by inefficient approaches.

Primarily, the proposed theoretical framework clarifies the concept of CT and reveals its connection to L2 writing. By stripping away all the confusing labels around CT (such as metacognition, problem solving, or rationality), the framework reveals the core essence of CT as a set of cognitive skills that enable one to make reasonable judgements and decisions as well as a set of dispositions that impel one to use these cognitive skills in a fair-minded manner. Based on the theoretical framework, the connection between CT and L2 writing will be further
investigated in this study by an exploration of the CT skills, dispositions and evaluation standards required in L2 writing. This connection also forms the premise for future exploration of effective pedagogical practice.

Furthermore, the developed framework establishes a theoretical foundation for the design of effective approaches to teaching CT in L2 writing. Although the teaching of CT should aim at both skills and dispositions, different approaches must be employed when focusing on each of them. Based on the inherent difference between CT skills and CT dispositions, the proposed theoretical framework draws insights from Skill Acquisition Theory and Constructivism that motivate a variety of principles and strategies for the teaching of CT skills and the cultivation of CT dispositions in the writing process.

2.4 Design of a CT-oriented L2 writing approach

The ultimate purpose of establishing the proposed theoretical framework is to facilitate the teaching of CT in L2 writing, so as to improve students’ CT competence as well as L2 writing proficiency. Revealing the core essence of CT, the connection between CT and L2 writing and the theoretical foundation for teaching CT, the theoretical framework implies and guides the design of the following CT-oriented L2 writing approach not only in the aspect of “what” but also in the aspect of “how” to teach CT in L2 writing. To facilitate the application of the CT-oriented L2 writing approach in actual teaching practice, some important teaching, learning and assessment tools are also designed based on Paul and Elder’s (2001) CT model as well as L2 writing pedagogy.

Generally speaking, the writing process consists of three stages: pre-writing, while-writing, and post-writing. Although each stage of the writing process involves thinking, pre-writing and post-writing are usually the two stages when CT is more easily promoted by writing and writing
is more influenced by CT, which is also why many researchers of previous studies paid particular attention to the activities involved in those two stages (see the review of related studies in Chapter 3). Viewing L2 writing as a thought-provoking process, I particularly stress the importance of using CT skills to develop and evaluate one’s ideas in this ongoing process. Instruction on both CT and L2 writing is provided in this process to facilitate students’ understanding of CT in L2 writing. Meanwhile, interactive activities are organized to provide opportunities of sufficient practice in both CT and L2 writing, as well as opportunities of development in their CT dispositions. More specifically, the CT-oriented L2 writing approach involves explicit instruction on CT and L2 writing, and requires students to follow a four-step writing process that consists of both CT-oriented activities and L2 writing practice: (1) brainstorming, (2) drafting (Draft 1), (3) peer review, and (4) revising (Draft 2). The time in each class is divided into three parts that are allocated to the instruction on CT and L2 writing, CT-oriented activities, and writing practice.

**2.4.1 Teaching objectives**

Teaching objectives usually specify the knowledge students will acquire, or the skills and behaviors students will be able to demonstrate at the end of a course. Serving as a “backbone” of a course, as Glanz (2009) indicates, the teaching objectives should be the aim that directs the design of all the instructional activities. Setting a set of clarified yet approachable teaching objectives is extremely important for the guarantee of encouraging learning outcomes of an infused CT and L2 writing course. However, when teaching CT in an L2 writing course, it requires more than the knowledge and skills of either CT or L2 writing, but a combination of both. Therefore, it is necessary to take into account the teaching objectives of both CT and L2 writing and make a practical combination in the expectations for students’ improved abilities.
Following a CT-oriented L2 writing approach, an infused CT and L2 writing course aims at the following teaching objectives:

- Students will understand the meaning of CT;
- Students will understand the role of CT in L2 writing;
- Students will learn to use CT skills to generate and organize ideas through CT-oriented brainstorming activities;
- Students will learn to use CT standards to evaluate and improve ideas through CT-oriented peer review activities;
- Students will develop their CT dispositions through the training so that they will be more aware and willing to apply CT to their L2 writing and other subjects, and even to their daily life.

### 2.4.2 Instruction on CT and L2 writing

As informed by Skill Acquisition Theory, teacher’s explicit instruction plays an important role in the early stages of students’ acquisition of a skill. Several previous studies (e.g., Li, 2011; Moghaddam & Malekzadeh, 2011) also stress the importance of explicit CT instruction. With the purpose of improving students’ CT skills as well as their L2 writing skills, the CT-oriented L2 writing approach provides explicit instruction on CT along with the instruction on L2 writing. To achieve better effects of CT instruction in an L2 writing course, it requires not only a clarification of the definition of CT, but also practical methods of how to think critically about their given writing tasks. In consideration of systematicity and practicability, the CT instruction is designed based on Paul and Elder’s (2001) CT model that involves CT skills and CT dispositions as well as the standards to evaluate CT. To make these abstract concepts easily understood by the students who have seldom heard about them before, plenty of examples,
particularly students’ own examples chosen from their newly submitted essays, are provided. Furthermore, sufficient time is spent on explaining how these elements and standards are able to be applied to writing through an illustration of how to use “elements of thoughts” to develop ideas for writing an essay and how to use “intellectual standards” to evaluate ideas for revising and improving a first draft.

The CT-oriented L2 writing approach also includes the instruction on L2 writing, which is particularly designed to make a natural connection between CT skills and L2 writing strategies so as to avoid any confusion among the students. For example, when teaching how to write supporting details, the strategies are related to the concept of information, which is one of the eight elements in the “elements of thought”. Realizing that information can be facts, data, evidences or experiences that needed to be considered to support one’s viewpoint, students understand at the same time what kinds of supporting details to look for when brainstorming ideas for an essay.

As the acquisition of a skill is a hierarchical process from the initial acquisition of knowledge through changes in behavior to the eventual well performed skill performance, particular attention is to be paid to students’ needs during the transition of different stages in this acquisition process by using concrete examples in combination with the abstract rules of using CT in writing, as well as designing sufficient exercises to allow students to constantly review the skills and practice using them as tools to guide their thinking in the writing process.

2.4.3 CT-oriented activities and writing practice

While design of innovative activities that foster students’ CT can certainly be beneficial, there is a need to explore how commonly used writing activities can be modified with an infusion of CT and thus become more effective for promoting CT, which makes the CT-oriented
L2 writing approach not only less time-consuming or risky for teachers, but also less intimidating for students. As brainstorming and peer review are commonly organized activities in the writing process and are believed to be beneficial to developing and evaluating ideas (e.g., Bean, 2011; Rao, 2007; Richards, 1990), the two activities are redesigned to infuse the teaching and practice of CT skills in students’ writing practices and peer interactions.

First of all, a CT-oriented brainstorming activity is designed to allow students to use CT skills to develop ideas before they begin to write their first drafts. As Thagard (1996) indicates, “thinking can be best understood in terms of representational structures in the mind and computational procedures that operate on those structures” (p. 10). Different from traditional brainstorming activities, the CT-oriented brainstorming is designed to be a structured activity to help students to develop ideas by thinking through the eight essential CT elements involved in the given tasks. During the brainstorming activities, the students are provided with the CT-oriented brainstorming worksheet, which is designed based on Paul and Elder’s (2001) “elements of thought” (see Table 4.3 on p. 110 for the brainstorming worksheet, and the details of how I developed it in Chapter 4, Section 4.1.7.3, on pp. 107-111). With the brainstorming worksheet, students are required to discuss the eight essential CT elements by asking and answering the corresponding questions. Their answers are the results of thinking and discussions concerning the CT elements that facilitate them to achieve a comprehensive understanding of the given tasks and to effectively develop ideas for their writing. Of course, students are also allowed to discuss other elements they consider important for their writing.

After students finish their first drafts, they are required to participate in a CT-oriented peer review activity, which is designed to help them to evaluate and improve their ideas. In the CT-oriented peer review activity, students are required to read their peers’ essays and ask each other
questions for clarification or explanation, etc. based on a carefully designed CT-oriented peer review checklist adapted from Paul and Elder’s (2001) “intellectual standards” (see Table 4.6 on p.114 for the peer review checklist, and the details of how I developed it in Chapter 4, Section 4.1.7.4, on pp. 111-114). Including the set of nine CT standards, the peer review checklist serves as a guiding tool to inform students of the criteria to evaluate and improve their ideas and to remind them of the nature of good writing. With this peer review checklist, students are encouraged to identify problems in their peers’ essays by asking the guiding questions when they find there is anything inaccurate, vague, irrelevant, etc. At the same time, these questions are supposed to trigger students’ reflections on their own thinking revealed from their writing. Students are also allowed to ask questions about other issues (such as vocabulary or grammar) that are not listed in the peer review checklist.

After the peer review activity, students are required to finish their Draft 2 by revising their Draft 1 based on the results of their peer review. After finishing each essay, students are required to submit their assignments in the form of a portfolio that includes the brainstorming worksheet as well as their first and second drafts.

2.4.4 Assessing CT in L2 writing

Since CT is taught as an integral part in L2 writing and the improvement of students’ CT an important objective of the CT-oriented L2 writing approach, the assessment of students’ CT is indispensable. In fact, both the assessment of CT and the assessment of L2 writing are to be conducted through an evaluation of students’ writing products. However, to assess students’ CT in L2 writing requires a set of different criteria from those used for writing assessment. Although most of the criteria for L2 writing often include some standards concerning idea development and quality of idea, they are not specific enough for a comprehensive evaluation of CT in L2
writing. Contextualizing CT in L2 writing, I have developed the “criteria for evaluating CT in L2 writing” (see Table 4.7 on p. 116) to include standards for both CT and L2 writing. Consisting of nine criteria and a set of five-scaled band descriptors for each criterion, the “criteria for evaluating CT in L2 writing” are designed to provide a comprehensive description of students’ level of CT as revealed in their L2 writing.
Chapter 3. Previous studies on teaching CT in writing

Although CT has remained a hot topic among researchers and educators worldwide, studies that focus on the exploration of practical approaches to teaching CT in writing courses are far from enough. There have been more discussions about the concept of CT and the importance of CT in various disciplines (e.g., Maiorana, 1992; Rudd, 2007; Shirkhani, & Fahim, 2011; Snyder & Snyder, 2008; Sun, 2011), which are indispensable for drawing people’s attention to the issue that is so important in education. However, at this stage, when many researchers and educators have realized the importance of CT and would like to strive for the improvement of their students’ CT abilities, it is also imperative to find a satisfactory answer to the “how” question. In this chapter, I focus on the review of previous studies concerning both the “why” and “how” questions. I first review the reasons why researchers consider it important to teach CT in writing and then I review some recent empirical studies that specifically address the teaching of CT in L1 and L2 writing courses. The researchers’ methods of instruction and their assessment of CT in L1 and L2 writing have important implications for the present study. Meanwhile, some conceptual, theoretical, and pedagogical gaps are also revealed from the previous research that shows the importance and necessity of the present study.

3.1 Why teaching CT in writing

Although the benefits of CT in learning are well acknowledged among researchers and educators from various disciplines, there shows some specific impetuses for researchers to focus on teaching CT in writing. A review of recent literature reveals some common understandings among L1 and L2 researchers concerning the importance of infusing the teaching of CT in their respective domains. In general, the enthusiasm or eagerness of these researchers who carried out
studies on CT in writing derives from mainly three aspects: (1) the importance of CT and writing; (2) students’ incompetence in CT and writing and (3) the connection between CT and writing.

3.1.1 Teaching CT in L1 writing

The importance of CT is one of the strongest impetuses for researchers who explore the cultivation of CT among students of various levels and disciplinary backgrounds. In the US, the development of CT skills is regarded as a priority of the curriculum in colleges throughout the country (Kovalik & Kovalik, 2007). In fact, CT is considered to be one of the most important skills for new entrants with a four-year college diploma to the 21st century US workforce (Casner-Lotto & Barrington, 2006). Some researchers attribute the increasing importance of CT to the coming of this information age. As Çavdar and Doe (2012) indicate, what challenges the students today is not to obtain facts because of the accessibility of information through all kinds of media, but the skills to critique and process the information easily obtained.

The importance of CT is often highly related to disciplinary requirements. Researchers from the field of nursing education, for example, consider CT as an essential activity (Mangena & Chabeli, 2005) and a major goal of nursing education (Shin, 1998). The attention to CT from nursing educators is based not only on the understanding that clinical nursing practice requires more than content knowledge (Cody, 2002), but also on the belief that CT can improve the outcome of the clinical practice by enabling the nurses to perform more evidence-based practice (Profetto-McGrath, 2005; Scheffer & Rubenfield, 2000). Similarly, the cultivation of CT is considered as being at the forefront of language and literacy education (Hillocks, 2010), the ultimate goal of which is to create “a just society whose citizens are critically literate about their world” (Alsup et al., 2006, p. 279). In other disciplines such as political science, CT is also set as one of the central objectives of the curriculum and their students are expected to acquire CT
skills to evaluate texts, access media reports and construct better arguments (Çavdar & Doe, 2012).

Besides the importance of CT, some researchers (e.g., Çavdar & Doe, 2012; Hillocks, 2010) also stress the importance of writing. Just as CT that plays an important role in learning and social practice, writing competence is also considered as one of the most important skills that students should acquire. As indicated in the report of the National Commission on Writing (2003), the quality of writing is a key factor for students’ success in college and life. Over a long period of time, writing has been viewed as a mode of learning (e.g., Bean, 2011; Çavdar & Doe, 2012; Emig, 1977), because it not only allows students to demonstrate what they know, but also helps them to understand what they know (The National Commission on Writing, 2006).

Despite the articulated importance of CT and writing over the past years, many researchers have expressed their dissatisfaction with their students’ competence in these two skills. After analyzing a group of 11th grade students’ written work, Jacobson and Lapp (2010) find that the students are able to form sentences and summarize basic information, but struggle with the ability to organize and present ideas in a logical manner, to present a logical connection of details within a paragraph, and to critically analyze the causes and propose solutions to problems. The lack of logic and critical analysis in students’ writing arouse their concerns about their writing proficiency as well as their CT competence. As to college students, many of them are considered to have left higher educational institutes without acquiring the requisite proficiency in writing and CT (Borglin, 2012). Focusing on the quality of writing among a group of political science students, Çavdar and Doe (2012) have summarized the problems revealed from their writing, which include:

1. Weakly constructed and substantiated arguments;
(2) Less-than-careful reading of the instructions;
(3) Lack of precision;
(4) Lack of a clear and sustained line of thought;
(5) Difficulty with utilizing evidence to substantiate or challenge an argument;
(6) Weak or absent evaluation of the assumptions of the theory at hand;
(7) Lack of organized, convincing, rich, and elaborate responses to the question at hand;
(8) An inability or unwillingness to integrate the feedback that instructors provide on drafts.

(Çavdar & Doe, 2012, p. 299)

Although these problems have been identified in students’ writing, they have also clearly revealed students’ problems in CT, which impels Çavdar and Doe (2012) to carry out their study on teaching CT skills in writing.

Just as Çavdar and Doe (2012) point out, “writing is crucial in cultivating CT skills” (p. 299), many researchers are well aware of the connection between CT and writing. Kovalik and Kovalik (2007) indicate that CT and writing are inseparable, because CT activities would also be beneficial to improving writing. Particularly addressing argumentative writing, Coe (2011) considers that CT skills can be practiced through writing argumentative writing tasks, because they require students to select, analyze and interpret ideas, imagine and respond to objections, identify and question assumptions, clarify reasons and present the reasons in a logical manner. Hillocks (2010) also addresses the importance of making a good argument, and considers argument as essentially important for both CT and writing. Strongly advocating an integration of CT and writing, Bean (2011) considers writing as a process that involves CT and communicates the result of CT. Based on the results of a comparative case study on the pedagogical influences
on students’ CT development, Tsui (2002) finds that writing and rewriting are beneficial to students’ development of CT skills.

The understanding of the reciprocal effects between CT and writing encourages researchers who want to teach CT and who want to improve students’ writing skills to explore the possibilities of combining the instruction of both. Having investigated how different types of courses and instructional strategies affect students’ improvement in their CT, Tsui (1999) suggests that writing is one of the courses that make most significant influences on students’ growth in CT. After a seven year long-term comparison study, Hatcher (1999) also suggests that courses that integrate the instruction of CT and writing are more effective than the standard stand-alone course of either CT or writing. Although less time might be devoted to the instruction of CT in an integrated course compared to that in a stand-alone CT course, students are given chances to practice and internalize CT skills by repeatedly applying them to their writing. Given the discussions and investigations, teaching CT in a writing course seems to be a practical way to combine CT and writing instruction for the improvement of both.

3.1.2 Teaching CT in L2 writing

In fact, L2 researchers’ enthusiasm for teaching CT in L2 writing derives from similar impetuses as those that have propelled L1 researchers. Understanding the importance of CT and L2 writing, many L2 researchers have shown their concerns for the lack of practice in either of them within the current L2 curriculum (e.g., Barnawi, 2011; Moghaddam & Malekzadeh, 2011). Although many researchers agree that the teaching of CT should be infused into the regular curriculum, which not only avoids adding an additional course but also allows students to understand that good thinking is not an isolated subject for learning but something to be presented in everything we do (Miraman & Tishman, 1988), the effective methods to integrate
CT and L2 education is still under exploration. As Liaw (2007) puts it, “language as a way of thinking and learning has been more of a pedagogical catchphrase than instructional practice” (p. 47). In many L2 classes, writing turns out to be only a practice of grammar (Arju, 2010). Therefore, it is not surprising to notice students’ difficulties in both CT and L2 writing (Liang, 2011; Wen & Zhou, 2006). Recognizing the reciprocal effects between CT and writing, Moghaddam and Malekzadeh (2011) strongly advocate an exploration outside of the linguistic elements and an approach of improving students’ writing by enhancing their CT skills.

Although CT is considered to be important for L2 learners as well, there has been a heated discussion about whether CT can actually be taught in different cultures. Assuming CT as a concept that presupposes individualism and self-expression, Atkinson (1997) reminds teachers to be cautious when teaching CT to non-native English speakers, who have been raised in cultures that “endorse modes of thought and education that almost diametrically oppose it” (p. 72). With her review of Chinese and Japanese educational practices, Carson (1992) also indicates the difficulty in teaching CT among Asian students based on her observation that innovation and individual creativity in writing are strongly discouraged due to an emphasis on memorization and recitation in instruction. Although these arguments recognize the importance of cultural differences in second or foreign language teaching and learning, as Kubota (1999) indicates, they have “tended to dichotomize Western culture and Eastern culture and to draw rigid cultural boundaries between them” (p. 14). Admittedly, CT is culturally related. However, these concerns for teaching CT to students from non-Western cultures convey some misunderstandings towards both the concept of CT and its connections to other cultures.

A commonly raised concern by the opponents is the lack of consensus in defining CT. Atkinson (1997) claims that CT is more like a social practice than a clearly defined educational
concept. As Fox (1994) puts it, CT is learned so intuitively that it is easy to recognize but hard to be defined or taught. Admittedly, CT is a complex concept that is not easily defined even by L1 researchers and educators despite the fact that they often use the term in teaching and can easily identify and evaluate it (Fox, 1994). Listing a variety of definitions of CT, for example, McPeck’s (1981) “reflective skepticism”, Paul’s (1990) “disciplined thinking which exemplifies the perfections of thinking appropriate to a particular mode or domain of thinking” (p.33) and Ennis’s (1992) “reasonable, reflective thinking that is focused on deciding what to believe or do (p.22), Atkinson (1997) indicates that many CT definitions are “desiderative or polemical” (p.74), because they are defined in a way to include the elements the definers would like to discuss or teach. Opposing Atkinson and Fox’s views, however, Davidson (1998) argues that the lack of consensus and clear understanding of CT does not mean CT does not exist. He points out that there are actually large areas of overlap among the existing definitions, which show little essential difference in terms of the nature of CT. According to Davidson, the various definitions are often paraphrases of the same idea that connects CT to rational judgement. Therefore, he believes that the diversity revealed from the different versions of CT definitions, to some degree, shows that the researchers try to interpret CT from different perspectives from which they see the best applicability of CT to their teaching practice.

Another concern is about cultural issues, because CT is considered by some researchers (e.g., Atkinson, 1997; Fox, 1994) as equivalent to individualism and deeply rooted in Western culture. According to Atkinson’s (1997) interpretation of CT, “critical” presupposes individual conflict and dissensus, while “thinking” assumes to be within the individual. Some researchers, however, disagree with the interpretation that limits CT to individuals. As Ennis (1985) declares, CT is applicable to both group thinking and individual thinking. In fact, students from cultures
that value group thinking, for example Japanese students or Chinese students, can present a firm grasp of the basic elements of CT (Davidson, 1995; Stapleton, 2002; Zheng, 2010). In addition, empirical evidence also supports the possibility of improvement in L2 students’ CT after receiving relevant training and instruction (Chapple & Curtis, 2000; Davidson & Dunham, 1997).

As a way of thinking which requires skills for reasoning and an attitude to use these skills in appropriate circumstances, CT is actually not a challenge for just Asian students who share a collectivist cultural background, but rather a challenge for every human being who, in nature, as Dewey (1933) indicates, tends to believe what is in harmony with our desire, and refuses to accept ideas that are contrary to our hopes and wishes. The nature of CT is, in fact, an art of “analyzing and evaluating thinking with a view to improving it” (Paul & Elder, 2006, p. 2). To perform better thinking in learning and in life, everyone, no matter from which cultural background, should and could learn CT and benefit from the learning of it.

In the previous studies on CT in L2 writing, CT is often associated with self-expression, voices, or willingness to challenge authorities in writing. A study by Stapleton (2002) among 70 Japanese undergraduates found little hesitation among the students to voice their opinions counter to authority figures. By analyzing 45 Japanese undergraduate students’ essays, Stapleton (2001) finds out that the quality of CT actually greatly depends on the topic content. A study by Liu (2005) among 56 Chinese undergraduate students also substantiates that familiar topics generate better performance of CT. Although these studies are not intended to depict Asian L2 learners as good critical thinkers, they remind the necessity of a reconceptualization of the influence of cultural differences on the teaching and learning of CT.

Although CT is considered to be rooted in the teaching practice of Socrates, it is not exclusive to Western culture. In fact, a critical spirit can be traced back more than 2,000 years
ago in Chinese culture. According to Liu’s (2010) research, there reveals a critical spirit in several classics of Chinese ancient philosophy. Dated back to the time of Confucius, there were his wide-spread sayings that highly valued the critical attitude in learning, such as: *Being skeptical is the starting point of reflection, and the beginning of learning; learning without thought means labour lost, and thought without learning is perilous.* Many other Chinese philosophers and educators like Mencius, Xun Tzu, Zhu Xi, and Lu Jiuyuan also stressed the importance of a critical and reflective way of thinking in learning (Liu, 2010). Although these ideas in Chinese philosophy do not correspond exactly to the modern concept of CT (as what has been elaborated so far), it does not mean that the concept is beyond understanding within a Chinese cultural context. Admittedly, Chinese traditional way of thinking values much of imagination, comprehensiveness and integration rather than abstraction and analysis (Liu, 2010), which has led to insufficient practice of CT in both social and educational contexts. This, as Davidson (1998) suggests, is actually a strong argument for teaching CT in such cultures.

**3.2 How to teach CT in writing**

There have been a multitude of discussions about why teaching CT in writing is important but far less empirical studies on how it can be effectively taught in actual teaching practice. Both the teaching of CT and the teaching of writing are considered to be challenging tasks for educators, let alone the teaching of both in one course. In an integrated course that involves the instruction of both CT and writing, the instruction of CT seems to bring more challenges. First of all, there are inconsistent definitions of CT (Borglin, 2012), and it is rarely precisely defined in a specific disciplinary context (Hillocks, 2010). An obscure understanding of CT has made it difficult to comprehend for both instructors and students. Secondly, despite the importance of CT, it remains an “underaddressed objective of higher education” (Çavdar & Doe, 2012, p. 305).
Therefore, it is not surprising to see, as Franklin, Weinberg and Reifler (2014) claim, that there is no one specific course that all students get the training of CT. Involving a set of complex thinking skills, however, students are not possibly expected to learn CT without formal instruction and sufficient practice (Carter & Rukholm, 2008).

Although many researchers and educators have attempted to explore effective means of teaching CT skills, several problems have been identified from the current instruction methods. According to Mangena and Chabeli (2005), there are five obstacles to the teaching of CT, which include (1) the teachers’ lack of knowledge about CT; (2) the teaching and assessment methods; (3) negative attitudes of the teachers and their resistance to change; (4) students’ educational background; and (5) inadequate socialization. When infusing the instruction of CT in a writing course, the design of writing instruction could also become an obstacle to the teaching of CT. As Çavdar and Doe (2012) indicate, traditional writing assignments often fall short in helping students to develop their CT skills, because they rarely provide students with incentive to pay attention to and learn from instructor’s feedback. In addition, problems of writing instruction also lie in the teaching materials. Hillocks (2010) points out that the widely used rubrics for evaluating secondary English writing do not access CT in writing. Having a strong belief in the connection between argument and CT and the importance of both, he is disappointed to find out that a significant textbook of over 1,100 pages devotes only 1.5 pages to argument, without sufficient explanation of the features of good reasoning. Being understressed in writing courses, the teaching of CT is not likely to achieve the expected outcomes. Given all the problems and challenges, it is necessary to review how some L1 and L2 researchers have endeavored to include CT as an important part of their writing instruction. Their methods of instruction and the outcomes they have achieved provide great insights for the present study.
3.2.1 Review of empirical studies on teaching CT in L1 writing

In higher education, besides English composition courses, many disciplinary courses also require students to have a certain level of academic writing abilities and teach writing along with the course content. Some recent studies that investigate the teaching of CT in L1 writing involve a variety of disciplines. Although I mainly focus on the studies in higher education, this review also includes two studies in high school settings. Table 3.1 presents a summary of these empirical studies. When reviewing these studies, I particularly focus on the methods these researchers have employed for teaching CT and their assessment of CT.

Table 3.1

*Recent Empirical Studies on Teaching CT in L1 Writing*

<table>
<thead>
<tr>
<th>Study</th>
<th>Students</th>
<th>Course/Discipline</th>
<th>Methods of instruction</th>
<th>Assessment of CT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Çavdar &amp; Doe, 2012</td>
<td>College students</td>
<td>Politics</td>
<td>Using a Two-stage writing assignment</td>
<td>Task-based rubric</td>
</tr>
<tr>
<td>Coe, 2011</td>
<td>College students</td>
<td>Philosophy</td>
<td>Using scaffolded writing assignments</td>
<td>N</td>
</tr>
<tr>
<td>Mulnix &amp; Mulnix, 2010</td>
<td>College students</td>
<td>Philosophy</td>
<td>Using a writing portfolio project</td>
<td>N</td>
</tr>
<tr>
<td>Franklin, Weinberg &amp; Reifler, 2014</td>
<td>College students</td>
<td>Political science</td>
<td>Using a skeleton essay assignment</td>
<td>Inquiry and Analysis Value Rubric (Association of American Colleges and Universities, 2012)</td>
</tr>
<tr>
<td>Carter &amp; Rukholm, 2008</td>
<td>Registrants of a continuing education program</td>
<td>Nursing</td>
<td>Using two online bulletin board postings</td>
<td>Johns’ Model of Structured Reflection (Johns, 1995)</td>
</tr>
<tr>
<td>Hillocks, 2010</td>
<td>High school students</td>
<td>/</td>
<td>Modeling critical analysis through pre-writing discussions</td>
<td>N</td>
</tr>
<tr>
<td>Jacobson &amp; Lapp, 2010</td>
<td>High school students</td>
<td>/</td>
<td>Modeling critical analysis by using a “higher order thinking guide”</td>
<td>N</td>
</tr>
<tr>
<td>Kovalik &amp; Kovalik, 2007</td>
<td>College students</td>
<td>English composition</td>
<td>Using language simulations activities</td>
<td>Textual analysis</td>
</tr>
</tbody>
</table>
3.2.1.1 CT instruction in L1 writing

In the recent empirical studies on teaching CT in L1 writing as listed in Table 3.1, the researchers actually used different methods of instruction based on their understanding of CT concept and theories. Most of the researchers choose to use particularly designed writing assignments to develop and improve students’ CT skills. And the others choose to use some other methods such as modeling critical analysis and organizing thought-provoking activities.

Teaching in a lower-division political science course, Çavdar and Doe (2012) designed a two-stage writing assignment to improve students’ CT by requiring them to reconsider concepts, critically evaluate assumptions and make substantive revisions. Believing that CT skills require intellectual self-discipline and reflexive thinking, Çavdar and Doe developed a writing assignment based on Watson-Glaser Critical Thinking Appraisal (Watson & Glaser, 1952), a long established CT measurement instrument that identifies five levels of intellectual activity essential to CT: inference, recognition of assumptions, deductions, interpretation and evaluation of arguments. Drawing on this CT instrument, Çavdar and Doe designed their writing assignment to engage students in a recursive writing process. The two-stage writing assignment consisted of two papers. The first paper required students to write according to the given question, content and style requirements. While the second paper required students to revise their first paper based on instructor’s feedback and to add at least five outside sources to challenge or substantiate the selected argument. In addition, for the second paper, students were also asked to write a postscript in which they should self-evaluate their revisions and reflect on their learning from the writing process. Çavdar and Doe believed that the two-stage writing assignment enabled students to make good use of instructor’s feedback and achieve progress in CT and writing from the revision process. They found that the second papers presented a generally
higher degree of clarity, accuracy, coherence and substantiality, and gained a higher average score than the first ones. As revealed from students’ postscripts, they admitted to have benefited from this two-stage writing assignment for not only better understanding the course content, but also better developing their ideas in writing. Çavdar and Doe’s study sets a good example of integrating the teaching of both CT and writing in a disciplinary course by using well designed writing assignments. Although the improvement in students’ writing and students’ self-reflection reports, to some degree, showed their progress in CT, which is quite encouraging for researchers who want to teach CT through writing assignments, it is a pity that the researchers did not actually use the CT measurement instrument to assess students’ CT before and after the study to present a more valid and detailed result of students’ progress in CT.

Also using multiple writing assignments, two groups of researchers from the discipline of Philosophy (Coe, 2011; Mulnix & Mulnix, 2010) designed scaffolded writing assignments and a writing portfolio project to teach CT skills. In fact, both studies attempted to break a big and challenging writing task into a series of small tasks, and allowed students to concentrate on learning some specific skills from each task and synthesize them all at the end. In Coe’s (2011) study, CT is contextually understood as a kind of thinking that will lead to “a clearly stated thesis supported by a well-organized and rationally compelling argument” (p.36). Based on this understanding of CT and following Bloom’s taxonomy of cognitive skills, Coe designed a series of four writing assignments in her introductory philosophy courses. The first assignment focused on a comprehension level of cognitive skill and required students to write a description and explanation based on the content knowledge. The second assignment required an analysis level of cognitive skill and asked students to write accurate and insightful interpretation. Extending the abilities to understanding the reasons behind a position, the third assignment required students to
draw a conclusion by comparing two different authors’ texts. The last assignment moved on to an even higher level that required students to use their evaluation ability to defend a judgement, based on their previous comprehension, analysis and reflection. During the writing process, the students would also gain a chance of self-evaluation based on the guiding questions as well as the instructor’s feedback. One thing that was missing in the process was interactive activity such as peer review, which Coe mentioned that she would like to incorporate in future teaching practice. Although Coe did not present students’ scores for these assignments, she did include some of the students’ feedback, which indicated their satisfaction with the writing assignments for allowing them to start from simple ones to more demanding ones, and to develop a better understanding of the methods of philosophy as well as the ways to write a good essay. However, from the students’ feedback, there seems to have no significant evidence to show students’ understanding of their improvement in CT, which might be a result of an implicit CT instruction in Coe’s study. Although to improve CT was the major objective of Coe’s designing of the scaffolded writing assignments, neither did she explicitly discuss CT in class or in assignment requirements, nor did she assess students’ CT based on any CT measurement instruments. Admittedly, these writing assignments provided great opportunity for students to practice some higher level cognitive skills. However, the absence of explicit CT instruction and CT assessment might have restrained the outcome of the study.

Also using a series of writing assignments to teach CT, Mulnix and Mulnix (2010) designed a writing portfolio project that included a set of nine progressively staged assignments that guided students through the development of writing an argumentative paper. Different from Coe (2011), Mulnix and Mulnix spent two to three weeks teaching CT, with a focus on elements related to argument. Their CT instruction included the methods to identify arguments and
argument patterns, understand ways to evaluate arguments, map argument and represent argument structures. The nine assignments were designed to allow students to practice and reinforce these skills. The first assignment was the start of the semester-long journey, requiring students to express a position on a self-chosen topic. The second assignment did not require writing, but identifying argument and mapping argument. It aimed at strengthening students’ ability to understand the evidential relationships between statements and to improve their structure of writing, based on which students were able to modify their argument when rewriting their essay for the third assignment. After revising their essay, the students were asked to review two essays written by their classmates. Following the fourth assignment, there was an in-class discussion about the peer review results. Then, the students were given another chance to refine their papers based on feedbacks from both peers and the instructor. The sixth assignment moved on to require the students to get prepared to incorporate outside sources, which were two readings on their writing topics. They were asked to use the previous skills, such as identifying arguments and mapping argument, to analyze the readings. At this stage, the students were expected to plan how to make use of outside sources to refine and support their positions. Then, in the seventh assignment, the students were required to extend their previous writing by refining the structure and incorporating outside sources. Following another peer review session in the eighth assignment, the final draft was expected to be written for the last assignment. Together with the final paper, all the previous writing assignments were required to be submitted in a form of writing portfolio. With the portfolio accounting for 60 percent of the overall course grade, each assignment was graded according to a suggested weight. Besides the final paper that accounted for higher weight (200 points), the assignments that required the use of outside sources, peer review and rewriting also weighed relatively higher than the other assignments.
One of the significance of Mulnix and Mulnix’s (2010) study is to present a contextualized CT concept in argumentation, which allows the students to understand CT as a tool to refine and analyze arguments. In addition, the carefully designed writing assignments have played an important role in students’ practice and reinforcement of the related CT skills. Besides, Mulnix and Mulnix emphasized the importance of peer review, which actually provided the students with more opportunities to practice using the CT skills. While doing the peer review, each reviewer was required to list one objection to the original writer’s position and propose a plausible response. When revising the paper, the original writer was required to make a good use of the objections provided by his or her two reviewers and thus achieved stronger arguments. One interesting thing is that in the following in-class peer review discussion session, the original writer was not allowed to participate in the discussion. Although Mulnix and Mulnix thought it would avoid discouraging the reviewers who might offer constructive criticism, I consider that it would be better if the students were allowed to exchange ideas freely in this session. The reviewers might have misunderstood the original writer’s ideas due to the ambiguity in expressions or irrelevant evidence. If they ask questions instead of just making comments, the original writer might get a chance to illustrate clearer ideas or provide stronger evidence while explaining or responding to his or her reviewers. In other words, the peer interaction might benefit both the writer and reviewer for a deeper understanding of writing and CT skills.

In general, the writing portfolio project seems to be quite applicable either to a writing course or any disciplinary courses. Many researchers and educators would be interested in finding out its effectiveness in improving students’ CT and writing. However, similar as Coe (2011), Mulnix and Mulnix (2010) did not present any analysis of students’ CT or writing scores or any textual analysis of students’ essays. Although there was a questionnaire question directly
addressing students’ learning of CT at the end of the course, students’ improvement in CT was
not clearly evaluated and analyzed before and after the study, which makes the study fall short in
examining the effectiveness of the proposed method of instruction. Besides, focusing on
elements related to argument, Mulnix and Mulnix’s CT instruction only scratched a certain
aspect of CT without presenting a holistic view of the concept.

Considering the improvement of students’ CT and writing skills as important goals of
modern university, Franklin, Weinberg and Reifler (2014) used writing assignments as a way to
examine students’ improvement in CT and writing skills in a large political science course that
was a compulsory course for all students. Understanding that using writing assignments was
always labor-intensive and time-consuming particularly for large classes enrolled by a maximum
of 200 students, they paid special attention to a more efficient writing assignment—the skeleton
essays, which was a short-answer response to an essay question. Including the requirement of
essential skills, such as stating a testable hypothesis, supporting the hypothesis and making
implications, a skeleton essay was expected to be more favorable to be used as a way to teach CT
and writing skills in large classes. To test the efficacy of the writing assignment, Franklin,
Weinberg and Reifler conducted an experiment among three classes, using different techniques
in their mid-term exams (for the political science course). One of the classes was tested by a
multiple-choice exam; another class was tested by a combination of multiple-choice test and a
standard essay exam; while the third class was tested by a combination of multiple-choice test
and a skeleton essay assignment. Then in the final exam, the three groups were given the same
test consisting of an essay and some multiple-choice questions. The tests were evaluated partly
according to a course specific rubric prepared by the instructor and partly according to a rubric
adapted from the Association of American Colleges and Universities (2012) “Inquiry and
Analysis Value Rubric. By analyzing the three groups’ results, Franklin, Weinberg and Reifler found a general weakness in students’ ability of making arguments across all the three groups. Although the results did not suggest that one testing strategy was obviously superior to any other, they did present a poor performance of the skeleton essay group in almost every category (hypothesis, evidence, counterargument, implications, content accuracy, intramechanism and intermechanism). However, as Franklin, Weinberg and Reifler explained, such underperformance might be due to students’ confusion in connecting short-answer tests and appropriate essay structures, and a lack of writing instruction, rather than the inefficacy of the skeleton essay itself. Franklin, Weinberg and Reifler’s study clearly indicates that a writing assignment alone does not guarantee a favorable result in improving students’ CT and writing skills. In regards to the general underperformance in CT and writing among students in large classes, Franklin, Weinberg and Reifler’s study not only emphasizes the necessity of CT and writing instruction, but also calls for further explorations of efficient methods that could combine the instruction and writing assignments without increasing the burden for instructors.

Different from the above studies that were all conducted in the US, Carter and Rukholm’s (2008) study was conducted in Canada. In Carter and Rukholm’s study, the writing assignments were two online bulletin board postings: the first required a reflection on a comprehensive health assessment, and the second involved reflecting on a focused assessment of a specific body system. Drawing on Johns’ Model of Structured Reflection (Johns, 1995), which involves four kinds of thinking (aesthetic, personal, ethical, and empirical knowing), Carter and Rukholm analyzed 36 bulletin board postings written by 19 project registrants of the School of Nursing and Centre for Continuing Education in a Canadian university. With a belief that the postings that illustrated a greater number of the four kinds of thinking represented a higher level of CT,
and that empirical thinking was least representative of CT, Carter and Rukholm analyzed the collected postings and found that 20% of them showed a high level of CT. They also found that in the second set of postings, some students were able to show their skills to integrate research-based findings with practically based clinical knowledge. Admitting that the sample was quite small, Carter and Rukholm noted that high level of CT and growth in writing competence could occur in an online setting. As Carter and Rukholm’s study did not clearly present the process of instruction and students’ levels of CT and writing before the study, it is hard to conceive how the instruction has led to the result of improvement in students’ CT or writing. In addition, as Carter and Rukholm indicated that they did not instruct on Johns’ model during the learning process, it would be interesting to know how the online environment, other than teacher-student interaction that was mentioned in the study, has affected students’ learning of CT and writing. Nevertheless, the study presents the possibility of using writing assignments as a tool to promote CT in an online environment, which deserves further investigation in various disciplinary areas.

Besides using writing assignments, some researchers choose to teach CT by modeling critical analysis, which requires a close connection between reading and writing. Recently, two groups of researchers (Hillocks, 2010; Jacobson & Lapp, 2010) applied the modeling method to their teaching among high school students. Considering argument as essential to CT and a key writing skill students need to know for success in college and career, Hillocks (2010) was not satisfied with the current teaching materials that showed less attention to argumentative writing. Considering the characteristics of high school students, Hillocks claims that the students have to learn the skills by participating in interesting activities that engage and challenge the students, and at the same time, allow the teacher to provide immediate feedback. Based on Toulmin’s (1958) basic concept of argument that includes a claim, evidence, a warrant, backing,
qualifications and rebuttals, Hillocks designed such an activity and used it in a class of 30 ninth graders for seven weeks to see how it worked. Stressing that a thesis statement should be based on a question that rises from the examination of information or data, Hillocks disagrees with the common methods that begins with teaching how to write thesis statements. Therefore, his teaching begins with critical analysis of related information. He first distributed a crime scene picture to the students and read a passage that introduced the background information. Then he asked the students to investigate the scene carefully and try to determine what really happened. In a teacher-led discussion, Hillocks guided students to pay attention to the details by asking questions in between students’ comments. He led them to first find out the evidence of flaws, and then explain why it was a flaw based on general rules. After the discussion, the students were required to write an essay that should include at least five pieces of evidence, each with an appropriate warrant and necessary explanation. Showing one student’s essay as an example, Hillocks expressed his satisfaction for having students learn to write with support after only four days’ instruction. In this study, by modeling the way to critically analyze information and identify evidence of flaws, Hillocks guided his students through the process of identifying question and evidence that would reasonably lead to their claims and warrants. This method, however, requires plenty of work for the instructor to prepare the “treat”, like Hillocks’ crime scene picture, as well as the questioning techniques that would naturally guide students’ thinking through the process of critical analysis.

Also expecting to improve high school students’ CT through modeling critical analysis, Jacobson and Lapp (2010) used a different strategy. Drawing on the revised Bloom’s taxonomy (Anderson & Krathwohl, 2001) that includes six levels of cognitive skills: remembering, understanding, applying, analyzing, evaluating and creating, Jacobson and Lapp developed a
“higher order thinking guide” that provided a series of questions guiding students to critically analyze texts and to critically construct their own writing. First of all, they created model essay critiques in response to the works of authors that students were reading in class. Then, the instructor and the students read the original text and the model essay critiques together. Afterwards, the instructor modeled how to use the questions in the “higher order thinking guide” to analyze the thinking in both the original text and the model critique, and then worked together with her students to develop written answers to these questions. With the guidance of the questions, the students became clear about the thinking process to plan, outline and compose a written text and a critique in response to the text. After a year-long observation, Jacobson and Lapp found that their students were more interested in writing and gained such abilities as grasping the main idea, synthesizing core concepts, presenting logical organization, and demonstrating creative solutions to problems, etc. Compared to Hillocks’s (2010) study, Jacobson and Lapp provided a more systematic model by listing the guiding questions under a CT framework, so that the students can refer to these questions not only during the in-class discussions, but also during their own writing process. It would be interesting to find out the connection between students’ improvement in writing and CT with a further investigation of how the students actually used the guiding questions in their writing process.

Instead of using staged writing assignments or modeling critical analysis, Kovalik and Kovalik (2007) designed a series of thought-provoking activities in a college English composition course to enhance students’ CT and writing skills. Believing in the interrelationship between CT and writing, and the role language simulations play in promoting both skills, Kovalik and Kovalik designed a series of six activities based on the four phases of language simulations: the orientation phase, the participant training phase, the simulation operation phase,
and the debriefing phase (Joyce, Weil, & Calhoun, 2000). Involving active thinking about the topic as well as the sharing and crystallization of ideas, the four phases were considered to entail the same activities needed in CT. Specifically, the six activities in Kovalik and Kovalik’s study involved both writing and oral forms which include: “an in-class quick response, an in-class small-group gaming activity, a library assignment, a whole-class debate, a debriefing session, and an at-home writing assignment” (Kovalik & Kovalik, 2007, p. 313). All together 45 freshmen college students who enrolled in Composition I course at two higher education institutions in the US participated in the study. The first activity was designed to encourage students’ active thinking by requiring them to write a one-to-three paragraph response to a given quote from Montesquieu: “Liberty is the right to do whatever the laws permit.” In the second activity, the students were put into groups of four and asked to play a card game. The groups were divided into three categories, one of which was provided with one single rule for the game, one of which received four sets of rules, and the rest of which was not provided with any rules. The game was designed to find out whether the students would realize the importance of rules and be willing to follow the given rules or to negotiate a rule among themselves. The next activity required individual library research, finding outside sources that addressed the given topic. In this activity, students were expected to learn how to identify, interpret and evaluate information. The fourth activity, the whole-class debate, was organized in the form of a talk show, which allowed students to share their opinions about liberty. In the fifth activity, the students were asked to express their feelings of participating in the previous activities. Then, the last activity required the students to compose a well-developed argument either for or against Montesquieu’s definition of liberty. By comparing the students’ first and second essays, Kovalik and Kovalik categorized the students into four categories based on the change of their opinions:
For/For, Against/Against, Against/For, and For/Against. For the first two categories, although there was no change of stance, Kovalik and Kovalik found that the For/For group’s essays showed a qualitative improvement by extending their perspectives and including more subtle issues, while the Against/Against group’s essays fell short in backing up their arguments and showed little sense of community and other people’s rights. The reason for showing no improvement in their argumentation, as Kovalik and Kovalik found out from their comments, was due to students’ resistance to outside influence. As to the latter two categories that showed a change of stance, Kovalik and Kovalik found that the Against/For group showed a clear change of perspective. As one of the students indicated, he changed his opinion because the card game activity allowed him to realize the importance of getting an order. Besides, the talk show activity also helped to change their ideas when they were exposed to new perspectives and were able to exchange ideas with other students. The essays of the For/Against group showed a switch from a favorable attitude towards liberty/law to a less favorable one because of, as one indicates, the realization of the possibility that laws can be confusing and contradictory with the existing gray areas. According to Kovalik and Kovalik, the students were on their way of becoming critical thinkers, with an illustration of their awareness of the complexity of issues in real life situations. Kovalik and Kovalik’s study shows great implications for using thought-provoking activities to promote CT and writing skills by encouraging students to think actively and reflectively, exposing them in different viewpoints and perspectives, and allowing them to apply hands-on experience to solving problems. Although there is no mentioning of the list of CT skills that need to be developed or the criteria for evaluating the improvement of CT skills in writing, the analysis of students’ essays somehow showed the beneficial effects of CT in writing, and also indicated the necessity of cultivating CT dispositions along with CT skills. The applicability of
these activities to other topics or courses, however, might need some modification and flexibility, as some of the activities (such as the card game) were particularly designed for the topic chosen for their study.

3.2.1.2 CT assessment in L1 writing

An assessment of CT provides not only important indicators of students’ CT competency, but also important feedbacks to inform teachers of the effectiveness of their approaches (Ennis, 1993). In fact, there have been a series of published CT tests since 1980s (Wang & Wen, 2011), such as California Critical Thinking Skills Test (Facione, 1992), and California Critical Thinking Disposition Inventory (Facione & Facione, 1992). However, most of the currently available CT tests are general-content based. As Ennis (1993) points out, a subject-specific CT test is strongly recommended as it assesses CT in a subject area.

Among the limited empirical studies on teaching CT in L1 writing, however, few researchers have actually conducted specific assessments to examine students’ improvement in CT, either with general-content-based CT tests or subject-specific CT tests. Although the researchers and educators who conducted the above studies applied different methods and strategies in their teaching of CT in an L1 writing context and expressed their satisfaction with the outcomes, none of them actually carried out a quantitative assessment of CT before and after the study to compare the degree and aspects of students’ improvement in CT. Although half of the reviewed studies involved some kinds of qualitative CT assessments, they were either conducted through a general textual analysis (Carter & Rukholm, 2008; Kovalik & Kovalik, 2007) or through an integrated evaluation by a writing rubric that included some elements of CT (e.g., Çavdar & Doe, 2012; Franklin, Weinberg and Reifler, 2014).
In Kovalik and Kovalik’s (2007) study, they analyzed each student’s two essay drafts by identifying if there was a change of initial stance. Based on students’ change or preservation of their initial opinions towards the given statement, Kovalik and Kovalik analyzed the essay texts to figure out whether there was an improvement in students’ quality of argumentation. Although the reasons for students’ change or preservation of perspectives could somehow reflect their mental process, the assessment of CT was actually so vaguely involved in the textual analysis process that it did not result in a comprehensive evaluation of students’ CT abilities and CT improvement based on the analysis results.

In the study that aimed at investigating nursing students’ CT in their online postings, Carter and Rukholm (2008) applied Johns’(1995) model to assess students CT by identifying four types of thinking in their postings: aesthetic, personal, ethical, and empirical. According to their assessment, a greater number of the four kinds of thinking would indicate a higher level of CT. That means, a posting that presented three or four of the four kinds of thinking represented a high level of CT. As there is no elaboration on each kind of thinking and no exemplification of writing that presents each kind of thinking, it is actually hard to examine the validity of their assessment. The lack of objectivity in the process of this assessment also makes it hard for other researchers to apply it to their studies.

Another two groups of researchers tended to combine the assessment of CT with that of writing, which is why they tried to include some elements of CT in their writing rubrics. For example, Çavdar and Doe (2012) developed a rubric that included both requirements for writing and CT. In their rubric, there were all together ten requirements, among which essay question, essay components, description, outside sources, postscript, grammar and punctuation, and formatting directly addressed the requirements for writing, while the recognition of assumptions,
inference/application, and interpretation and evaluation of arguments were requirements for CT. The elements of CT that were included in the rubric derived partly from Watson-Glaser Critical Thinking Appraisal (Watson & Glaser, 1952). In fact, some of the requirements for writing in the rubric also reflected that for CT. For example, the use of outside sources was considered a requirement for writing, while the selection of sources and how the sources were used to support the argumentation also presented the level of CT. The mixing of CT and writing standards in one rubric, therefore, could not precisely present students’ overall performance of CT in writing.

Partly designed by the course instructor and partly adapted from the Association of American Colleges and Universities “Inquiry and Analysis Value Rubric” (Association of American Colleges and Universities, 2012), Franklin, Weinberg and Reifler’s (2014) rubric is a combination of general requirement and requirements for specific categories. The general requirement includes writing with relevance, coherence and consistency. The rubric also specifies three major categories of requirement: content accuracy, making connections and source of expended powers. Similar as Çavdar and Doe’s (2012) rubric, Franklin, Weinberg and Reifler’s (2014) rubric is also a mixing of CT and writing standards that falls short in presenting an overall evaluation of CT.

3.2.1.3 Summary

The review of the recent empirical studies on teaching CT in L1 writing in this section reveals an attention to the roles that CT and writing play in education, particularly higher education, and the efforts made in the exploration of effective methods of CT instruction in L1 writing. The results of the studies are encouraging, not only for teachers who designed such methods, but also for students who actually benefited from the studies with improved CT and writing skills. Just as CT and writing are both considered as effective skills for learning, the
studies that were conducted in disciplinary courses also presented students’ improvement in learning their course-related contents. The methods of CT instruction involved in these studies as well as their outcomes highlight some important strategies for teaching CT in writing, and at the same time reveal implications for future studies.

First of all, the design of writing assignments plays an important role in promoting CT in writing. Among the methods that were used in the reviewed studies, many of the researchers (Carter & Rukholm, 2008; Çavdar & Doe, 2012; Coe, 2011; Mulnix & Mulnix, 2010) chose to promote students’ CT through well-designed writing assignments. They designed multiple or staged writing assignments to achieve a progressive writing process, so that students would get chances to learn from simple to more complex skills or to learn to revise their writing based on feedbacks. When the topics of writing assignments were designed to solve the problems pertaining to their disciplinary courses, these assignments also served as a way to encourage deeper thinking about their disciplinary knowledge. Nevertheless, as Franklin, Weinberg and Reifler’s (2014) study indicates, a well-designed writing assignment alone may not guarantee an improvement in students’ CT and writing, further investigation is needed to explore effective ways to combine teachers’ instruction with well-designed writing assignments.

Secondly, combining thought-provoking activities and writing assignments shows encouraging effects on triggering deeper thinking about the required tasks. As thought-provoking activities, such as debate or card game in Kovalik and Kovalik’s (2007) study, often involve a high degree of interaction, they are beneficial to cultivating students’ CT dispositions by broadening students’ views, allowing them to understand their own limitations and to be open to different viewpoints. Admittedly, thought-provoking activities will easily arouse students’ interests and get them engaged in given tasks, too many activities in class might distract students’
attention from the writing process. Therefore, a careful selection of these activities is important for their combination with writing assignments so as to allow students to apply their experience from the activities to the ideas in their written work.

Thirdly, CT is a skill that is transferrable from reading to writing, as long as the teacher provides sufficient guidance to bridge the skills. The studies that used critical analysis modeling (e.g., Hillocks, 2010; Jacobson & Lapp, 2010) to enhance students’ CT and writing skills were good examples to show the effects of teacher’s guidance on transferring the skills. The process of modeling how to critically analyze a reading material is actually a recurrence of the author’s trajectory of logic in his or her thinking, and a presentation of the CT elements involved in composing a written work. When the trajectory of logic and the CT elements are sufficiently stressed, they will then transfer to the ability that leads to more reasonable thinking in students’ writing.

While the strategies used for CT instruction in these studies provide great insights for the exploration of effective approaches to CT in writing, the weaknesses of these studies are also highly informative. First of all, the fact that almost all the studies lacked a specific assessment of CT reveals an obvious gap in the existing research. In fact, the assessment of CT serves as not only an important indicator of students’ improvement in CT, but also a guiding tool in students’ process of learning CT. In the above studies, the conclusion of students’ improvement in CT was mainly derived from students’ improvement in writing. However, as writing and CT should be evaluated according to different criteria, using a writing rubric or a writing rubric that includes some CT elements could not lead to valid results of students’ performance of CT. Therefore, it is very important that researchers who carry out studies on teaching CT in writing develop a valid
assessment instrument that specially evaluates CT in writing for the purposes of both teaching and learning.

Another limitation that stands out in most of the studies is the absence of explicit instruction on CT. Few of the researchers ever spent time on defining CT and explaining how to think critically or how to evaluate one’s CT abilities, let alone the CT dispositions. Although the researchers expected an improvement of CT as an outcome of their courses, they tended to embed the idea of CT in their design of writing tasks or in-class activities rather than to explicitly discuss it with students, which on the one hand, deprived students of the opportunities to achieve a comprehensive understanding of CT, and on the other hand, prevented them from understanding the significance of CT in their writing and learning. The absence of explicit CT instruction in these studies might be mainly due to the difficulty of defining CT or finding a widely applicable CT model. The difficulty of infusing CT instruction into the instruction of writing and disciplinary contents might be another reason. Further investigation is thus needed to explore effective ways to integrate explicit CT instruction into the existing curriculum.

3.2.2 Review of empirical studies on teaching CT in L2 writing

The promising results received from L1 research motivates L2 researchers to incorporate CT into L2 curriculum, although there have been heated discussions about whether CT could actually be taught in an L2 context (e.g., Atkinson, 1997; Davidson, 1998; Ennis, 1998; Stapleton, 2002). Nevertheless, many L2 researchers are optimistic and assert that CT should and could be taught in L2. As Davidson (1998) indicates, L2 teachers have even better reasons than L1 teachers to introduce CT to their students, because part of their teaching objectives is to prepare L2 students to communicate with native English speakers who might value the essential elements of CT. Becoming proficient in an L2 means that, as Kabilan (2000) suggests, the users
are able to not only use the language and understand the meaning, but also display CT and creative thinking through that language.

Aware of the importance of CT in L2 writing, an increasing number of researchers are involved in the discussions of effective pedagogical strategies, which mainly concern integrating CT into the current teaching contents, improving the design of writing tasks or process and adding thought-provoking activities. For example, some researchers mention the importance of the selection of writing topics and suggest using familiar (Liu, 2005) or debatable (Han & Yi, 2009) writing topics. Some researchers believe that certain types of writing tasks, such as argumentative writing (Zeng, 2012), persuasive writing (Barnawi, 2011), or dialogue journal (Bhushan, 2014), have the advantage of encouraging CT. Also, some researchers (e.g., Li & Wan, 2011; Zhang, 2009) suggest that combining reading and writing tasks is conductive to promoting CT and writing abilities. Although all these discussions are quite informative and the strategies seem to be quite effective, it is important to explore how to employ those methods in actual teaching practice and how well they would work in terms of improving students’ CT and L2 writing skills. In this respect, some recent empirical studies on teaching CT in L2 writing are reviewed in this section. Table 3.2 presents a summary of these studies.

Table 3.2

<table>
<thead>
<tr>
<th>Study</th>
<th>Students</th>
<th>Country</th>
<th>Methods of instruction</th>
<th>Assessment of CT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fahim &amp; Mirzaei, 2014</td>
<td>College students</td>
<td>Iran</td>
<td>Using a dialogic CT approach</td>
<td>N</td>
</tr>
<tr>
<td>Arju, 2010</td>
<td>College students</td>
<td>Bangladesh</td>
<td>Assigning opinion writing tasks</td>
<td>N</td>
</tr>
<tr>
<td>Moghaddam &amp; Malekzadeh, 2011</td>
<td>EFL learners studying in language institutes</td>
<td>Iran</td>
<td>Providing explicit instruction on CT principles</td>
<td>N</td>
</tr>
<tr>
<td>Study</td>
<td>Students</td>
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<tr>
<td>Li, 2011</td>
<td>College students</td>
<td>China</td>
<td>Providing explicit instruction on CT and developing a seven-step writing process</td>
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</tr>
<tr>
<td>Zeng, 2012</td>
<td>College students</td>
<td>China</td>
<td>Providing explicit instruction on CT and developing a six-step argumentative writing process</td>
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<tr>
<td>Zheng, 2011</td>
<td>College students</td>
<td>China</td>
<td>Providing explicit instruction on CT and using a writing portfolio</td>
<td>Post-study questionnaire survey</td>
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### 3.2.2.1 CT instruction in L2 writing

Much thought have been devoted to the discussion of the importance and necessity of teaching CT among L2 learners, however, little attention has been given to the pedagogical exploration of teaching CT in L2 writing (Bamawi, 2011). CT is such a complex concept that even a CT syllabus cannot guarantee the implementation of CT instruction in actual teaching practice. For example, according to Mok’s (2009) classroom observation of two English writing classes in a Hong Kong secondary school, their CT syllabus that was issued by the educational authority was actually not translated into classroom practice, as the students were constantly deprived of the opportunity to engage in CT because of the teacher-dominated interactions in class, and the learning atmosphere did not value CT with activities that promote students’ thinking and reflection. A lot of things need to be done to bridge the gap between the motivation of teaching CT and the implementation of CT instruction in actual teaching practice.

Of the limited empirical studies, two Iranian researchers, Fahim and Mirzaai (2014), investigated the combined effects of L2 writing instruction and a dialogic CT approach on the quality of argumentative writing. Four classes of college students (n=43) from science and technology were randomly selected and grouped into an experimental group and a control group. For a period of five weeks, the control group received writing instruction on how to write
argumentative essays, while the experimental group not only received the writing instruction, but also was engaged in CT activities, which required the students to read a written dialogue about the topic and to summarize, reflect on and analyze the opinions revealed from the dialogue so as to determine their preference and finally express their own opinions about the given topic. The two groups were given a pre-test before the study and a post-test after the study. Both tests required the students to write a 180-word argumentative essay, under similar but different topics. The results of the pre-test showed that there was no significant difference between the two groups in terms of argumentative writing. As to the post-test results, both groups actually made statistically significant improvement in their writing scores, showing the impact of writing instruction on argumentative essays. However, there also showed a significant difference between the writing scores of the two groups on the post-test, indicating that the combination of writing instruction with dialogic CT activities was more effective in terms of improving students’ L2 writing.

Nevertheless, it is left unknown how exactly the students have performed in terms of their CT in both their pre-test and post-test essays, as all the test essays were assessed based on a writing rubric, the Rubric for the Assessment of the Argumentative Essay, that focused on five categories of writing: introduction, main points, organization, mechanics and style, and sources. Without an assessment of CT, it is difficult to verify if there was also an improvement in students’ CT or to identify the difference in the effects of different approaches on promoting CT. In addition, although the students in the experimental group were asked to evaluate other people’s opinions and express their own during the dialogic activities, there was actually no explicit instruction on the definition of or standards for CT. The students might have benefited from the exchanging of ideas during the dialogic activities so that their ideas were better developed when
they were to write their essays, but they might have little idea about how clear, accurate, precise, or relevant, etc. they should be to present good reasoning in their argumentation. The lack of explicit instruction on CT deprived students of the important guidance they should have on the way of becoming critical thinkers.

Also focusing on improving students’ CT by practicing expressing personal opinions, a researcher from Bangladesh, Arju (2010), suggests using opinion writing as a way to teach CT. In her writing classes, she combined the opinion writing tasks with some pre-writing and post-writing activities. First of all, she provided her students with reading materials about recent or popular issues and asked the students to read and discuss the materials before they wrote an outline for their essays. Then, the students were required to select three ideas from the reading material and provide their personal opinions in their essay drafts. After that was a peer editing which focused on grammatical mistakes. When students finished their writing and editing, Arju organized a presentation session for students to present their final essay. Finally, the instructor would hold a formal session providing her comments on students’ presentations. In Arju’s study, she emphasized the importance of material selection, which played an important role in motivating students and practicing their problem-solving skills. The organization of pre-writing activities and post-writing activities provided students with opportunities to exchange ideas with their peers and think from different perspectives. However, similar as Fahim and Mirzaai’s (2014) study, there was no explicit instruction on CT or assessment of CT in Arju’s study. Although the students were given opportunities to select and evaluate information by expressing their opinions and to listen to other people’s opinions, they were not aware of the standards they should follow to guide them to become more proficient in their CT.
Believing in the effects of explicit instruction of CT, some researchers included CT instruction as an integral part of their L2 writing courses. Giving an instruction based on Cottrell’s (2005) principles for promoting CT, Moghaddam and Malekzadeh (2011) carried out a study to compare students’ essays before and after the CT instruction to investigate the effects of CT on improving students’ writing skills. In their study, a total of 70 L2 students were asked to write a composition about a unique topic they had never thought before, so that students’ writing would not be significantly influenced by their topical knowledge. After the first draft, students were given the CT instruction that stressed the importance of evaluating the evidence for alternative points of view, weighing up opposing arguments and evidence fairly, recognizing techniques used to make certain positions more appealing than others, such as false logic and persuasive devices, and presenting a point of view in a structured, clear, well-reasoned way that convinces others. Having learned these CT principles, the students were asked to write the same topic again. Their findings showed that the explicit instruction on CT led to a considerable improvement in students’ writing, both qualitatively and quantitatively. A comparison between students’ first drafts and second drafts showed students’ improvement in their imaginative, supportive and disciplinary skills with more clarified and organized ideas, precise examples and open-minded views. They also indicated that the principles of CT had better effects on proficient learners (as compared to their less-proficient participants), as they were more cognitively ready and their language proficiency enabled them to benefit more from the input and feedback during the instruction sessions. Although opposing the idea of putting all the responsibilities of better writing skills on the shoulder of CT, Moghaddam and Malekzadeh believe that the teaching of CT will help students to overcome some of the problems they encounter in the process of their L2 writing. Focusing on the effects of CT on improving students’ writing, however, Moghaddam
and Malekzadeh’s study did not mention how the improvement of students’ L2 writing might have affected their learning of CT, a question left for other researchers who are interested in the reciprocal effects between CT and L2 writing.

Another study that included explicit CT instruction was conducted by a Chinese researcher. In her L2 writing course for 24 English major Chinese students, Li (2011) carried out a 16-week action research to explore effective ways of improving students’ reader awareness and CT competence. In her CT instruction, Li emphasized the importance of using CT skills in writing research papers and also designed tasks for students to practice identifying target readers, the logical relations between premises and conclusions, and fallacies. Her students were asked to write a research-based argumentative essay every two weeks through a seven-step process which included: (1) brainstorming, (2) outlining, (3) first draft, (4) self-evaluation, (5) peer-evaluation, (6) teacher feedback, and (7) teacher-student face-to-face workshop. Based on the feedback from the post-study questionnaire survey and interview, 62.5% of the participants considered that they have made improvement in their English writing, which was in accordance with their final writing scores; and that 50% of the students considered that they have made improvement in their CT competence. Her participating students also reported that they had benefited most from the peer review activity in terms of broadened viewpoints, more proficient reasoning skills and enhanced reader awareness. This study is a worthy attempt for exploring the effects of an infusion approach on both CT and L2 writing. However, the result would have achieved higher reliability if students’ CT competence had been evaluated by an instrument particularly designed to assess CT. In addition, although the study included instruction on CT and designed tasks that encouraged thinking, the CT instruction only focused on logic and fallacies, which might have led to an incomprehensive understanding of CT among her students.
Also including some instruction on CT, another two recent empirical studies (Zeng, 2012; Zheng, 2011) attempted to enhance students’ CT through the design of the entire writing process. Considering argumentative essay as in close relation to CT, Zeng (2012) assigned argumentative writing tasks to her 62 first-year Chinese college students. In her instruction session, she clarified the meaning of CT and made it clear to the students that the objective of the writing tasks was to promote their CT skills. Then the students were required to finish their writing tasks following six steps: (1) collecting resources; (2) evaluating resources in group discussions; (3) writing the first draft; (4) peer review; (5) revising the first draft; (6) post-writing feedback. Zeng designed this writing process according to Facione’s (2011) definition of CT, which includes six cognitive skills: interpretation, analysis, evaluation, inference, explanation and self-regulation. According to Zeng, the six-step writing process not only interprets what CT is, but also provides chances for students to practice the skills that CT entails. For a period of four months, the students were required to finish an argumentative essay every week. According to the comparison of students’ first essays and last essays, Zeng found that students improved their CT in terms of relevance, clarity, logic and coherence. But she also identified the difficulties students encountered in the aspect of logic, as it did not show as much improvement as the other three aspects. To examine the effects of her approach, Zeng conducted a questionnaire survey both before and after the study. The comparison of the results from the two surveys indicated that the students not only improved their understanding of CT, but also enhanced their awareness of using CT skills in their writing. It seems that the explicit instruction of CT at the beginning of the study played an important role in helping students to understand the significance of CT and the relationship between CT and English writing. However, it is not clear how CT has guided the students in their writing process as there was actually no CT instruction or guidance during the writing
practice. Although the majority of the students reported to have improved in their CT after the study, there was no empirical evidence of students’ improvements in terms of the six CT skills based on Facione’s (2011) definition of CT. Nevertheless, the study shows an important implication that each step in the writing process may involve the use of certain CT skills and thus should be well designed.

Like Zeng (2012), Zheng (2011) also involved the instruction on CT and the design of an entire writing process in her study among 52 Chinese third-year English major college students. To emphasize the importance of writing process rather than writing products, she required each of her students to establish a writing portfolio. Different from Mulnix and Mulnix’s (2010) portfolio that includes some progressively staged assignments, Zheng’s portfolio included staged drafts of different writing tasks. To allow students to have enough time brainstorming ideas, collecting information, and revising drafts, Zheng asked her students to write after class. Thus, she could also have time to have students do peer review and to provide teacher feedback in class. Similar to Zeng (2012), Zheng did not assess students’ improvement in CT but conducted a questionnaire survey, the result of which indicated students’ satisfaction with the use of portfolio and its effects on promoting their CT. As Zheng did not explain clearly how she instructed on CT at the beginning of the study, it is not clear how her students understood CT and its connection to writing.

Besides the empirical studies on teaching CT in L2 writing, I also reviewed another group of studies that did not particularly focus on teaching CT in writing but investigated the effects of some thought-provoking activities on promoting students’ thinking in a writing process. The findings of this line of research also provide great implications for the present study. When investigating the effects of thought-provoking activities, some researchers focused on
brainstorming activities. At the pre-writing stage when students are faced with a task and beginning to make plans for their first drafts, they are engaged in active mental efforts in an attempt to solve problems and make decisions. Researchers (e.g., Rao, 2007; Richards, 1990) suggest that brainstorming activities, which are usually organized as pre-writing discussions, are helpful for L2 students to create and organize ideas for writing. To investigate the effects of pre-writing discussions on students’ L2 writing, Shi (1998) carried out a study among 47 adult L2 students from three pre-university writing classes in Canada. While comparing students’ writing under conditions of peer discussion, teacher-led discussion and no discussion, she found that pre-writing discussions, especially peer discussions, helped students to develop more verbs indicating mental process. However, as Shi further indicates, the greater variety of verbs did not lead to qualitatively better essays, which implies a need of guidance in the process of peer brainstorming discussions for better organizing their ideas.

Hypothesizing the importance of training on brainstorming strategies, Rao (2007) investigated the effects of explicit instruction for brainstorming activity on students’ performance and perception among 118 sophomore students in a Chinese university. The participants were randomly divided into three classes, with two classes as the experimental classes and one as the control class. Students in the experimental classes were asked to follow a four-step brainstorming activity: (1) thinking individually; (2) verbalizing ideas in pairs or groups; (3) brainstorming ideas in oral and note forms; (4) classifying ideas into proper categories. The students in the control class followed a traditional product-based approach. All the students were asked to do a writing task before the study and to write the same topic again one year later. The comparison of the ratings of students’ pre-test and post-test essays revealed that the experimental classes gained significant progress after the experiment and scored much
higher than the control class in the post-test. He also found from the post-study questionnaire survey that most of the participants perceived that brainstorming helped them in the following aspects: (1) stimulate thinking (86%); (2) organize raw materials into a logical order (82%); (3) create ideas (78%); (4) cultivate ability to analyze and summarize (73%).

Although the studies on brainstorming among L2 learners so far have been concentrating more on students’ improvement in writing, the results concerning the promising effects on stimulating thinking and generating ideas in this process have revealed the possibility of using it at the pre-writing stage to teach CT. These studies have also highlighted the necessity of the teacher’s guidance for better effects of such activities.

Assuming that most of the unrevised writing drafts reveal an undeveloped thinking process that does not “confront all the available evidence, consider alternative views, examine assumptions, or imagine the needs of a new reader”, Bean (2011) indicates that “much of the thinking promoted by writing occurs during the messy process of revision when the writer’s ideas become focused and clarified” (p. 10). A number of researchers have been interested in the effects of post-writing activities, particularly peer review (also referred to as peer feedback or peer response). During the past two decades, there have been a substantial amount of studies on the use of peer review in an L2 writing context. As Ferris (2003) summarizes, there are a number of practical benefits of using peer review for L2 learners:

- Students gain confidence, perspective, and critical thinking skills from being able to read texts by peers’ writing on similar tasks.
- Students get more feedback on their writing than they could from the teacher alone.
- Students get feedback from a more diverse audience bringing multiple perspectives.
• Students receive feedback from non-expert readers on ways in which their texts are unclear as to ideas and language.

• Peer review activities build a sense of classroom community.

(Ferris, 2003, p. 70)

Based on the discussion of the concept of CT and its importance to L2 writing, Han and Yi (2009) highlight the role of peer review in teaching CT in L2 writing. They consider that peer review is beneficial to the training of both CT skills and CT dispositions by providing students with an opportunity to think sympathetically from the others’ perspectives and to practice using effective reasoning skills and substantial evidence when providing suggestions and defending one’s viewpoints.

Although proponents of peer review have made claims about the benefits of using peer review in L2 writing, some researchers have also pointed out some potential problems that may affect the implementation and effectiveness of peer review (Carson & Nelson, 1994; Ferris, 2003; Saito & Fujita, 2004). The major problems lie in students’ incapability of: (1) rating their peers’ work because of their lack of language ability, skill and experience (Saito & Fujita, 2004); and (2) providing valuable suggestions because of their unwillingness to criticize others (Carson & Nelson, 1994). It is therefore considered necessary to provide adequate training on what to look for and how to provide feedback in peer review (Ferris, 2003). The key factor for assuring the success of peer review, as Ferris further emphasizes, is the “structure or guidelines provided by the instructor” (p. 171). Although either guided questions or peer feedback forms are considered to be effective for this purpose, there has not been much discussion about how to design such questions or forms and how different questions or forms will affect students’ learning of CT and revision of writing.
Studies on the effectiveness of trained peer review have reported significant effects on the quality of peer feedback (Min, 2005), and the revision types and writing quality (Min, 2006). Indicating that the misunderstanding of writers’ intentions and vague comments are two major reasons why reviewers’ comments are often disregarded during writers’ revisions after peer review, Min (2005) investigated the effect of using a four-step peer review procedure: (1) clarifying writers’ intentions, (2) identifying problems, (3) explaining the nature of problems, and (4) making suggestions by giving specific examples. Her study was carried out among 18 English major sophomore students in Taiwan. She provided a training session that was composed of both in-class demonstration and teacher-student conference outside of class. The analysis of students’ comments indicated that after the training the reviewers could provide more relevant and specific feedback that involved the clarification, identification of specific problems and suggestions for solving the problems. Although Min did not intend to incorporate the teaching of CT into the peer review activity, it seems that her four-step procedure training focused more on thinking skills rather than writing skills, which has led to a result of more effective peer review with successful problem identification and problem solving.

Min’s follow-up study (2006) further demonstrates the effects of better thinking on writing. To investigate the effects of trained peer review on students’ revision types and writing quality, Min (2006) examined the peer review comments and the revised drafts collected from her previous study. She found that a significantly higher percentage of the post-training peer comments (77%) were incorporated into the final revisions. The revisions triggered by peer comments were aimed at making the writing easier for the reviewers to understand, which led to a result of better essays that presented clearer and more organized ideas.
Min’s (2005, 2006) encouraging findings about the effects of trained peer review on improving the effectiveness of peer review and the quality of students’ writing highlight the ultimate purpose of the teaching of L2 writing, which is to achieve effective written communication. It clearly reveals the possibility of infusing CT into the training of peer review to systematically guide students with high standards of thinking which will lead to an effective communication of thoughts between the writers and the reviewers.

3.2.2.2 CT assessment in L2 writing

When teaching CT in an L2 writing course, most of the researchers would expect to see improvement in both CT and L2 writing. Although half of the empirical studies on teaching CT in L2 writing reviewed above reported the progress of students’ CT, the assessment of CT was all conducted by using questionnaire surveys. Asking students to identify whether they had made progress in their CT served only as a subjective evaluation from the perspective of students, yet was not valid enough to present a comprehensive assessment of students’ actual CT performance. The rest of these studies only involved the assessment of L2 writing, using different writing rubrics. Although the writing assessment might reveal some results concerning the progress in CT, such as clarity, coherence, or relevance, it is difficult for either the teacher or the student to gain a specific understanding of students’ level of CT abilities from these results.

3.2.2.3 Summary

The empirical studies on teaching CT in L2 writing reviewed in this section have shown no disagreement on the necessity and significance of teaching CT in L2 writing, although the researchers have employed different pedagogical strategies. Several important factors have been highly valued by these researchers. First, writing is viewed as a process rather than a product. It is based on this perception of writing that researchers identify when and where to integrate the
training of thinking in the writing process. Besides the selection of the types of writing tasks, the researchers also devoted special efforts to the design of the writing process (e.g., Li, 2011; Zeng, 2012; Zheng, 2011), each step of which may involve the development of CT skills and writing practice. Secondly, classroom interactions, whether in the form of brainstorming or peer review, are considered to be beneficial to stimulating thinking in the writing process (e.g., Min, 2005, 2006; Rao, 2007; Shi, 1998). Thirdly, explicit instruction of CT is valued for providing fundamental ideas of the concept. More than half of the reviewed empirical studies (Li, 2011; Moghaddam & Malekzadeh, 2011; Zeng, 2012; Zheng, 2011) involved a certain degree of explicit CT instruction.

One weakness of the studies is that the explicit instruction on CT that these L2 researchers have provided for their students only touched certain aspects of the complex concept. The researchers who provided CT instruction mainly focused on explaining the meaning of CT and clarifying the purpose of learning CT. None of them talked about how to actually apply CT to writing and the objectives they should aim at in terms of improving their CT abilities and cultivating their CT dispositions. In addition, the CT instruction was often treated separately from the writing practice. The gap between CT instruction and writing practice might have made it hard for students to establish a connection between CT and writing and thus the students were not likely to benefit most from the approach they had followed.

Another limitation of the studies is the lack of valid assessment of CT. With no specific rubrics for evaluating CT in writing, the researchers either skipped the assessment of CT and deduced students’ progress of CT from their improvement in writing (Arju, 2010; Fahim & Mirzaii, 2014; Moghaddam & Malekzadeh, 2011), or drew conclusions from questionnaire surveys which asked students to make subjective self-evaluation of their progress in CT (Li,
2011; Zeng, 2012; Zheng, 2011). Neither way was able to present a valid assessment result of students’ improvement in CT and thus made it hard for justifying the effectiveness of their pedagogical strategies for teaching CT in L2 writing. Further research is needed to develop specific rubrics applicable to assessing CT in an L2 writing context.

3.3 Implications for the present research

Great efforts have been devoted to the exploration of effective methods of teaching CT in writing, although there has been no panacea for cultivating critical thinkers. The review of recent empirical studies on teaching CT in writing reveals some conceptual, theoretical, and pedagogical gaps that provide implications for the present research.

First of all, in spite of the discussions about the concept of CT, a comprehensive understanding of CT was rarely clearly presented in the design of the approaches. Few researchers have attempted to define CT in a writing context or to clarify the connection between CT and writing. In addition, almost all the researchers, explicitly or implicitly, perceive CT only as a set of cognitive skills. Little attention has been paid to the cultivation of students’ CT dispositions.

Furthermore, although some researchers (e.g., Li, 2011; Zeng, 2012; Zheng, 2011) included explicit CT instruction in their writing class, the instruction of CT was majorly limited to the discussion of the meaning and significance of CT, and was only provided at the beginning of the course. It might have been effective for drawing students’ attention to CT, but was far from enough and left out some essential elements (for example, the standards of CT) that should be included in a CT instruction. Several thought-provoking activities are considered to be effective for teaching CT in a writing process. However, to ensure an improvement of CT as an outcome of a writing course, it requires more than simply adding these activities into the current
curriculum. More efforts should be devoted to the design of a CT-oriented writing approach, which entails not only an explicit instruction on the concept and principles of CT throughout the course, but also the necessary guidance and resources that will facilitate the infusion of CT in each step of the writing process. The current deficiency in CT instruction is partly due to a lack of comprehensive understanding of CT, as well as a lack of an appropriate theoretical framework that can guide the instruction of CT in a writing context.

Finally, an obvious drawback that stands out in most of the studies is the lack of valid CT assessment. Although almost all the studies yielded encouraging results with the improvement of students’ CT, the results were mainly based on students’ progress in writing, their self-reported growth, or the instructor’s general evaluation. Thus, it is not clear to which degree or in which aspects the students have made their improvement. In fact, this dearth of standard and valid CT assessment has become a major defect of these studies as they provide little empirical evidence of the effectiveness of the proposed approaches or strategies for promoting students’ CT in a writing course. Besides, an assessment of CT in writing would also have been able to present students’ strengths and weaknesses so as to inform the instructors and researchers of when and how to provide needed help for the students. An evaluation rubric that specifically assesses students’ CT in L2 writing should be developed to facilitate the assessment of CT for both the purposes of teaching, learning and evaluation of CT.

The limited attempts so far have made valuable contribution by highlighting some key elements that should be highly valued for the development and improvement of an effective CT-oriented L2 writing approach. Yet the problems revealed from the previous studies also suggest that, to achieve higher reliability and wider applicability, it requires not only a comprehensive understanding of CT and a solid theoretical foundation for the design of the approach, but also an
empirical study that investigates the effectiveness of such an approach in actual teaching practice and explores the role it plays in students’ process of learning CT in L2 writing. The gaps of previous studies in concept, theory, and pedagogy make the present study a timely supplement to the efforts for the exploration of effective ways to teach CT in L2 writing.

3.4 Summary

In this chapter, I have reviewed some recent studies concerning why and how to teach CT in L1 and L2 writing. In summary, the researchers shared the understanding that both CT and writing are important and the connection between them makes the integration of CT and writing instruction conductive to the improvement of both. In addition, the lack of attention to CT in current writing curriculum as well as students’ deficiency in both CT and writing skills strongly propel L1 and L2 researchers to explore effective solutions.

Given the shared understanding of the importance and necessity of teaching CT in writing, there are some divergences in both the views and methods of CT instruction between L1 researchers who focus on teaching CT in L1 context and L2 researchers who focus on teaching CT in L2 context. Some L1 researchers (e.g., Atkinson, 1997; Fox, 1994) express their concerns regarding the possibility of teaching CT in different cultures because they view CT as a hardly-definable social practice rather than a clearly-defined educational concept. On the contrary, some L2 researchers (e.g., Davidson, 1998; Kabilan, 2000) strongly believe in the importance and necessity of including CT in L2 education. Reminding people of the objectives of L2 education, Davidson (1998) declares that L2 teachers have even better reasons to teach CT.

When integrating the teaching of CT with writing instruction, the L1 and L2 researchers have shown both similarities and differences in the methods they have employed. First of all, both the L1 and L2 researchers tend to view writing as a process and CT as a set of skills that are
involved in each step of the process. Therefore, they have designed staged writing tasks or portfolio projects (e.g., Çavdar & Doe, 2012; Coe, 2011; Mulnix & Mulnix, 2010; Zeng, 2012; Zheng, 2011) to provide students with opportunities to practice CT in the writing process. Secondly, both the L1 and L2 researchers highly value the importance of peer interactions for the learning of CT in writing. Following their approaches, the students were encouraged to exchange ideas in brainstorming, peer review or other activities like debate or presentation.

One obvious difference between the L1 and L2 researchers’ teaching methods lies in the instruction of CT. While most of the L1 researchers did not provide explicit instruction on CT in their studies, most of the L2 researchers felt the need to explain the meaning of CT and to clarify the purpose of learning CT (e.g., Li, 2011; Zeng, 2012; Zheng, 2011). The fact that CT is not sufficiently practiced in both social and educational contexts for L2 students might be the major reason for this difference. Another difference is that some of the L1 researchers (e.g., Hillocks, 2010; Jacobson & Lapp, 2010) tried to set themselves as model critical thinkers who demonstrated their ability to critically analyze given materials, while none of the L2 researchers ever tried this strategy. It might be mainly due to L2 researchers’ lack of confidence in presenting themselves as critical thinkers, and a separation of reading and writing activities in many L2 writing courses.

Despite the similarities and differences in teaching methods, both the L1 and L2 studies reviewed in this chapter showed the same drawback in their lack of valid CT assessment. None of the studies were designed to examine both the pre-test and post-test CT scores based on specific evaluation criteria for CT in writing. Mainly relying on the progress of writing or students’ self-evaluation, the report of progress in students’ CT lacked objectivity and validity, which made it hard to examine the effectiveness of the approaches that these researchers have
employed or to explain the specific effects of the approaches on students’ learning of CT and writing.

Presenting the possibility of a variety of strategies that can be used to teach CT in writing, the review of recent empirical studies also reveals some gaps in concept, theory and pedagogy. Building on these previous studies, the present research is designed to fill the gaps by clarifying the concept of CT in L2 writing context, establishing a theoretical framework for teaching CT in L2 writing, designing an approach that is applicable to teaching CT in L2 writing and finally examining the effectiveness of the approach in actual teaching practice.
Chapter 4. Methodology

CT per se is a complex concept. Teaching CT in L2 writing is a complicated problem that involves a variety of dimensions in search for an effective solution. Employing a single method for the research on such issues will lead to potential limitations and impose constraints on the multi-dimensional perspectives that could be taken for achieving both a profound understanding of the construct and a practical solution to the problem. As Morse and Niehaus (2009) suggest, “when a researcher asks a question that cannot be answered using a single method, the research outcome may be improved by using more than that one method” (p. 13). Therefore, the use of mixed methods that involve both quantitative and qualitative research methods would be more appropriate for dealing with such a complex and interdisciplinary issue as teaching CT in L2 writing. Illustrating the mixed methods research design of the present study, this chapter presents the research methods used in the study as well as the methods of data collection and data analysis.

4.1 Research design

Johnson and Onwuegbuzie (2004) suggest that “research methods should follow research questions in a way that offers the best chance to obtain useful answers” (p. 18). The research questions of the present study involve not only the investigation of students’ background knowledge of CT but also the evaluation of the effectiveness of a CT-oriented L2 writing approach as well as the exploration of the effects of the approach on students’ learning process, which are both complicated and multi-dimensional and will be most likely fully answered through a mixed methods approach.

4.1.1 Mixed methods approach

Mixed methods research is often recognized as “the third major research approach or research paradigm” (Johnson, Onwuegbuzie, & Turner, 2007, p. 112), along with qualitative
research and quantitative research. When dealing with complicated research questions, it often requires more than one research method in the same project so that the results will enhance the level of understanding or provide further explanation of the phenomenon under investigation (Morse & Niehaus, 2009). Through their analysis of the existing definitions, Johnson, Onwuegbuzie and Turner (2007) define mixed methods research as a type of research “in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches for the broad purposes of breadth and depth of understanding and corroboration” (p. 123). With specific attention to the nature of data collection, the priority of each type of data and the point of mixing concerning data collection, data analysis, or data interpretation, Creswell, Clark, Gutmann and Hanson (2003) provide a more elaborate definition of mixed methods research:

*A mixed methods study* involves the collection or analysis of both quantitative and/or qualitative data in a single study in which the data are collected concurrently or sequentially, are given a priority, and involve the integration of the data at one or more stages in the process of research. (p. 212)

The existing definitions reveal that the design of mixed methods research requires not only a profound understanding of the purpose of using a variety of methods in a single study, but also a careful consideration of how different methods will be mixed and combined to provide solutions to the research problem.

As most researchers agree that a mixed methods research design involves both quantitative and qualitative research methods (Onwuegbuzie & Turner, 2007), it is predictable, as Morse and Niehaus (2009) claim, that a mixed methods study is twice the work and twice the worry of a single method study. Considering mixed methods research as consisting of “one core component
with an additional supplementary component that fits into the core component of the study” (p. 14), Morse and Niehaus (2009) indicate that one of the most important principles for a mixed methods design is to identify from the research questions the theoretical drive that will guide the use of the core method for the research.

Although mixed methods approach brings great challenges for researchers, it provides at the same time irreplaceable benefits to research by bridging the two methodologies to inform and enrich each other in the same project, and allowing researchers to view the complex research questions from different methodological perspectives. As Calfee and Sperling (2010) declare, mixed methods will benefit studies in many aspects:

• They are able to bring to bear multiple perspectives springing from varied data sources and analysis.

• Their conclusions are more strongly corroborated than qualitative or quantitative approaches alone would have allowed.

• They increase methodological rigor by utilizing multiple methods, so they are better able to present a valid “story of reality”.

• They illuminate underlying processes/cause-effect relations, important both for understanding and for action.

(Calfee & Sperling, 2010, pp.15-16)

Based on the roles of qualitative methods and quantitative methods in a research project, Gay, Mill and Airasian (2009) suggest three common types of mixed methods research designs: the QUAL-quan model, the QUAN-qual model, and the QUAN-QUAL model (the method in uppercase letters is weighted more heavily than the method in lowercase letters). In this sense, a QUAL-quan model represents a qualitative-driven exploratory research design, and a QUAN-
qual model represents a quantitative-driven explanatory research design. While a QUAN-QUAL model means that quantitative methods and qualitative methods are equally weighted for the research. The choice of mixed methods designs is actually the recognition of the theoretical drive and an understanding of the ways to integrate the quantitative data and qualitative data for answering the research questions.

In the process of doing mixed methods research, Calfee and Sperling (2010) encourage researchers to recognize mixed methods approach “as a dialogue, a conversation, between and among the voices behind the project” (p. 44). Onwuegbuzie and Mallette (2011) also remind researchers to pay attention to not only the individual qualitative research and quantitative research components, but also how they are related to each other in the exploration of solutions to the research questions.

4.1.2 The mixed methods design of the present study

It is important to understand that the goal of doing mixed methods research “is not mixing for the sake of mixing, but a purposeful strategy in which a particular combination of methodologies is guided by a particular research question” (Calfee & Sperling 2010, p. 2). The possible qualitative and quantitative research methods in my mixed methods research design are chosen according to how well they can help to fulfill the research purpose of my study, which is to explore effective ways to infuse the teaching of CT in L2 writing courses. To fulfill this purpose, it requires both the identification of students’ background knowledge of CT (which is framed into Research Question One), and the evaluation of the effectiveness of a carefully designed instructional intervention (which is framed into Research Question Two). In addition, an exploration of how this proposed approach affect students’ learning of CT in their process of L2 writing (which is framed into Research Question Three) will provide further explanation of
the effectiveness of the approach and at the same time enhance the understanding of teaching CT in an L2 writing context.

The study was conducted in a classroom context and involved an experimental group and a control group, which lent itself to a quasi-experimental design, combined with the use of a pre-study questionnaire survey and a post-study interview. To explore effective ways to infuse the teaching of CT in L2 writing, it requires not only quantitative research methods to examine the effectiveness of the instructional intervention, but also qualitative research methods to explore how the instructional intervention affects students’ learning. With the quantitative and qualitative research methods playing equally important roles, the present study employed a QUAN-QUAL mixed methods design.

In an attempt to answer the research questions and to fulfill the purpose of the present study, several quantitative and qualitative research methods were employed in the design of this study. First of all, a questionnaire survey was conducted among all the participants before the study. The quantitative data collected from the survey research contributed to the identification of students’ perceptions of CT and its connection to L2 writing. Secondly, the CT-oriented L2 writing approach was implemented among the experimental group during the study. The effectiveness of the approach was evaluated based on a series of statistical analyses of students’ pre-test and post-test CT and L2 writing scores. Finally, while conducting the study, qualitative data (students’ worksheets and essays) were also collected, which were used together with another set of qualitative data collected from the post-study interview to further explain how the CT-oriented L2 writing approach led the students to achieve the results revealed from the quantitative analysis. The analysis of the qualitative data collected from the post-study interview
also revealed students’ experience of learning CT in an L2 writing course. Figure 4.1 illustrates the QUAN-QUAL mixed methods research design of the present study.

*Figure 4.1. The Research Design of the Present Study*
4.1.3 Research site

The present study was conducted in a Chinese university of technology in the fall semester of 2013. The university is a key university located in a metropolitan city in northern China, which specializes in engineering studies and provides academic courses in diverse disciplines including technology, science, economics, management and arts. It provides a wide range of degree programs for more than 20,000 students every year.

Although the university has a history of more than 100 years, the School of Foreign Languages is much younger. It provides courses for not only English majors but also Japanese and French majors. English is greatly emphasized in this school. Students in the School of Foreign Languages, whether they majored in English, Japanese or French, are required to take and pass a national English test (Test for English Majors-Band 4) in their second year of study in order to get their diploma. For English major students, the school offers a wide range of courses that focus not only on improving their language skills (e.g., Intensive Reading, Listening, Oral English, English Writing, and Translation) but also on enhancing their understanding of the English cultures (e.g., Exploring English-Speaking Countries).

The president of the School of Foreign Languages is open-minded and shows positive attitudes to new concepts and teaching methodology. As he learned about the purpose of my study from my initial contact letter (see Appendix E), he showed great interest and strong support in his reply to my request to conduct my study in their school (see Appendix F for the Letter of Permission). His enthusiastic encouragement also convinced me of the necessity and urgency of conducting such a study, and at the same time propelled me to get fully prepared to ensure a fruitful result.
4.1.4 Participants

Considering the potential influence of English language proficiency on the analysis of the research results, senior English major students were selected instead of English major freshmen or non-English majors who might have lower English language proficiency. A number of 44 English major sophomores from two natural classes (22 in each class) participated in this study. Table 4.1 presents the demographics of the participants in this study.

Table 4.1

Participant Demographics

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<th>Experimental group (n=22)</th>
<th>Control group (n=22)</th>
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The 44 participants were in their second year of study for a four-year diploma program in English Department. All of them registered in the English Writing course, which was a compulsory course in their program. Like what is common among English majors in Chinese colleges and universities, the majority of the participants were female (n=37, 84%), with only seven (16%) males. To be more specific, there were three male participants and 19 female participants in the experimental group, while there were four male participants and 18 female participants in the control group. As to the age of the participants, the majority of them were at the ages of 20 and 21 (n=35, 80%) when the study was conducted.
Before the study, the two classes of participants were taught by the same English writing teacher, who had been using a traditional writing approach focusing more on lecturing and writing practice, with no explicit instruction on CT. As informed by the writing teacher who had taught these participants for a whole academic year, the two classes of participants were at a similar level in terms of their average language proficiency and writing competency. Furthermore, these students were used to a passive manner of learning and did not perform actively in class, which had forced the teacher to decrease the variety of interactive activities in class.

One class of students was randomly chosen to serve as the experimental group and the other class of students served as the control group. During the study, I taught the experimental group using the carefully designed CT-oriented L2 writing approach that developed for the study. The students in the control group followed a traditional writing approach provided by their original writing teacher.

4.1.5 Pilot study

Prior to the main study, a pilot study was carried out among 50 English major sophomores in another key university in Southwest China. During the pilot study, I implemented the CT-oriented L2 writing approach. On the one hand, the pilot study was conducted to ensure that the time allocated to the CT-related instruction was sufficient for the students’ understanding of the concept of CT. On the other hand, the pilot study also served as an evaluation of the feasibility of the designed approach and the validity of the proposed instruments. Based on the results of the pilot study, some of the instruments were revised accordingly, which is described in detail in the next section regarding the development of the CT-oriented brainstorming worksheet and CT-oriented peer review checklist (see Section 4.1.7.3 and Section 4.1.7.4).
4.1.6 Instructional intervention

During the study, the students in the experimental group followed the CT-oriented L2 writing approach which, as discussed early in Chapter 2, was designed to integrate the instruction of CT into that of L2 writing. While teaching students the basic principles and strategies for writing argumentative essays, I also provided explicit instruction on CT, which included Paul and Elder’s (2001) “elements of thought”, “intellectual standards” and “intellectual traits”. Besides, the students were required to practice using CT in the CT-oriented brainstorming and peer review activities, guided by the particularly designed brainstorming worksheet (see Table 4.3 on p. 110) and peer review checklist (see Table 4.6 on p.114). The students followed a four-step writing process for each essay task: (1) brainstorming, (2) drafting (Draft 1), (3) peer review, and (4) revising (Draft 2). The brainstorming and peer review activities were conducted in pairs. The students were allowed to choose their own partner, as what they did in their previous English writing course. Each essay task was completed during two writing sessions over two weeks. In the first session, the students focused on developing ideas by discussing the CT elements involved in the given task and then wrote their first draft. In the second session, the students were required to use CT standards to evaluate ideas and then revise their first draft. During the study, the students in the control group wrote the same writing tasks through the same four-step writing process, following a traditional L2 writing approach that involved neither explicit CT instruction nor explicit practice of CT in the brainstorming and peer review activities.

4.1.7 Instruments

Six instruments were used in the process of the present study: (1) a pre-study questionnaire; (2) the writing tasks; (3) the brainstorming worksheets; (4) a peer review checklist; (5) the criteria for evaluating CT in L2 writing; and (6) the interview guidelines.
4.1.7.1 Pre-study questionnaire

A questionnaire (Appendix A) was developed and used in the pre-study survey to gather information in terms of students’ perceptions of CT and its connection to L2 writing. It was also used to obtain related information such as the participants’ L2 writing proficiency, their experience of the current L2 writing approach as well as their self-reported level of CT competence before the study. All together 11 items were designed for the survey. The first item was about the frequency that students had heard about the term “critical thinking”. It was a multiple choice question. Those who chose “never” were allowed to skip the next five items that were designed to further explore the participants’ knowledge of CT. To be more specific, Item 2 asked the participants to provide a definition for CT according to their own understanding. Item 3 asked the participants to choose an appropriate Chinese translation for CT. Item 4 was designed to identify whether the participants had received any formal instruction or training related to CT in class, while Item 5 required the participants to identify the benefits or potential benefits of CT in different aspects of their English learning.

Having discussed informally with the participating teacher about the participants’ previous experience of learning CT, I confirmed that there had been no explicit instruction on CT for the participants before this study. With the purpose of evaluating the participants’ understanding of the concept of CT as well as their level of CT in L2 writing, I designed two scale items based on Paul and Elder’s (2001) “elements of thought” and “intellectual standards”.

To avoid any potential confusion, the eight “elements of thought” (Paul & Elder, 2001) were rephrased in the context of English writing when designing Item 6, which was designed to explore the participants’ ability of thinking through the CT elements in a writing process. By providing descriptions like “identifying major questions that need to be addressed” instead of
using the abstract term as *question at issue*, I attempted to make a connection between the CT elements and the activities involved in writing. The participants were required to evaluate the degree of difficulty for doing these activities while writing English essays. The evaluation was made under a five-point scale, from “very easy” to “very difficult” for each item. The participants were allowed to choose “do not understand” if they felt it difficult to figure out the meaning of certain items in this task.

Similar to Item 6, Item 7 used descriptions instead of abstract terms as well. It was also a 5-point scale item with an additional choice of “do not understand”. It required the participants to make a self-evaluation of their English writing according to the given criteria, which were adapted from the “intellectual standards”. This item was designed to identify the participants’ ability of applying CT standards to their L2 writing.

Items 8 and 9 were designed to gather information about the participants’ level of L2 writing proficiency. Item 8 asked about the participants’ previous English writing scores in some national or international English tests. Item 9 asked the participants to describe their level of English writing proficiency by choosing from the given descriptions as “very good”, “good”, “average”, “poor”, and “very poor”.

Item 10 was designed to identify the pre-writing and post-writing activities that were frequently organized in the participants’ pre-study English writing course. It was to find out whether the participants were taught in a way that had involved thought-provoking strategies although there might not be any explicit instruction on CT. The last item, Item 11, was designed to directly identify the participants’ understanding of the relationship between CT and L2 writing.
4.1.7.2 The writing tasks

When CT is included as an objective in an L2 writing course, the writing tasks are expected to be designed in a way to encourage thinking from multiple viewpoints and to provide opportunities for students to use their background knowledge to make decisions, justify opinions and solve problems. These requirements are quite similar to those of the IELTS (Academic) Writing Test (Task 2) which accesses candidates’ ability to “present a solution to the problem, present and justify an opinion, compare and contrast evidence and opinions, and evaluate and challenge ideas, evidence or arguments” (Cambridge ESOL, 2011, p. 6). Therefore, I decided to choose IELTS (Academic) Writing Test (Task 2) as a model to design the writing tasks for the present study. During the pilot study, I invited the participants to provide some topics that they would be interested in writing, and asked them to make evaluations of certain writing topics concerning the level of difficulty. While designing the writing tasks, I carefully considered students’ background knowledge and interests. Based on the suggestions from the participating teacher, I also made further revisions of these writing tasks to ensure that there were no significant differences between these tasks concerning the level of difficulty for English major sophomores.

Four writing tasks were designed for this study. Providing students with a point of view, these tasks required students to express their opinions on the given viewpoint and then justify their opinions. According to Constructivism, real-life tasks are conducive to students’ construct of knowledge and contribute to the establishment of a constructive learning environment. Therefore, these writing tasks were set up with a real-life background and a meaningful purpose by inviting students to write their opinions on the given issue for a column called “Opinion” in a widely read English newspaper in China —21st Century.
Task 1.

You have been invited by 21st Century to write your opinion on the following issue for a column called “Opinion” in this newspaper:

There is a growing concern about the development of tourism due to the damages it brings to local environment and culture. Some people think that the development of tourism should be restricted.

To what extent do you agree or disagree? Give appropriate reasons and try to persuade your audience of your viewpoint. Write about 250 words.

Task 2.

You have been invited by 21st Century to write your opinion on the following issue for a column called “Opinion” in this newspaper:

There is a growing concern about the reduction of tree population. To save the forests, some people think that printed books should be replaced by e-books.

To what extent do you agree or disagree? Give appropriate reasons and try to persuade your audience of your viewpoint. Write about 250 words.

Task 3.

You have been invited by 21st Century to write your opinion on the following issue for a column called “Opinion” in this newspaper:

Nowadays, a lot of people enjoy online shopping. However, when shopping for clothes, some people consider it better to buy them in physical stores rather than in online stores.

To what extent do you agree or disagree? Give appropriate reasons and try to persuade your audience of your viewpoint. Write about 250 words.
Task 4.

You have been invited by 21st Century to write your opinion on the following issue for a column called “Opinion” in this newspaper:

*Nowadays, an increasing number of students choose to study abroad to experience different cultures and broaden their horizons. Some people consider that students should be encouraged to study abroad.*

To what extent do you agree or disagree? Give appropriate reasons and try to persuade your audience of your viewpoint. Write about 250 words.

The four writing tasks provided students with opportunities to make decisions based on sound reasoning and to reflect on their experience in solving real-world problems. The students were required to write about 250 words in 40 minutes for each writing task.

4.1.7.3 Brainstorming worksheets

During the brainstorming activities, the participants in the two groups were provided with different brainstorming worksheets. To facilitate the brainstorming activity for the participants in the experimental group, a CT-oriented brainstorming worksheet (Table 4.2) was designed based on Paul and Elder’s (2001) “elements of thought”, with eight elements and some corresponding questions. With the space left for additional questions, it also allowed opportunities for students to talk about other elements they think necessary for developing ideas for their first draft. The participants were supposed to use this brainstorming worksheet as a tool to trigger topic-related discussions between peers before writing.

With this brainstorming worksheet, students were supposed to discuss ideas for their essay based on the eight CT elements by asking and answering the corresponding discussion questions. The effectiveness of the brainstorming worksheet was evaluated in the pilot study. It turned out
that many students were unclear about which question they should choose to discuss during the activity and quite a number of them left a lot of blanks in their brainstorming worksheets after the activity. From the follow-up interview, I found that the brainstorming worksheet did not show a natural connection between the “elements of thought” and the writing tasks, which made the brainstorming worksheet not as helpful as expected.

Table 4.2

*The Brainstorming Worksheet for the Experimental Group (First Version)*

<table>
<thead>
<tr>
<th>Elements</th>
<th>Discussion questions</th>
<th>Notes</th>
</tr>
</thead>
</table>
| Purpose                 | • What is the purpose of the task?  
  • Who is the audience?  
  • What do we want to say to them?                                          |       |
| Question at issue       | • What is the major question (problem, issue) that needs to be addressed?  
  • Are there other questions (problems, issue)?  
  • What would we have to do to answer these questions?                      |       |
| Information             | • On what information do we need to base our comments?  
  • Is this information relevant to the problem?  
  • Have we left out any important information that we need to consider?     |       |
| Interpretation and Inference | • What does the evidence imply?  
  • Given all the information (facts), what is the best possible conclusion?  
  • Is there an alternative plausible conclusion?                             |       |
| Concepts                | • What is the main concept to be addressed?  
  • Are there alternative concepts?  
  • Are we going to use these concepts in keeping with the established usage? |       |
| Assumptions             | • What is the statement (policy, strategy, explanation, etc.) assuming?  
  • What assumptions are leading us to our conclusions?  
  • Is there anything that is taken for granted?                              |       |
| Implications and consequences | • What is implied from the assumptions?  
  • If we decide to do “X”, what things might happen?  
  • If we decide not to do “X”, what things might happen?                   |       |
| Point of view           | • From what point of view are we looking at this?  
  • Is there another point of view we should consider?  
  • Which of these possible viewpoints makes the most sense given the situation? |       |
Although the participants would be given longer time and more practices during the main study to obtain a deeper understanding of CT so that they would feel much easier to complete the brainstorming worksheet, I considered it extremely important to revise the worksheet before the main study to ensure a more satisfactory result of the brainstorming activity and a more effective practice of CT skills during the process of this activity. In an attempt to bridge the abstract “elements of thought” with the traditional elements embedded in the writing process, I not only revised the corresponding questions to make them sound like normally discussed questions in a pre-writing discussion, but also provided Chinese translations for the eight elements as well as the corresponding questions, with a careful consideration of the wording in the translation to make them closely related to those used in the L2 writing context. Furthermore, I also reordered the eight elements in a sequence that seemed to be more easily accepted for developing ideas. For example, point of view used to be listed as the last (the eighth) element in the original brainstorming worksheet. However, it is normally discussed or considered with much more priority in a pre-writing thinking process. Therefore, in the revised brainstorming worksheet (Table 4.3), point of view was advanced to the fourth element, right after three other elements (purpose, question at issue, and concepts) that may naturally lead the writers to a logical analysis of the possible points of view and finally to their viewpoints concerning the given topic. Besides the translation and the rearrangement of the elements, I also reduced the number of corresponding questions from three to one, which means, the participants did not have to spend time choosing one of the three questions to explore ideas. The time saved could be devoted to developing ideas by answering the carefully selected question concerning each specific element. All in all, making the worksheet easy to understand and practical to use would greatly ensure the possibility of a more satisfactory outcome.
Using this brainstorming worksheet as a guide for discussion and questioning, students would be led to a structured process of thinking that aimed at figuring out the purpose of the writing task, identifying the key questions to answer, deciding on the information to provide, clarifying the key concepts, making appropriate inferences, assumptions and implications, and finally drawing rational and convincing conclusions. With all these key elements thought through, it is likely that students not only develop ideas about what and how to write their first drafts, but also perceive a deeper understanding of the connection between the CT elements and their L2 writing.

Table 4.3

*The Brainstorming Worksheet for the Experimental Group (Revised Version)*

<table>
<thead>
<tr>
<th>Elements</th>
<th>Questions</th>
<th>Answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose</td>
<td>What is the purpose of writing the essay?</td>
<td></td>
</tr>
<tr>
<td>Question at issue</td>
<td>What is the major question that needs to be addressed in the essay?</td>
<td></td>
</tr>
<tr>
<td>Concepts</td>
<td>What is the main concept to be addressed?</td>
<td></td>
</tr>
<tr>
<td>Point of view</td>
<td>Given the situation, what are the possible viewpoints?</td>
<td></td>
</tr>
<tr>
<td>Assumptions</td>
<td>What is the most fundamental assumption of your viewpoint?</td>
<td></td>
</tr>
<tr>
<td>Information</td>
<td>What is the most important information that needs to be considered to support your viewpoint?</td>
<td></td>
</tr>
<tr>
<td>Interpretation</td>
<td>Given all the information, what is the best possible conclusion?</td>
<td></td>
</tr>
<tr>
<td>Implications</td>
<td>What are the most significant implications you expect from this essay?</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.3

The Brainstorming Worksheet for the Experimental Group (Revised Version)
When the students in the control group were organized to develop ideas in their brainstorming activities, they were provided with a different brainstorming worksheet (Table 4.4) that provided no specific guidance on CT. The students in the control group were required to note down their ideas developed during the discussions and to provide their opinions concerning each idea. It would be interesting to identify what kind of ideas they would develop without the guidance of the “elements of thought”, and what opinions they would provide without the guidance of the corresponding questions.

Table 4.4

*The Brainstorming Worksheet for the Control Group*

<table>
<thead>
<tr>
<th>Ideas</th>
<th>Opinions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

4.1.7.4 Peer review checklist

Mindful of the concerns for implementing peer review, researchers (e.g., Ferris, 2003; Min, 2005, 2006) emphasize the importance of appropriate training on how to do peer review. Apart from explanations or demonstrations, Carr (2008) suggests that teachers’ guidance can also take the form of guiding questions. With the objective of improving CT in L2 writing, the questions guiding students through their peer review should be related to the standards for CT. A peer
review checklist (Table 4.5) that included both evaluation criteria and guiding questions (adapted from Paul and Elder’s (2001) “intellectual standards”) has been designed as a possible solution.

Table 4.5

The Peer-review Checklist for the Experimental Group (First Version)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Explanations</th>
<th>Guiding questions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clarity</strong></td>
<td>Understandable, the meaning can be grasped; free from confusion or ambiguity, without obscurities.</td>
<td>Q1: Could you elaborate further? Q2: Could you give an example? Q3: Could you illustrate what you mean?</td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td>Free from errors, mistakes or distortions; true, correct.</td>
<td>Q4: How could you check on that? Q5: How could you find out if that is true? Q6: How could you verify or test that?</td>
</tr>
<tr>
<td><strong>Precision</strong></td>
<td>Exact to the necessary level of detail, specific.</td>
<td>Q7: Could you be more specific? Q8: Could you give me more details? Q9: Could you be more exact?</td>
</tr>
<tr>
<td><strong>Relevance</strong></td>
<td>Bearing upon or relating to the matter at hand; implying a close logical relationship with, and importance to, the matter under consideration.</td>
<td>Q10: How does that relate to the problem? Q11: How does that bear on the question? Q12: How does that help you with the issue?</td>
</tr>
<tr>
<td><strong>Depth</strong></td>
<td>Containing complexities and multiple interrelationships, implying thoroughness in thinking through the many variables in the situation, context, idea, question.</td>
<td>Q13: What factors make this a difficult problem? Q14: What are some of the complexities of this question? Q15: What are some of the difficulties you need to deal with?</td>
</tr>
<tr>
<td><strong>Breadth</strong></td>
<td>Encompassing multiple viewpoints, comprehensive in view, wide-ranging and broadminded in perspective.</td>
<td>Q16: Do you need to look at this from another perspective? Q17: Do you need to consider another point of view? Q18: Do you need to look at this in other ways?</td>
</tr>
<tr>
<td><strong>Logic</strong></td>
<td>The parts make sense together, without contradictions; in keeping with the principles of sound judgement and reasonability.</td>
<td>Q19: Do all these make sense together? Q20: Does your first paragraph fit in with your last? Q21: Does what you say follow from the evidence?</td>
</tr>
<tr>
<td><strong>Significance</strong></td>
<td>Having importance, being of consequence; having considerable or substantial meaning.</td>
<td>Q22: Is this the most important problem to consider? Q23: Is this the central idea to focus on? Q24: Which of these facts are most important?</td>
</tr>
<tr>
<td><strong>Fairness</strong></td>
<td>Free from bias, dishonesty, favoritism, selfish-interest, deception or injustice.</td>
<td>Q25: Is there any biased viewpoints in dealing with this issue? Q26: Do you sympathetically represent the viewpoints of others?</td>
</tr>
</tbody>
</table>
Like what happened while using the brainstorming worksheet, the peer review checklist did not work perfectly well during the pilot study. The main reason was that the participating students were not quite familiar with the process of peer review due to a lack of experience in their previous learning of English writing. In addition, the difficulty in understanding these “intellectual standards” partly led to an ineffective use of the checklist. The participants reported it was hard to understand the meaning of some CT standards even though the explanations were already provided in the checklist. Identifying the need for a Chinese translation to save them out of any confusion when using the checklist in peer review activities, I revised the peer review checklist (see Table 4.6). Besides the Chinese translation for both the nine standards and the corresponding explanations, I also tried to simplify the explanation for each standard so as to make them easier to understand. This peer review checklist was only used in the experimental group. In the control group, the students did not use any checklist in their peer review activities.

During the peer review activities, the students in the experimental group were required to use the nine “intellectual standards” to evaluate their peer’s essays. When they identified problems concerning clarity, accuracy or precision, etc., they were required to ask the corresponding questions so as to ask their peers to give examples, provide more details or make further explanations. Based on the questions and answers, the students would understand their problems in writing as well as the ways to improve it. By using the revised peer review checklist in the study, the participants were supposed to be able to familiarize themselves with these intellectual standards, and to gain a deeper understanding of their connections to good writing. The question-and-answer process was expected to engage students in deeper thinking and better collaboration, and hopefully would direct them to effective written communication.
Table 4.6

The Peer-review Checklist for the Experimental Group (Revised Version)

<table>
<thead>
<tr>
<th>No.</th>
<th>Standards</th>
<th>Explanations</th>
<th>Guiding questions</th>
</tr>
</thead>
</table>
| 1   | Clarity   | Understandable, the meaning can be grasped; free from confusion or ambiguity.| Q1: Could you elaborate further?  
Q2: Could you give an example?  
Q3: Could you illustrate what you mean? |
| 2   | Accuracy  | Free from errors, mistakes or distortions; true; correct.                   | Q4: How could you check on that?  
Q5: How could you find out if that is true?  
Q6: How could you verify or test that? |
| 3   | Precision | Exact to the necessary level of detail; specific.                           | Q7: Could you be more specific?  
Q8: Could you give me more details?  
Q9: Could you be more exact? |
| 4   | Relevance | Bearing upon or relating to the matter at hand.                             | Q10: How does that relate to the problem?  
Q11: How does that bear on the question?  
Q12: How does that help you with the issue? |
| 5   | Depth     | Containing complexities and multiple interrelationships; implying thoroughness in thinking. | Q13: What factors make this a difficult problem?  
Q14: What are some of the complexities of this question?  
Q15: What are some of the difficulties you need to deal with? |
| 6   | Breadth   | Encompassing multiple viewpoints, comprehensive in view, wide-ranging and broadminded in perspective. | Q16: Do you need to look at this from another perspective?  
Q17: Do you need to consider another point of view?  
Q18: Do you need to look at this in other ways? |
| 7   | Logic     | The parts make sense together, without contradictions; in keeping with the principles of sound judgement and reasonability. | Q19: Do all these make sense together?  
Q20: Does your first paragraph fit in with your last?  
Q21: Does what you say follow from the evidence? |
| 8   | Significance | Having importance; being of consequence; having considerable or substantial meaning. | Q22: Is this the most important problem to consider?  
Q23: Is this the central idea to focus on?  
Q24: Which of these facts are most important? |
| 9   | Fairness  | Free from bias, dishonesty, favoritism, selfish-interest, deception or injustice. | Q25: Is there any biased viewpoints in dealing with this issue?  
Q26: Do you sympathetically represent the viewpoints of others? |
4.1.7.5 Criteria for evaluating CT in L2 writing

The review of the previous empirical studies on teaching CT in writing has revealed an obvious gap in the assessment of CT due to lack of reliable standards. Aware of the necessity of CT assessment in L2 writing and the need of such reliable assessment standards, I designed a set of “criteria for evaluating CT in L2 writing” (Table 4.7) based on Paul and Elder’s (2001) “intellectual standards” as well as the normally accepted standards for L2 writing. Indeed, both CT and L2 writing are so abstract to be evaluated that the evaluation of CT in L2 writing requires much more than a general description of each standard. To make this evaluation process as objective as possible, I attempted to break down the general descriptions of CT standards into five degrees of performance and to include the performance of L2 writing in each corresponding degree. The “criteria for evaluating CT in L2 writing” consists of nine criteria, corresponding to the nine “intellectual standards”. Each criterion is rated according to a 5-point scale, from “very good” (5 points) to “very poor” (1 point). The final score of CT will be the average of the nine scores gained from each criterion.
### Table 4.7

**The Criteria for Evaluating CT in L2 Writing**

<table>
<thead>
<tr>
<th>CRITICAL THINKING BAND DESCRIPTORS</th>
<th>5 Very good</th>
<th>4 Good</th>
<th>3 Average</th>
<th>2 Poor</th>
<th>1 Very poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Clarity</td>
<td>Completely understandable; Free from any confusion or ambiguity</td>
<td>Fairly understandable even though some words are not completely clear</td>
<td>Understandable, but some words or sentences are not clear enough or slightly confusing</td>
<td>Presenting a number of unclear referents or sentences that are not easily understandable or rather confusing</td>
<td>Hardly understandable; Full of confusion or ambiguity</td>
</tr>
<tr>
<td>2 Accuracy</td>
<td>Completely free from errors, mistakes or distortions; True, Correct</td>
<td>Fairly correct; No misleading information</td>
<td>Most of the information is fairly correct; Some information needs further verification, but is not quite misleading</td>
<td>Some of the information is not correct, or with unidentified sources; Some information is quite misleading</td>
<td>Presenting many errors or mistakes; Very misleading</td>
</tr>
<tr>
<td>3 Precision</td>
<td>Completely exact to the sufficient level of detail; Presenting sufficient examples and explanations; Fairly specific</td>
<td>Exact to the necessary level of detail; Presenting necessary examples and explanations; Fairly specific</td>
<td>Exact to the fundamental level of detail; Presenting some examples and explanations but not enough; Not very specific</td>
<td>Not exact to the necessary level of detail; Lacking some necessary examples or explanations; Not specific at all</td>
<td>Not exact to the fundamental level of detail; Missing some key points; Presenting some information that is not closely related to the task</td>
</tr>
<tr>
<td>4 Relevance</td>
<td>Implying a completely close relationship with the task; Covering all the key points; Presenting no irrelevant information</td>
<td>Implying a fairly close relationship with the task; Covering almost all the key points; Presenting no irrelevant information</td>
<td>Implying some relationship with the task; Not covering all the key points; Presenting some information that is not closely related to the task</td>
<td>Not implying a close relationship with the task; Missing some key points; Presenting some information that is not related to the task</td>
<td>Not implying any relationship with the task; Missing all the key points</td>
</tr>
<tr>
<td>5 Depth</td>
<td>Implying thoroughness in thinking; Presenting full understanding of the complexities</td>
<td>Implying depth in thinking; Presenting an understanding of the complexities</td>
<td>Not implying enough depth in thinking; Not presenting a basic understanding of the complexities</td>
<td>Not implying depth in thinking; Not presenting an understanding of the complexities</td>
<td>Not implying any depth in thinking; Not presenting any basic understanding of the complexities</td>
</tr>
<tr>
<td>6 Breadth</td>
<td>Encompassing multiple viewpoints; Fully considering differing ideas</td>
<td>Encompassing multiple viewpoints; Appropriately considering differing ideas</td>
<td>Encompassing multiple viewpoints to some extent; Not broad-minded enough; Not fully considering differing ideas</td>
<td>Narrow-minded in perspective; Not considering much about differing ideas</td>
<td>Very narrow-minded in perspective; Not considering differing ideas</td>
</tr>
<tr>
<td>7 Logic</td>
<td>Completely making sense; No contradictions; No logical errors; Providing strongly convincing evidence to fully support all the key viewpoints</td>
<td>Fairly making sense; No contradictions; No logical errors; Providing fairly convincing evidence to support most all the key viewpoints</td>
<td>Making sense; No obvious contradictions; Having occasional errors in logic; Not providing enough convincing evidence to support all the key viewpoints</td>
<td>Having some obvious contradictions or logical errors; Lacking convincing evidence for several key viewpoints</td>
<td>Having many obvious contradictions or logical errors; Lacking convincing evidence for all the key viewpoints</td>
</tr>
<tr>
<td>8 Significance</td>
<td>Having great importance; Showing great substantiality in meaning; Highlighting all the important features</td>
<td>Having appropriate importance; Showing appropriate substantiality in meaning; Highlighting most of the important features</td>
<td>Having importance; Missing some important features; Or presenting certain features that are not important enough</td>
<td>Presenting some features that are not important enough; Not substantial enough in meaning; Not highlighting the important features</td>
<td>Not having any importance; Not showing any substantiality in meaning</td>
</tr>
<tr>
<td>9 Fairness</td>
<td>Presenting ethical appropriateness in the aspects of viewpoints, evidence, argument and conclusion; The writing is based on verifiable facts; Not showing any bias in terms of religion, ethics, gender, age, profession, etc.</td>
<td>Presenting ethical appropriateness in the aspects of viewpoints, evidence, argument and conclusion; The writing is based on verifiable facts; Not showing any obvious bias in terms of religion, ethics, gender, age, profession, etc.</td>
<td>Presenting necessary ethical appropriateness in the aspects of viewpoints, evidence, argument and conclusion; Most of the writing is based on verifiable facts; Not showing any obvious bias in terms of religion, ethics, gender, age, profession, etc.</td>
<td>Not presenting necessary ethical appropriateness in many of the aspects of viewpoints, evidence, argument and conclusion; Most of the writing is not based on verifiable facts; Showing obvious bias in terms of religion, ethics, gender, age, profession, etc.</td>
<td>Not presenting ethical appropriateness in many of the aspects of viewpoints, evidence, argument and conclusion; Most of the writing is not based on verifiable facts; Showing obvious bias in terms of religion, ethics, gender, age, profession, etc.</td>
</tr>
</tbody>
</table>
4.1.7.6 Interview guidelines

Six students from each group were chosen to participate in a one-on-one semi-structured interview after the study. The participants were selected according to the improvement in their CT scores. The interview was expected not only to explore the factors that were favorable for students’ learning of CT, but also to identify the potential difficulties in the learning process. Different interview guidelines (Appendix D) were designed for the two groups. The interview questions for students from the experimental group were designed to explore their experience of the CT-oriented brainstorming and peer review activities in terms of the effects on their learning of CT and L2 writing, and their overall evaluation of this CT-oriented L2 writing approach. Students from the control group were asked to comment on the experience of their brainstorming and peer review activities and to evaluate the effects of these activities on their learning of L2 writing. They were also asked to evaluate the approach that they had followed. As the students from both groups were asked several similar questions concerning their in-class activities, a comparison of their answers to these questions was also expected to provide further explanation of the effects of different approaches on students’ learning of CT and L2 writing.

4.2 Data collection

The present study consisted of three phases and involved the collection of both quantitative and qualitative data. The first phase took place before the study when the participants took part in the pre-study questionnaire survey and the pre-test. The second phase was the main study during which the experimental group and the control group followed different approaches. The third phase took place after the study when the selected participants took part in the post-study interview. Figure 4.2 illustrates the procedure of data collection.
In the first phase, the students in both groups participated in a pre-study questionnaire survey and wrote a pre-test essay (Essay 1). The data collection took place in the participants’ classroom when they were having their English Writing class. The participating teacher first introduced me and the research project, and then helped me to distribute the consent form (Appendix B). After the participants read and signed their consent forms, they were required to complete a questionnaire (Appendix A), which took about 20 minutes. Next, the participants were assigned a writing task (Task 1, pre-test essay) which required them to write about 250 words in 40 minutes in class. All the consent forms, questionnaires and essays were collected when completed.
In the second phrase when the participants completed their pre-study questionnaire and pre-test essay, the experimental group and the control group began to take their English Writing class separately following different approaches. Using a CT-oriented L2 writing approach, I taught the experimental group, while the participating teacher taught the control group using a traditional writing approach. Both groups were required to write their next three essay tasks in four steps: (1) Brainstorming; (2) Draft 1; (3) Peer review; (4) Draft 2. However, when doing the brainstorming activities, the experimental group used a CT-oriented brainstorming worksheet (Table 4.3), while the control group was given a different brainstorming worksheet (Table 4.4) that provided no guidance of CT-related elements. Besides, when doing peer review activities, the experimental group used a CT-oriented peer review checklist (Table 4.6), while the control group was not given any peer review checklist. On the whole, the design of the present study was to make sure that the only difference between the experimental group and the control group was whether CT was explicitly involved in the instruction and practice. During this phase, all the participants’ essay drafts (Essays 2, 3, 4) and their brainstorming worksheets were collected.

In the third phase, six students from each group were selected to participate in a one-on-one semi-structured post-study interview. The six students were chosen according to their improvement in CT scores. Three students who had made the most significant improvement in their CT scores (comparison between pre-test and post-test scores), and three students who had made the least improvement in their CT scores were selected for the interview. The interview was conducted via a widely used online chatting tool among Chinese college students. As the online chatting tool offered the function of keeping the chatting history, it helped to record the transcripts during the process of the interview. Another advantage of the online interview was that it helped to make the participants feel relaxed during the interview when the teacher
(interviewer) was not asking questions face-to-face and thus they could freely express their opinions. As Spradley (1980) indicates, it is ideal to conduct interviews in participants’ native languages. I used Chinese language when interviewing the participants. The interview with the experimental group took about 40 to 50 minutes each. As there were fewer questions for the control group, the interview with them took about 20 to 30 minutes each. All the transcripts were saved and translated into English after the interview with the 12 interviewees.

4.3 Data analysis

The present study involved the collection of both quantitative and qualitative data. The quantitative data include the pre-study questionnaire survey results and the pre-test and post-test CT and L2 writing scores. The qualitative data include the post-study interview transcripts and the participants’ brainstorming worksheets and essay drafts. It took several steps to analyze these research data.

4.3.1 Analysis of the questionnaire

The pre-study questionnaire was designed to explore the answer to the first research question, which concerned students’ perceptions of CT and its connection to L2 writing. Of the 11 items in the questionnaire, ten of them were multiple choice questions or scale items, and only one of them was an open-ended question. Frequency tests were conducted to analyze the answers to the multiple choice questions and scale items. When analyzing the answers to the open-ended question that asked about the participants’ definition for CT, an additional researcher (also a graduate student in the area of language and literacy education) was invited to join the coding process. We first read through all the answers repeatedly to get a whole picture of the participants’ understanding of the concept. Then we drafted a coding scheme based on the framework of Paul and Elder’s (2001) CT model, particularly “intellectual standards” (clarity,
accuracy, precision, relevance, depth, breadth, logic, significance, fairness) and “intellectual traits” (intellectual humility, intellectual courage, intellectual empathy, intellectual integrity, intellectual perseverance, confidence in reason, intellectual autonomy, fair-mindedness). Then we each coded 10% of the data separately and reached an agreement of 90%. The only divergence occurred in the coding of depth and was resolved by a further discussion on Paul and Elder’s (2001) explanation of depth. Using the co-developed coding scheme, I coded the rest of the data.

Besides the demographic information about the participants, the data collected from the questionnaire survey also provided information concerning their general knowledge of CT, their levels of CT competence and L2 writing proficiency, their pre-study English writing course and their perception of the relationship between CT and L2 writing.

4.3.2 Analysis of the pre-test and post-test CT and L2 writing scores

After the study, the participants’ pre-test (Essay 1) and post-test (Essay 4) essays were evaluated for the pre-test and post-test CT scores based on the “criteria for evaluating CT in L2 writing” (see Table 4.7 on p. 116), as well as the pre-test and post-test L2 writing scores based on “IELTS Writing Task 2 Band Descriptors” (Appendix C). To ensure the reliability of the scoring procedure, both the CT scores and the L2 writing scores in this study were evaluated by two raters. The participating teacher and I rated the pre-test and post-test CT scores. The participating teacher and another writing teacher from the same department in the participating university rated the pre-test and post-test writing scores. The average scores of the two raters were taken as the final scores.

The evaluation of the pre-test and post-test CT scores was conducted by the participating teacher and me based on the “criteria for evaluating CT in L2 writing” that I developed for the
present study. Before scoring, I provided a one-day training session for the participating teacher, who had been very interested in understanding how to teach and evaluate CT in L2 writing. During the training session, I explained the concept of CT and the “criteria for evaluating CT in L2 writing”, along with several example essays that had been rated by me with different scores based on the criteria. The participating teacher was also given a chance to rate two essays himself by using the criteria. Finally, I reviewed the scoring procedure together with the participating teacher and discussed all the unclear points until a consensus was reached about the criteria.

To avoid any interference with students’ handwriting (Markham, 1976) during the scoring, all the participants were required to submit their final essays in a digital format. Confirming that all the participants’ names were eliminated from the essays, I printed out all the essays in two sets. All together 88 essays were shuffled and assigned to the participating teacher and me. We each rated the essays separately. Our average CT score was then calculated for the final CT score of each essay. Although I planned to invite a third rater to rate the essays if there showed a great discrepancy between the two raters (more than one point between the scores), no such difference occurred. After the rating, an inter-rater reliability test was conducted, the result of which ($r=0.88$, $p<.01$) suggests a high reliability between the raters in their ratings of the CT scores.

As the writing tasks were designed following IELTS (Academic) Writing Test (Task 2), “IELTS Writing Task 2 Band Descriptors” (n.d., Appendix C) were used to rate the essays for the pre-test and post-test L2 writing scores. The assessment of L2 writing was conducted by the participating teacher and another writing instructor, both of whom had previous experience of using “IELTS Writing Task 2 Band Descriptors” to rate IELTS writing tasks. The two teachers evaluated the essays separately and each gave their own writing scores for the same essay. Based
on the two writing scores for each essay, an average writing score was calculated, which was taken as the final writing score of the essay. After the rating, an inter-rater reliability test was conducted, the result of which ($r=0.86$, $p<.01$) suggests a high reliability between the raters in their ratings of the writing scores.

The second research question concerned the effectiveness of the proposed CT-oriented L2 writing approach that was revealed from participants’ improvement in their CT and L2 writing scores before and after the study. A series of statistical analyses were conducted to evaluate the effectiveness of the approach.

As the present study involves the comparison of post-test results between the experimental and control groups, the baseline (pre-test) differences should be taken into consideration in the process of result analysis. An Analysis of Covariance (ANCOVA), which is believed to be able to reduce error variance (Field, 2013), is ideally applicable to identifying the influence of the covariate (pre-test CT score) on the dependent variable (post-test CT score) and then controlling its influence in order to illustrate a more accurate assessment of the effect of the CT-oriented L2 writing approach on the improvement of CT scores.

To examine the influence of the covariate on the dependent variable, the assumption of homogeneity of regression slopes was tested. In the analysis of the difference between pre-test and post-test CT scores, the covariate was the pre-test CT score and the dependent variable was the post-test CT score. Table 4.8 presents the result of the test of homogeneity of regression slopes for CT. The result indicates that different approaches (as indicated by “Group”) have shown no significant interaction with the pre-test CT score ($F_{(1,40)}=.066$, $p=.799>.05$), which means that there was no statistical significant difference between the pre-test CT scores of the
two groups. Therefore, an ANOVA analysis, instead of ANCOVA analysis, could be conducted to compare the difference in the post-test CT scores between the two groups.

Table 4.8

Testing the Assumption of Homogeneity of Regression Slopes for CT

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>6.662*</td>
<td>3</td>
<td>2.221</td>
<td>14.505</td>
<td>.000</td>
</tr>
<tr>
<td>Intercept</td>
<td>1.825</td>
<td>1</td>
<td>1.825</td>
<td>11.920</td>
<td>.001</td>
</tr>
<tr>
<td>Group</td>
<td>.025</td>
<td>1</td>
<td>.025</td>
<td>.160</td>
<td>.691</td>
</tr>
<tr>
<td>Pre-test CT</td>
<td>.618</td>
<td>1</td>
<td>.618</td>
<td>4.035</td>
<td>.051</td>
</tr>
<tr>
<td><strong>Group * Pre-test CT</strong></td>
<td><strong>.010</strong></td>
<td>1</td>
<td><strong>.010</strong></td>
<td><strong>.066</strong></td>
<td><strong>.799</strong></td>
</tr>
<tr>
<td>Error</td>
<td>6.124</td>
<td>40</td>
<td>.153</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>484.058</td>
<td>44</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>12.785</td>
<td>43</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. R Squared = .521 (Adjusted R Squared = .485)

Similarly, the assumption of homogeneity of regression slopes was also tested for the L2 writing scores. In the analysis of the difference between pre-test and post-test L2 writing scores, the covariate was the pre-test L2 writing score and the dependent variable was the post-test L2 writing score. Table 4.9 presents the result of the test of the assumption of homogeneity of regression slopes for L2 writing. The result indicates that different approaches (as indicated by “Group”) showed no significant interaction with the pre-test L2 writing score (\(F_{(1, 40)}=0.08, p=0.929>.05\)), which means that there was no statistical significant difference between the pre-test L2 writing scores of the two groups. Therefore, an ANOVA analysis, instead of ANCOVA analysis, could be conducted to compare the difference in the post-test L2 writing scores between the two groups.
Testing the Assumption of Homogeneity of Regression Slopes for L2 Writing

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>5.900(^a)</td>
<td>3</td>
<td>1.967</td>
<td>6.987</td>
<td>.001</td>
</tr>
<tr>
<td>Intercept</td>
<td>4.722</td>
<td>1</td>
<td>4.722</td>
<td>16.775</td>
<td>.000</td>
</tr>
<tr>
<td>Group</td>
<td>.024</td>
<td>1</td>
<td>.024</td>
<td>.087</td>
<td>.770</td>
</tr>
<tr>
<td>Pre-test writing</td>
<td>2.611</td>
<td>1</td>
<td>2.611</td>
<td>9.277</td>
<td>.004</td>
</tr>
<tr>
<td><strong>Group * Pre-test writing</strong></td>
<td><strong>.002</strong></td>
<td>1</td>
<td><strong>.002</strong></td>
<td><strong>.008</strong></td>
<td><strong>.929</strong></td>
</tr>
<tr>
<td>Error</td>
<td>11.259</td>
<td>40</td>
<td>.281</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1495.000</td>
<td>44</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>17.159</td>
<td>43</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(a. \) R Squared = .344 (Adjusted R Squared = .295)

In addition, a correlation analysis was conducted to examine the relationship between the CT scores and the L2 writing scores. The correlation test was intended to identify whether the two groups of participants’ CT scores correlated with their L2 writing scores. The identification of the relationship between CT score and L2 writing score would further support the idea of the reciprocal effect between CT and L2 writing. It would also illustrate the importance and necessity of infusing CT in L2 writing instruction.

### 4.3.3 Analysis of post-study interview, brainstorming worksheets and essay drafts

The post-study interview was designed to explore an enhanced understanding of the effects of this CT-oriented L2 writing approach on the participants’ learning of CT and L2 writing. Six interviewees from each group participated in the post-study interview. Each interviewee was assigned a pseudonym, followed by a letter in the bracket indicating whether the participant had achieved the most (M) or the least (L) improvement in CT. In addition, all the interviewees from the experimental group were assigned a name starting with the letter “E”, while the interviewees from the control group were assigned a name starting with the letter “C”. For example, Emma (M) is one of the participants from the experimental group who has achieved the most significant
improvement in her CT score during the study, and Cindy (L) is one of the participants from the control group who has achieved the least improvement in her CT score during the study.

When analyzing the interview transcripts, I employed a thematic analysis approach focusing on what was said rather than how it was said (Bryman, Bell & Teevan, 2012) to explore the effects of the CT-oriented L2 writing approach on students’ learning of CT and L2 writing. The analysis of the interview data focused more on the results of the experimental group. Based on the third research question of the present study (How does the CT-oriented L2 writing approach used in the present study affect students’ learning of CT and L2 writing?), I first categorized the interview questions for the experimental group (see Appendix D) into two initial categories: (1) effects of the approach on the learning of CT; and (2) effects of the approach on the learning of L2 writing. Then I read through the interview transcripts carefully and noted down the emerging themes related to the two initial categories. Four themes of participants’ answers were identified: (1) brainstorming and the learning of CT; (2) brainstorming and the learning of L2 writing; (3) peer review and the learning of CT; and (4) peer review and the learning of L2 writing.

The interview data collected from the control group were also analyzed. However, as the control group was not given instruction on CT, there were no questions about their learning of CT. Therefore, the initial categories and themes of participants’ answers identified in their transcripts were only related to their learning of L2 writing and were the same as the L2-writing-related categories and themes identified in the transcripts of the experimental group. The analysis of the interview data from the control group served as a comparison of the effects of the two approaches on the learning of L2 writing.

The interview data provided further explanation of how the CT-oriented L2 writing approach had affected students’ learning of CT and L2 writing, which answered the third
research question of the present study. In addition, the analysis of students’ answers to the interview questions may also provide insights for an enhanced understanding of students’ experience of following a CT-oriented approach in an L2 writing context.

Besides the post-study interview data, I also analyzed the participants’ brainstorming worksheets and essay drafts, with a purpose to identify further evidence of students’ learning of CT and L2 writing. When analyzing the experimental group’s brainstorming worksheets and essay drafts, I focused on identifying if the participants had provided answers in a way to show their appropriate understanding of each CT element and if their understanding of certain CT elements had led to some well written or poorly written texts. When analyzing the control group’s brainstorming worksheets and essay drafts, I focused on comparing their ideas and texts with those of their peers in the experimental group. The analysis of the interview data as well as the brainstorming worksheets and essay drafts also served as triangulation for evaluating the effectiveness of the CT-oriented L2 writing approach on improving students’ CT and L2 writing.
Chapter 5. Perceptions of CT and its connection to L2 writing: Findings and discussion for Research Question One

This chapter reports and discusses the findings for the first research question, which aims to identify the participants’ perceptions of CT and its connection to L2 writing. The answer to this research question was generated from the participants’ responses to the pre-study questionnaire survey. Presenting 11 items, the pre-study questionnaire was designed to generate information about the participants’ general knowledge of CT, their levels of CT abilities and English writing proficiency, their pre-study English writing course, and their understanding of the relationship between CT and English writing.

5.1 Participants’ general knowledge of CT

All together five items were designed to explore the participants’ general knowledge of CT, concerning the frequency of hearing about CT, the personal definition of CT, the preference of CT’s Chinese translation, the previous experience of formal CT instruction, and the expected benefits from CT in their English learning. Except for Item 2, which was an open-ended question that required the participants to define CT based on their understanding, the other four items were all presented in the form of multiple choice questions, with or without an open-ended option. Table 5.1 illustrates the participants’ answers to the multiple choice questions (Item 1, Item 3, Item 4 and Item 5).
### Table 5.1

**Participants’ General Knowledge of CT**

<table>
<thead>
<tr>
<th>Items</th>
<th>Options</th>
<th>Experimental group (n=22)</th>
<th>Control group (n=22)</th>
<th>Total (n=44)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Item 1: How often do you hear about the term “critical thinking”?</strong></td>
<td>All the time</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Sometimes</td>
<td>19</td>
<td>17</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>Once or twice</td>
<td>1</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Never</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Item 3: There are some commonly used translated versions of “critical thinking” in Chinese. Please indicate which one you would prefer.</strong></td>
<td><em>Pi pan si wei</em> (批判思维)</td>
<td>10</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td><em>Si bian neng li</em> (思辨能力)</td>
<td>12</td>
<td>18</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Do not know</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Item 4: Have you ever received any formal instruction/training related to critical thinking in class?</strong></td>
<td>Yes</td>
<td>13</td>
<td>8</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>9</td>
<td>14</td>
<td>23</td>
</tr>
<tr>
<td><strong>Item 5: In which aspect of English learning do you think you will benefit (or have benefited) most from critical thinking?</strong></td>
<td>Reading</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Writing</td>
<td>2</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Listening</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Speaking</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>All of the above</td>
<td>14</td>
<td>12</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>None of the above</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

#### 5.1.1 Frequency of hearing about CT

When the participants were inquired about how often they had heard about the term “critical thinking”, none of the participants chose “never”, although if they had chosen this option, they could have skipped the next five items and directly gone to Item 6 in the questionnaire. More than 80% of all the participants reported to have heard about the term “sometimes” (n=36, 81.8%). About one tenth of the participants (n=5, 11.4%) had heard about the term much less frequently (“once or twice”). Very few participants (n=3, 6.8%) reported to have heard about the
term “all the time”. The result of this item shows little difference between the participants in the experimental group and the control group. In both groups, the majority (about 80%) of the participants reported to have heard about the term “sometimes”, which was favorable for the present study because CT was not an entirely new term to the participants, so that they might not find it difficult to accept the instruction of it in their classes. However, the low frequency of hearing about CT also indicates a lack of formal CT instruction in their current curriculum, as well as a lack of attention to CT from both the instructors and the students.

5.1.2 Translation of CT

As to the translation of CT in Chinese, there are two commonly accepted versions: *pi pan si wei* (批判思维) and *si bian neng li* (思辨能力), which are often used interchangeably but indicate different understanding of the word “critical” and of the concept as a whole. Being a more direct literal translation, *pi pan si wei* (批判思维) has been used quite widely not only in research but also in daily conversation when people refer to CT. However, as indicated by some Chinese researchers (e.g., Wen, 2008), this translation, which literally means “thinking to criticize”, is inclined to lead to misunderstanding. Another translation version, *si bian neng li* (思辨能力), which literally means the “reflective thinking ability”, has recently been used more and more widely and frequently as a more appropriate substitute of *pi pan si wei* (批判思维) to refer to CT among Chinese researchers.

Although the participants would not have paid so much attention to the distinctions between these translations, their choice of CT’s equivalent Chinese phrase in this survey could also, to some extent, indicate their understanding of CT. Therefore, the third item in the questionnaire required the participants to identify their preference from the two Chinese translations for CT. If the participants were not satisfied with either of them, they were allowed to write down their
own versions. The result shows that the majority of the participants (n=30, 68.2%) preferred si bian neng li (思辨能力). Less than one third of the participants (n=12, 27.3%) chose the other translation version pi pan si wei (批判思维). Possibly, by providing the two translations at the same time, the item itself triggered the participants’ thinking about the meaning of “critical” in the concept of CT. Two participants provided their own translations. One was duo shi jiao si kao (多视角思考), which literally means “thinking from multiple perspectives”; and the other one was li xing si wei (理性思维), which literally means “rational thinking”.

5.1.3 Previous experience of formal CT instruction

Item 4 concerned the participants’ previous experience of formal CT instruction. As indicated by the original writing instructor of the participants, there had been no formal CT courses in the curriculum in their university and it was not formally required for the instructors to teach CT in their content courses. Therefore, it was hypothesized that most of the participants would choose “no”. Surprisingly, the result turned out that the number of participants who thought that they had received formal CT instruction (n=21, 47.7%) was almost the same as those who thought they had never received formal CT instruction (n=23, 52.3%).

Those who chose “yes” to indicate that they had received formal CT instruction were requested to provide further information concerning the specific titles of the courses. Four courses emerged from the answers provided by 15 participants: Intensive reading (7), Exploring English-speaking countries (4), Debate (3), Oral English (1). Considering the fact that all the participants had been taking these courses together, and that only a relatively small number of participants considered that these courses had provided formal CT instruction, the result was inconclusive indication of any formal CT instruction in these courses. Actually, from the chatting with the students after class, I found several reasons why some participants thought they had
received CT instruction. Firstly, some of their instructors had mentioned about CT or encouraged them to think critically in class. Secondly, the textbooks used in some courses included sections that required students to think from different perspectives. For example, their intensive reading textbook had a discussion section in every unit, asking students to discuss certain debatable questions based on the reading material. Nevertheless, these CT-related elements do not equal to formal CT training that should be not only explicit but also systematic.

5.1.4 Benefits of CT in English learning

The fifth item was designed to find out in which L2 skill (reading, writing, listening, and speaking) the participants saw benefits of CT. Except for about half of all the participants (n=26, 59.1%) who thought they could benefit most from CT in all the four L2 skills, the majority of the rest of the participants (n=9, 20.5%) considered that they could benefit most from CT in their L2 writing. Although they might have made the choice because the survey was conducted in a writing course, it was a good sign that these participants showed a positive attitude towards the connection between CT and L2 writing even before the study. None of the participants chose “none of the above”, which somehow indicates their optimistic attitudes towards the benefits of CT in their L2 learning. Nevertheless, none of the participants chose “listening”. Although it is somehow included in the option of “all of the above”, none of the participants actually expected to improve solely in their listening as a result of learning CT.

5.1.5 Definition of CT

As the only open-ended item in this questionnaire, Item 2 required the participants to define CT in their own words. Among the 44 definitions provided by the participants, two of them were not written in an appropriate form of definition. One of the two definitions was a Chinese translation for CT with no further explanation, and the other one provided no substantial
meaning by saying CT is “a thinking way to think”. Therefore, these two invalid definitions were not coded. All together a total of twelve elements were identified in the 42 definitions for CT: *breadth, depth, logic, fairness, intellectual autonomy, intellectual courage, intellectual humility, intellectual empathy, confidence in reason, self-reflection, creativity and intelligence*. Of the twelve elements, four of them (*breadth, depth, logic, fairness*) corresponded to Paul and Elder’s (2001) “intellectual standards”; another five of them (*intellectual autonomy, intellectual courage, intellectual humility, intellectual empathy, confidence in reason*) corresponded to Paul and Elder’s (2001) “intellectual traits”; and the rest three (*self-reflection, creativity and intelligence*) emerged with no corresponding elements in Paul and Elder’s (2001) CT model. Table 5.2 illustrates the twelve elements, the corresponding explanations and the episodes from the participants’ CT definitions.

Table 5.2

*Elements of CT Identified in the Participants’ Definitions for CT*

<table>
<thead>
<tr>
<th>Elements</th>
<th>Explanation (Paul &amp; Elder, 2001)</th>
<th>Examples (episodes from the participants’ definitions for CT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breadth</td>
<td>Encompassing multiple viewpoints, comprehensive in view, wide-ranging and broadminded in perspective.</td>
<td>Thinking things from many aspects; To think in different perspectives; Think from different sides; Think about one thing from different points of view.</td>
</tr>
<tr>
<td>Depth</td>
<td>Containing complexities and multiple interrelationships, implying thoroughness in thinking.</td>
<td>Don’t think it simply; Understand the matters more completely; Don’t think a thing is totally wrong or right.</td>
</tr>
<tr>
<td>Logic</td>
<td>The parts make sense together, without contradictions; in keeping with the principles of sound judgement and reasonability.</td>
<td>To think over a problem logically.</td>
</tr>
<tr>
<td>Fairness</td>
<td>Free from bias, dishonesty, favoritism, selfish-interest, deception or injustice.</td>
<td>Think about things objectively; Not relying on personal emotion; Thinking in an objective way.</td>
</tr>
<tr>
<td>Elements</td>
<td>Explanation (Paul &amp; Elder, 2001)</td>
<td>Examples (episodes from the participants’ definitions for CT)</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Intellectual autonomy</td>
<td>Being an independent thinker.</td>
<td>Thinking independently; Don’t follow other’s step; Do not always believe in everything the teacher tells you; Have your own opinion.</td>
</tr>
<tr>
<td>Intellectual courage</td>
<td>Being willing to challenge beliefs.</td>
<td>Be brave to doubt the authority; Express our opinions bravely; Break traditional thoughts.</td>
</tr>
<tr>
<td>Intellectual humility</td>
<td>Having a consciousness of the limits of one’s knowledge.</td>
<td>Willing to accept different ideas.</td>
</tr>
<tr>
<td>Intellectual empathy</td>
<td>Entering opposing views.</td>
<td>Think on the other side.</td>
</tr>
<tr>
<td>Confidence in reason</td>
<td>Recognizing that good reasoning has proven its worth.</td>
<td>Reason; Take the best of the advantages and change the disadvantages to develop ourselves.</td>
</tr>
<tr>
<td>Self-reflection</td>
<td>/</td>
<td>To think whether our learning ways or habits are good or bad; Check myself.</td>
</tr>
<tr>
<td>Creativity</td>
<td>/</td>
<td>People who think critically are creative.</td>
</tr>
<tr>
<td>Intelligence</td>
<td>/</td>
<td>Intelligence.</td>
</tr>
</tbody>
</table>

With twelve elements identified in the participants’ definitions for CT, the two groups as a whole seemed to have a certain degree of knowledge concerning the concept of CT. In fact, a great number of the participants could only identify one or two elements. In the experimental group, for example, half of the participants defined CT by using only one CT element and none of them defined CT by using more than three elements. In addition, most of them illustrated an obvious tendency of defining CT as such elements like breadth and intellectual autonomy (Table 5.3). Specifically, about 70% (73.8%) of the definitions entailed the element of breadth. And about one third (33.3%) of them included the element of intellectual autonomy. For example, some participants defined CT as “thinking from different points of view” or “having your own opinion”.
Table 5.3

The Distribution of the CT Elements in the Participants’ Definitions of CT

<table>
<thead>
<tr>
<th>CT Elements</th>
<th>Experimental group (n=22)</th>
<th>Control group (n=20)</th>
<th>All (n=42)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Breadth</td>
<td>17</td>
<td>77.3</td>
<td>14</td>
</tr>
<tr>
<td>Intellectual autonomy</td>
<td>7</td>
<td>31.8</td>
<td>7</td>
</tr>
<tr>
<td>Intellectual courage</td>
<td>6</td>
<td>27.3</td>
<td>/</td>
</tr>
<tr>
<td>Depth</td>
<td>0</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Fairness</td>
<td>2</td>
<td>9.1</td>
<td>3</td>
</tr>
<tr>
<td>Logic</td>
<td>2</td>
<td>9.1</td>
<td>3</td>
</tr>
<tr>
<td>Confidence in reason</td>
<td>/</td>
<td>/</td>
<td>4</td>
</tr>
<tr>
<td>Self-reflection</td>
<td>/</td>
<td>/</td>
<td>2</td>
</tr>
<tr>
<td>Intellectual humility</td>
<td>/</td>
<td>/</td>
<td>1</td>
</tr>
<tr>
<td>Intellectual empathy</td>
<td>/</td>
<td>/</td>
<td>1</td>
</tr>
<tr>
<td>Creativity</td>
<td>/</td>
<td>/</td>
<td>1</td>
</tr>
<tr>
<td>Intelligence</td>
<td>/</td>
<td>/</td>
<td>1</td>
</tr>
</tbody>
</table>

The analysis of the participants’ definitions for CT indicates that their understanding of CT was very limited, although they were able to identify some important features of CT. Equaling CT to a wider perspective in thinking or independent thinking, the participants were actually viewing CT only at the surface level. In fact, without a systematic instruction on CT, it might be impossible for the participants to present a holistic understanding of CT at the pre-study stage.

5.2 Participants’ levels of CT and L2 writing abilities

Four items were designed to identify the participants’ levels of CT and L2 writing abilities. Based on Paul and Elder’s (2001) “elements of thought” and “intellectual standards”, two five-point scale items were designed to explore the participants’ ability of thinking through the CT elements as well as their ability of applying CT standards to L2 writing. Besides, the participants
were also required to provide their English writing scores in national or international English proficiency tests, and to make a self-evaluation of their English writing proficiency.

5.2.1 Participants’ ability of thinking through the CT elements in L2 writing

Item 6 was designed to find out the participants’ ability of thinking through the eight key CT elements in the process of L2 writing. Explaining that there were several elements being involved in the planning of the first draft for a writing task, I listed the eight elements in Item 6 and asked the participants to evaluate the degree of difficulty concerning each element. It was a five-point scale item, from “very easy” to “very difficult”. The participants were allowed to choose “do not understand” if they had any difficulty understanding certain elements. The results of this item, as shown in Table 5.4, indicate that the degree of difficulty varies in terms of the participants’ understanding of different CT elements. To begin with, there seemed to be no extremely easy or extremely difficult elements for the participants. Actually, few participants (no more than two) chose “very easy” or “very difficult” for any of the elements. However, two of the eight CT elements seemed to be comparatively easy for the participants. The first one was purpose. Almost 60% of the participants (n=26, 59.1%) considered it to be easy to “identify the purpose of a writing task”. Another element that seemed to be easy for the participants was information, with almost half (43.2%) of the participants choosing “easy” for “gathering information”. Nevertheless, not many elements were evaluated to be “difficult”, because for many of the other elements, such as question at issue, concepts, interpretation and inference and implications and consequences, the majority of the participants chose “neither easy nor difficult”. Actually, the most difficult one turned out to be point of view. Nineteen participants (43.2%) considered it “difficult” to “consider multiple viewpoints”. Another comparatively difficult one was concept. About one third of the participants (n=14, 31.8%) considered it to be difficult to
“clarify key concepts”. For some elements, although the majority of participants consider them as neither easy nor difficult, a certain number of participants showed their uncertainties by choosing “do not understand”. For example, almost one fifth of the participants (n=8, 18.2%) were uncertain about assumptions, and 13.6% (n=6) of the participants indicated that they did not understand interpretation and inference.

Table 5.4

**Participants’ Answers to Item Six: Self Evaluation of the Ability to Think Through the CT**

**Elements in L2 Writing**

<table>
<thead>
<tr>
<th></th>
<th>Very easy</th>
<th>Easy</th>
<th>Neither easy or difficult</th>
<th>Difficult</th>
<th>Very difficult</th>
<th>Do not understand</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
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<td>Purpose</td>
<td>E</td>
<td>2</td>
<td>9.1</td>
<td>10</td>
<td>45.5</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>1</td>
<td>4.5</td>
<td>16</td>
<td>72.7</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>T</td>
<td>3</td>
<td>6.8</td>
<td>26</td>
<td>59.1</td>
<td>10</td>
</tr>
<tr>
<td>Question at issue</td>
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<td>0</td>
<td>0</td>
<td>3</td>
<td>13.6</td>
<td>13</td>
</tr>
<tr>
<td></td>
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<td>0</td>
<td>0</td>
<td>10</td>
<td>45.5</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>T</td>
<td>0</td>
<td>0</td>
<td>13</td>
<td>29.5</td>
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<td>Concepts</td>
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<td>0</td>
<td>4</td>
<td>18.2</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>1</td>
<td>4.5</td>
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<td>18.2</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>T</td>
<td>1</td>
<td>2.3</td>
<td>8</td>
<td>18.2</td>
<td>19</td>
</tr>
<tr>
<td>Point of view</td>
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<td>5</td>
<td>22.7</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>C</td>
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<td>0</td>
<td>0</td>
<td>9</td>
<td>20.5</td>
<td>13</td>
</tr>
<tr>
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<td>4.5</td>
<td>1</td>
<td>4.5</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>C</td>
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<td>4.5</td>
<td>2</td>
<td>9.1</td>
<td>9</td>
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<td></td>
<td>T</td>
<td>2</td>
<td>4.5</td>
<td>3</td>
<td>6.8</td>
<td>18</td>
</tr>
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<td>Information</td>
<td>E</td>
<td>0</td>
<td>0</td>
<td>13</td>
<td>59.1</td>
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<td>0</td>
<td>6</td>
<td>27.3</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>T</td>
<td>0</td>
<td>0</td>
<td>19</td>
<td>43.2</td>
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<td>Interpretation and Inference</td>
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<td>0</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td></td>
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<td>1</td>
<td>4.5</td>
<td>1</td>
<td>4.5</td>
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</tr>
<tr>
<td></td>
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<td>1</td>
<td>2.3</td>
<td>1</td>
<td>2.3</td>
<td>25</td>
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<td>Implications and consequences</td>
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<td>0</td>
<td>0</td>
<td>4</td>
<td>18.2</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>9.1</td>
<td>14</td>
</tr>
<tr>
<td></td>
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<td>0</td>
<td>6</td>
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<td>20</td>
</tr>
</tbody>
</table>

*Note. E=Experimental group (n=22); C=Control group (n=22); T=Total (n=44).*
As these elements were rephrased as activities involved in English writing, many participants, as far as I assume, evaluated the level of difficulty of these elements according to their level of familiarity with the corresponding activities in their English writing class. That might be the reason why some CT elements, such as point of view and assumption, were not easy for them. The finding suggests that more activities should be designed for practicing such skills as considering multiple viewpoints, or identifying assumptions. In addition, as some participants chose “do not understand” for some of the CT elements, special attention should be paid to presenting examples or designing exercises when teaching these elements during the study.

5.2.2 Participants’ ability of applying the CT standards to L2 writing

Item 7 required the participants to make a self-evaluation of their CT performance in their English writing based on the given criteria. Again, the self-evaluation was based on a five-point scale from “very good” to “very poor”, and the participants were allowed to choose “do not understand” when they felt uncertain about the meaning of certain items. The results are presented in Table 5.5. According to the results, the participants tended to evaluate themselves as performing “averagely” in terms of all the criteria. More than 40% (from 40.9% to 63.6% in terms of different criteria) of the participants chose “average” for their performance of CT in their English writing. Few participants chose “very good” or “very poor”. A larger number of the participants considered themselves as performing poorly in such aspects as clarity, precision, relevance, depth and breadth than those who thought their performance could be evaluated as “good”. For logic and significance, however, more participants thought their performance was “good” rather than “poor”. Almost an equal number of participants chose “good” and “poor” for their performance in accuracy and fairness. As the participants had not received any formal instruction on these intellectual standards before the study, the results of their self-evaluation
were inconclusive indication of their actual CT abilities in terms of these standards. However, special attention should be given in the process of instruction and assessment to those aspects in which the majority of the participants considered themselves as performing poorly.

Table 5.5

Participants’ Answers to Item Seven: Self-Evaluation of the CT Performance in L2 Writing

<table>
<thead>
<tr>
<th></th>
<th>Very good</th>
<th>Good</th>
<th>Average</th>
<th>Poor</th>
<th>Very poor</th>
<th>Do not understand</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Clarity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>7</td>
<td>31.8</td>
</tr>
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<td>0</td>
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<td>13.6</td>
<td>15</td>
<td>68.2</td>
</tr>
<tr>
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<td>0</td>
<td>6</td>
<td>13.6</td>
<td>22</td>
<td>50</td>
</tr>
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<td>Accuracy</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>45.5</td>
</tr>
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<td>0</td>
<td>4</td>
<td>18.2</td>
<td>11</td>
<td>50</td>
</tr>
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</tr>
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<td></td>
<td></td>
<td></td>
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<td>14</td>
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</tr>
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<td>7</td>
<td>31.8</td>
</tr>
<tr>
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<td>0</td>
<td>8</td>
<td>18.2</td>
<td>21</td>
<td>47.7</td>
</tr>
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<td>11</td>
<td>50</td>
</tr>
<tr>
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<td>18.2</td>
<td>21</td>
<td>47.7</td>
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<tr>
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<td>13.6</td>
<td>10</td>
<td>45.5</td>
</tr>
<tr>
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<td></td>
</tr>
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<td>0</td>
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<td>13.6</td>
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<td>50</td>
</tr>
<tr>
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<td>0</td>
<td>13</td>
<td>59.1</td>
</tr>
<tr>
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<td>3</td>
<td>6.8</td>
<td>24</td>
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</tr>
<tr>
<td>Logic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
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<td>0</td>
<td>6</td>
<td>27.3</td>
<td>13</td>
<td>59.1</td>
</tr>
<tr>
<td>C</td>
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<td>3</td>
<td>13.6</td>
<td>15</td>
<td>68.2</td>
</tr>
<tr>
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<td>2.3</td>
<td>9</td>
<td>20.5</td>
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<td>63.6</td>
</tr>
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<td></td>
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<td>0</td>
<td>0</td>
<td>6</td>
<td>27.3</td>
<td>12</td>
<td>54.5</td>
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<tr>
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<td>0</td>
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<td>18.2</td>
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<td>63.6</td>
</tr>
<tr>
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<td>0</td>
<td>10</td>
<td>22.7</td>
<td>26</td>
<td>59.1</td>
</tr>
<tr>
<td>Fairness</td>
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<td>0</td>
<td>5</td>
<td>22.7</td>
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<td>40.9</td>
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<tr>
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<td>4.5</td>
<td>6</td>
<td>27.3</td>
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<td>40.9</td>
</tr>
<tr>
<td>T</td>
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<td>2.3</td>
<td>11</td>
<td>25.0</td>
<td>18</td>
<td>40.9</td>
</tr>
</tbody>
</table>

Note. E=Experimental group (n=22); C=Control group (n=22); T=Total (n=44).
5.2.3 Participants’ L2 writing proficiency

The next two items were designed to explore the participants’ level of English writing proficiency. Item 8 required the participants to provide their writing scores in any standard tests (such as College Entrance Exam, TOEFL, IELTS, etc.). Item 9 required the participants to provide a self-evaluation of their English writing proficiency.

Due to the fact that none of the participants had ever taken any tests such as TOEFL, IELTS or the Tests for English Majors (TEM), all the participants only provided their scores for College Entrance Exam on English. As indicated by the participants, they only knew their total score of the English test rather than the sub-score of the writing section. Therefore, they were allowed to provide the total score instead of the writing score for this item. According to the result, the mean scores turned out to be quite similar between the two groups, with a mean of 127.41 (SD=7.307) for the experimental group and 127.00 (SD=8.165) for the control group (the full score of the English exam was 150). It is not surprising that the participants got quite high marks in their English exams during the College Entrance Exam, because they were English majors and their English scores had been one of the key criteria for evaluating their eligibility of being admitted into the English department.

However, when it came to a more specific assessment of their English writing proficiency, the participants did not show much confidence, as none of the participants considered their English writing proficiency as being above average. As shown in Table 5.6, 63.6% (n=28) of all the participants evaluated their English writing proficiency as being at the “average” level, and 34.1% (n=15) of the participants assessed their level of English writing proficiency as “poor”. One participant in the control group chose “very poor”. Their lack of confidence in English writing proficiency, on one hand, might be due to a showing of modesty; and on the other hand,
lied in the possibility that writing was more difficult for them, compared to other English language skills.

Table 5.6

The Participants’ Self-evaluation of Their English Writing Proficiency

<table>
<thead>
<tr>
<th></th>
<th>Experimental group</th>
<th>Control group</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Very good</td>
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</tr>
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</tr>
<tr>
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<td>16</td>
<td>72.7</td>
<td>12</td>
</tr>
<tr>
<td>Poor</td>
<td>6</td>
<td>27.3</td>
<td>9</td>
</tr>
<tr>
<td>Very poor</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
<td>100</td>
<td>22</td>
</tr>
</tbody>
</table>

5.3 Participants’ pre-study English writing course

Although the participating instructor mentioned that he was not explicitly teaching CT in his English writing course, the participants might have been trained in their thinking skills through their participation in some in-class thought-provoking activities such as brainstorming, debating, or peer-review. Item 10 in the questionnaire was designed to explore the types of thought-provoking activities frequently organized in the participants’ English writing course before the study.

A series of pre-writing and post-writing activities were listed for the participants to identify the ones that were frequently organized in their English writing class. The participants were allowed to choose more than one activity and were also allowed to give examples of other pre-writing and post-writing activities that were regularly organized in their English writing class but not listed in the questionnaire.

For pre-writing activities, as shown in Table 5.7, 40.9% of the participants chose “brainstorming” and 47.7% chose “debating”. Interestingly, 13.6% of the participants thought neither of these activities was organized in their English writing class. Three participants also
indicated that there were other pre-writing activities such as “writing outlines” and “watching news”. For post-writing activities, 81.8% of the participants indicated that they were required to do “self review”, and only one fifth of the participants (n=9, 20.5%) chose “peer review”. Three participants from the control group thought neither of these post-writing activities was organized in their English writing class.

Table 5.7

*Pre-writing and Post-writing Activities in Participants’ Pre-study English Writing Class*

<table>
<thead>
<tr>
<th></th>
<th>Experimental group</th>
<th>Control group</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td><strong>Pre-writing activities</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brainstorming</td>
<td>14</td>
<td>63.6</td>
<td>4</td>
</tr>
<tr>
<td>Debating</td>
<td>7</td>
<td>31.8</td>
<td>14</td>
</tr>
<tr>
<td>Neither</td>
<td>1</td>
<td>4.5</td>
<td>5</td>
</tr>
<tr>
<td><strong>Post-writing activities</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self review</td>
<td>17</td>
<td>77.3</td>
<td>19</td>
</tr>
<tr>
<td>Peer review</td>
<td>4</td>
<td>18.2</td>
<td>5</td>
</tr>
<tr>
<td>Neither</td>
<td>3</td>
<td>13.6</td>
<td>0</td>
</tr>
</tbody>
</table>

It can be inferred from the results that all these activities had been organized in the participants’ English writing class, but not necessarily in a regular manner. Participants of the two groups shared similar opinions towards the post-writing activities, as the majority of both groups (77.3% of the experimental group and 86.4% of the control group) chose “self review”. However, there were some discrepancies in the choices made by the two groups in terms of pre-writing activities. For example, the majority of participants in the experimental group chose “brainstorming” while the majority of participants in the control group chose “debating”. Such discrepancy indicates that the participants had a different perception of the activities organized in their English writing class since they had the same instructor and had been taking the course together in the same classroom. Another possibility could be that these activities were not
frequently organized in their English writing class. Therefore, the participants provided different answers based on their understanding of “frequently organized activities”.

5.4 Participants’ perception of the relationship between CT and L2 writing

The last item in the questionnaire was designed to explore the participants’ perception of the relationship between CT and L2 writing. Instead of being required to describe the relationship in their own words, which might have been too difficult for them at the pre-study stage, they were given some options to choose from. According to their choices, more than 90% of the participants (n=41, 93.2%) considered that there was a positive relationship between CT and L2 writing (Table 5.8). In fact, no one marked the relationship as “negative”, although one of the participants from the experimental group considered that CT and L2 writing were not related, and one from each group admitted that they did not know. This result shows participants’ positive attitudes towards not only their understanding of the relationship between CT and L2 writing, but also their learning of CT in English writing.

Table 5.8

<table>
<thead>
<tr>
<th></th>
<th>Experimental group</th>
<th>Control group</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Positive</td>
<td>20</td>
<td>90.9</td>
<td>21</td>
</tr>
<tr>
<td>Negative</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>No relation</td>
<td>1</td>
<td>4.5</td>
<td>0</td>
</tr>
<tr>
<td>I don't know</td>
<td>1</td>
<td>4.5</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
<td>100</td>
<td>22</td>
</tr>
</tbody>
</table>

5.5 Summary

All together 11 items were designed in the pre-study questionnaire to explore the answer to the first research question which concerns the participants’ perceptions of CT and its connection to L2 writing. The analysis of the participants’ answers to these 11 items provided an overview
of their knowledge of CT as well as their levels of CT and English writing abilities, their pre-study English writing course, and finally, their perception of the relationship between CT and English writing.

First of all, the results show that CT is not a new term for the participants, who have, however, an in comprehensible understanding of the concept due to a lack of formal and explicit training. Although all the participants indicated that they had heard about the term “critical thinking”, the majority of the participants admitted that they had just heard about the term “sometimes”, which means that CT was not being frequently discussed in their classroom context. This lack of formal training or instruction on CT was further verified by the participants’ answers to the question that inquired about their experience of formal CT instruction, which turned out that more than half of them said they had never received any formal CT instruction.

The participants’ lack of a comprehensive understanding of CT was revealed from several aspects. Although the majority of the participants were sensitive enough to have chosen a more preferable translation for CT (si bian neng li), they showed the tendency of equating CT to presenting multiple viewpoints and being able to think independently when they were required to define CT in their own words. Despite the fact that some other important “intellectual standards” such as depth, logic, fairness, and some “intellectual traits” such as intellectual courage, intellectual humility were also identified in some of the participants’ definitions for CT, none of them had successfully included them all in their definitions. Indeed, it would be impossible for them to do so without an explicit and systematic training of CT. And it could be inferred from the survey results that there were not many frequently organized CT activities to specifically train the participants’ thinking skills in their English writing course before the study.
In addition, as revealed from the questionnaire, the participants’ levels of understanding and performing CT were about average, or even below average. As shown from the results, the majority of the participants did not feel it easy to understand the key CT elements, nor did they evaluate their performance of CT as better than average according to the nine “intellectual standards”. Moreover, the result indicates that some CT elements (such as assumptions or interpretation and inference) and some intellectual standards (such as clarity, precision, relevance, depth and breadth) may be more difficult than others for the participants and thus require particular attention in actual teaching.

Furthermore, despite an averagely high English score of their College Entrance Exam, the participants did not present much confidence when it came to the self-evaluation of their English writing proficiency. In fact, almost one third of the participants evaluated their English writing proficiency as “poor”. Apart from the possibility that they gave their answers out of modesty, it might be true that English writing was considered as really challenging by these participants. It thus requires further exploration of the participants’ writing proficiency based on their writing products, and the identification of the difficulties that lie in the process of their writing in English.

In spite of the participants’ limited knowledge of CT, they expressed a strong belief that CT could help them to improve almost all the aspects of English learning. Although not all the participants believed that they would benefit most from CT in their English writing, they tended to be quite optimistic towards the relationship between CT and English writing in that almost all the participants considered that there was a positive relationship between them.

All in all, the results of the pre-study questionnaire survey generate important information in terms of the participants’ knowledge of CT and their perception of its connection to English writing, which reveal the necessity of (1) providing well-designed, explicit and systematic CT
instruction that could be naturally infused in an English writing course; (2) conducting effective evaluation of students’ CT as revealed in their English writing to identify the effectiveness of such instruction on improving both their CT skills and English writing proficiency.
Chapter 6. Improvement in CT and L2 writing scores: Findings and discussion for Research Question Two

This chapter reports and discusses the findings for the second research question, which aims to identify whether a CT-oriented L2 writing approach helps to improve students’ CT and L2 writing scores. Descriptive statistics are presented to illustrate an overview of the pre-test and post-test CT and L2 writing scores, including both the total scores and sub-scores. A series of measurements were conducted to examine the effectiveness of the CT-oriented L2 writing approach and the relationship between the participants’ CT and L2 writing scores. First of all, an ANOVA analysis was conducted to compare the post-test CT and L2 writing scores of the two groups. Then, a Pearson correlation analysis was conducted to examine the relationship between the CT and L2 writing scores.

6.1 Improvement in CT scores

First of all, the participants’ CT scores were analyzed to investigate whether the participants in the experimental group had achieved significant improvement in their CT after following the CT-oriented L2 writing approach. The descriptive statistics of the two groups’ pre-test and post-test CT scores as well as the result of the ANOVA analysis are presented in this section.

6.1.1 Descriptive statistics: CT scores

Descriptive statistics of the participants’ pre-test and post-test CT scores and sub-scores are presented in the following tables (Table 6.1 and Table 6.2). The participants’ pre-test and post-test CT scores were rated based on the “criteria for evaluating CT in L2 writing”, which was a nine-dimensional five-point band scale that I developed for the study. Illustrating an overview of the final results, Table 6.1 presents the means (M) and standard deviations (SD) of the participants’ pre-test and post-test CT scores. The results show that the mean CT scores were
similar between the two groups before the study (M=2.58, SD=0.29 for the experimental group; M=2.69, SD=0.25 for the control group). For both groups, the mean CT scores for the pre-test were at a relatively low level (under a score of 3 on the 5-point CT band scale). This implies that students in both groups were under an average level concerning their CT ability before the study.

The post-test CT scores, as presented in Table 6.1, show an increase in both groups, compared to their pre-test CT scores. However, the mean post-test CT score of the experimental group (M=3.64; SD=0.50) was higher than the mean score of the control group (M=2.90; SD=0.28). As interpreted by the 5-point CT band scale, a mean score of 3.64 is above the average level and approaching the level of “good”. Meanwhile, their peers in the control group have remained at an under-average level with a score of 2.90.

Table 6.1

*Descriptive Statistics of the Participants' Pre-test and Post-test CT Scores*

<table>
<thead>
<tr>
<th></th>
<th>Pre-test</th>
<th>Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>Control</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>SD</td>
<td>SD</td>
<td>SD</td>
</tr>
<tr>
<td>2.58</td>
<td>2.69</td>
<td>3.64</td>
</tr>
<tr>
<td>0.29</td>
<td>0.25</td>
<td>0.50</td>
</tr>
</tbody>
</table>

As a CT score is an average score of nine sub-scores for *clarity, accuracy, precision, relevance, depth, breadth, logic, significance* and *fairness*, it is also important to investigate the pre-test and post-test CT sub-scores. As shown in Table 6.2 that presents the means (M) and standard deviations (SD) for pre-test and post-test CT sub-scores, the mean pre-test CT sub-scores of the control group were a little higher than that of the experimental group in almost all the sub-categories, except *clarity* and *fairness*, although the two groups were at a similar level. Despite CT sub-scores for *fairness*, which were exactly the same for both groups at 3.25, all the other eight CT sub-scores of both groups were under the average level of 3. As to the post-test CT sub-scores, the students in the experimental group achieved above-average level scores for
all the nine CT sub-categories. While the post-test CT sub-scores of the control group were all lower than those of their peers in the experimental group and were at an under-average level for six out of nine sub-categories.

Table 6.2

*Descriptive Statistics of the Participants’ Pre-test and Post-test CT Sub-scores*

<table>
<thead>
<tr>
<th>CT standards: Sub-categories</th>
<th>Pre-test Experimental group</th>
<th>Pre-test Control group</th>
<th>Post-test Experimental group</th>
<th>Post-test Control group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Clarity</td>
<td>2.55</td>
<td>0.47</td>
<td>2.50</td>
<td>0.37</td>
</tr>
<tr>
<td>Accuracy</td>
<td>2.47</td>
<td>0.40</td>
<td>2.58</td>
<td>0.35</td>
</tr>
<tr>
<td>Precision</td>
<td>2.26</td>
<td>0.34</td>
<td>2.34</td>
<td>0.29</td>
</tr>
<tr>
<td>Relevance</td>
<td>2.63</td>
<td>0.41</td>
<td>2.66</td>
<td>0.37</td>
</tr>
<tr>
<td>Depth</td>
<td>2.44</td>
<td>0.43</td>
<td>2.61</td>
<td>0.32</td>
</tr>
<tr>
<td>Breadth</td>
<td>2.49</td>
<td>0.36</td>
<td>2.75</td>
<td>0.35</td>
</tr>
<tr>
<td>Logic</td>
<td>2.50</td>
<td>0.39</td>
<td>2.72</td>
<td>0.34</td>
</tr>
<tr>
<td>Significance</td>
<td>2.63</td>
<td>0.41</td>
<td>2.77</td>
<td>0.35</td>
</tr>
<tr>
<td>Fairness</td>
<td>3.25</td>
<td>0.39</td>
<td>3.25</td>
<td>0.39</td>
</tr>
</tbody>
</table>

**6.1.2 Result of ANOVA analysis: CT scores**

As there was no significant difference between the pre-test CT scores of the two groups, an ANOVA analysis was conducted to compare the post-test CT scores of the two groups. Table 6.3 illustrates the result of one-way ANOVA analysis for the participants’ CT scores. As revealed from the result, there was a statistically significant difference \(F(1, 42) = 37.069, p < .01\) between the post-test CT scores of the experimental group and the control group. The result indicates that students in the experimental group performed better in their CT than students in the control group after following the CT-oriented L2 writing approach.
Table 6.3

Result of ANOVA Analysis (CT)

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>5.994</td>
<td>1</td>
<td>5.994</td>
<td>37.069</td>
<td>.000</td>
</tr>
<tr>
<td>Within groups</td>
<td>6.791</td>
<td>42</td>
<td>.162</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>12.785</td>
<td>43</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6.2 Improvement in L2 writing scores

Besides the analysis of the participants’ CT scores, the participants’ L2 writing scores were also analyzed to investigate whether the participants in the experimental group had achieved significant improvement in their L2 writing after following the CT-oriented L2 writing approach. The descriptive statistics of the two groups’ pre-test and post-test L2 writing scores as well as the result of the ANOVA analysis are presented in this section.

6.2.1 Descriptive statistics: L2 writing scores

Descriptive statistics of the pre-test and post-test L2 writing scores of both the experimental group and the control group are presented in the following tables (Table 6.4 and Table 6.5). The participants’ pre-test and post-test L2 writing scores were rated based on “IELTS Writing Task 2 Band Descriptors” (n.d., Appendix C), which is a four-dimensional nine-point band scale. Presenting an overview of the final results, Table 6.4 illustrates the means (M) and standard deviations (SD) of the participants’ pre-test and post-test L2 writing scores. The results show that the mean L2 writing scores were similar between the two groups before the study. Both their pre-test L2 writing scores were at a similar level around 5. The mean pre-test writing score of students in the experimental group was 5.00 (SD=0.49), while the score of their peers in the control group was 5.16 (SD=0.54). According to the 9-point IELTS band scale, a score at the fifth level means a “modest user” who is able to manage basic communication, but has only a partial command of the language (“Understand how to calculate your IELTS scores”, 2014).
Regarding the post-test L2 writing scores, the result in Table 6.4 indicates an increase in both groups, compared to their pre-test L2 writing scores. However, the mean post-test L2 writing score of the experimental group (M=6.07, SD=0.58) was higher than the score of the control group (M=5.52, SD=0.57). In addition, the students in the experimental group achieved a mean score over 6. As interpreted by the 9-point IELTS band scale, their post-test L2 writing ability was up to the “competent user” (“Understand how to calculate your IELTS scores”, 2014) and was able to show generally effective command of the language in writing. Meanwhile, their peers in the control group remained at a lower level under 6.

Table 6.4

*Descriptive Statistics of the Participants’ Pre-test and Post-test L2 Writing Scores*

<table>
<thead>
<tr>
<th></th>
<th>Pre-test</th>
<th>Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Experimental group</td>
<td>Control group</td>
</tr>
<tr>
<td>M</td>
<td>6.07</td>
<td>5.52</td>
</tr>
<tr>
<td>SD</td>
<td>0.58</td>
<td>0.57</td>
</tr>
</tbody>
</table>

According to “IELTS Writing Task 2 Band Descriptors” (n.d., Appendix C), students’ essays were rated from four dimensions: *task response, coherence and cohesion, lexical resource, grammatical range and accuracy*. Table 6.5 presents the means and standard deviations of the pre-test and post-test L2 writing sub-scores. The sub-scores of the control group for the pre-test were a little higher than those of the experimental group in all the four dimensions, although the two groups were at a similar level. As to post-test L2 writing sub-scores, students in the experimental group went above the sixth level for all the four sub-categories. While the post-test writing sub-scores of the control group were all lower than those of their peers in the experimental group and were all under the sixth level.
Table 6.5

*Descriptive Statistics of the Participants’ Pre-test and Post-test L2 Writing Sub-scores*

<table>
<thead>
<tr>
<th>Writing standards: Sub-categories</th>
<th>Pre-test</th>
<th>Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Experimental group</td>
<td>Control group</td>
</tr>
<tr>
<td>Task response</td>
<td>M (5.01)</td>
<td>SD (0.40)</td>
</tr>
<tr>
<td>Coherence and Cohesion</td>
<td>M (4.98)</td>
<td>SD (0.57)</td>
</tr>
<tr>
<td>Lexical resource</td>
<td>M (5.07)</td>
<td>SD (0.54)</td>
</tr>
<tr>
<td>Grammatical range and accuracy</td>
<td>M (4.93)</td>
<td>SD (0.58)</td>
</tr>
</tbody>
</table>

6.2.2 Result of ANOVA analysis: L2 writing scores

As there was no significant difference between the pre-test L2 writing scores of the two groups, an ANOVA analysis was conducted to identify the difference between the experimental group and the control group in their post-test L2 writing scores. As shown in Table 6.6, there was a statistically significant difference ($F_{(1, 42)}=9.899, p<.01$) between the post-test L2 writing scores of the experimental group and the control group. The result indicates that the experimental group achieved a higher L2 writing score than the control group after following the CT-oriented L2 writing approach.

Table 6.6

*Result of ANOVA Analysis (L2 Writing)*

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>3.273</td>
<td>1</td>
<td>3.273</td>
<td>9.899</td>
<td>.003</td>
</tr>
<tr>
<td>Within groups</td>
<td>13.886</td>
<td>42</td>
<td>.331</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>17.159</td>
<td>43</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.3 Relationship between CT and L2 writing scores

As shown in the results of the previous statistical measurements, the participants in the experimental group achieved significant improvement in both their CT and L2 writing scores after following the CT-oriented L2 writing approach. To enhance the understanding of the relationship between CT and L2 writing, it requires a further investigation of the correlation between the participants’ CT and L2 writing scores. Therefore, a Pearson correlation analysis was conducted to examine this relationship. As shown in Table 6.7, there was a significant high positive relationship \( (r=0.89, p<.01) \) between the participants’ CT and L2 writing scores.

Table 6.7

The Correlation Between the Participants’ CT and L2 Writing Scores

<table>
<thead>
<tr>
<th></th>
<th>Post-test writing score</th>
<th>Post-test CT score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Post-test writing score</strong></td>
<td>Pearson Correlation 1</td>
<td>( .893^{**} )</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed) .000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N 44</td>
<td>44</td>
</tr>
<tr>
<td><strong>Post-test CT score</strong></td>
<td>Pearson Correlation .893^{**}</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed) .000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N 44</td>
<td>44</td>
</tr>
</tbody>
</table>

\(^{**}\). Correlation is significant at the 0.01 level (2-tailed).

Although it is pervasively assumed by CT or L2 writing researchers that there are reciprocal effects between CT and L2 writing so that they show positive effects on each other when they are taught together, seldom has there been any statistical analyses to investigate this correlation between CT and L2 writing, due to the fact that CT is rarely evaluated by such clearly defined band scales. Therefore, this result is significantly important to this study for confirming this assumption and for explaining why the experimental group’s L2 writing improved significantly when CT was infused in their writing process.
6.4 Summary

A series of statistical measurements were conducted to investigate whether the CT-oriented L2 writing approach helped to improve students’ CT and L2 writing scores and to examine the relationship between the CT and L2 writing scores. First of all, the result of the ANOVA analysis shows that the experimental group performed significantly better than the control group in their post-test CT score ($F_{(1, 42)}=37.069, p<.01$) after following the CT-oriented L2 writing approach. In addition, the experimental group also showed improvement in all the nine post-test CT sub-scores (for clarity, accuracy, precision, relevance, depth, breadth, logic, significance and fairness), which means that when explicit CT instruction was provided with all the important elements and standards infused in the learning process, students tended to achieve a balanced and comprehensive improvement in their CT skills.

Besides, the result of the ANOVA analysis for L2 writing scores shows that the experimental group performed significantly better than the control group in their post-test L2 writing score ($F_{(1, 42)}=9.899, p<.01$) after following the CT-oriented L2 writing approach. In addition, the experimental group also showed improvement in all the four L2 writing sub-scores (for task response, coherence and cohesion, lexical resource, grammatical range and accuracy). While the students in the experimental group moved from a “modest user” level to a “competent user” level of L2 writing competency after the study, their peers in the control group still remained at the “modest user” level, despite a certain degree of increase in their post-test L2 writing scores.

Furthermore, a significant high positive relationship ($r=0.89, p<.01$) was found between the participants’ CT scores and L2 writing scores, suggesting reciprocal effects between CT and L2 writing. The positive connection between CT and writing implies the importance and necessity
of infusing the instruction of CT into L2 writing instruction. The present findings serve as powerful evidence of why enhancing students’ CT skills can lead to an improvement of their L2 writing skills. The significant improvements in CT and L2 writing scores of students in the experimental group lead to further explorations in the next chapter of the roles of the CT-oriented L2 writing approach in the process of students’ learning of CT and L2 writing.
Chapter 7. Effects on the learning of CT and L2 writing: Findings and discussion for Research Question Three

This chapter reports and discusses the findings for the third research question, which aims to explore how the CT-oriented L2 writing approach, particularly the CT-oriented brainstorming and peer review, has led to such significant improvement in the experimental group’s CT and L2 writing scores as reported in the previous chapter. The exploration of the effects of the CT-oriented L2 writing approach that used in the study also contributes to an enhanced understanding of the learning and teaching of CT in L2 writing. To answer the research question, I first analyzed the post-study interview to identify the participants’ experience of following the CT-oriented approach versus the traditional approach, and then examined the participants’ essay drafts and relevant worksheets to identify further textual evidence related to the participants’ learning of CT and L2 writing.

7.1 Effects on the learning of CT

Following the CT-oriented L2 writing approach, the participants in the experimental group were not only provided with an explicit instruction on CT, but also given opportunities to practice using CT in carefully designed CT-oriented brainstorming and peer review activities during their writing process. Almost all the interviewees from the experimental group (five out of six) admitted that they achieved a different understanding of CT after the study. The differences, as they reported, mainly lied in two aspects. Firstly, they indicated that they had changed from a rather unilateral understanding to a more comprehensive understanding of CT. Different from considering CT as being “critical” or “being able to think from the opposite perspective” as they did before the study, Eric (M), Emma (M), Eva (M) and Edward (L) mentioned that they had a much broadened view of CT along with the knowledge of the essential
elements involved in CT and the standards to evaluate CT. Emma (M) also mentioned about her understanding of CT dispositions by indicating that CT had to be used actively rather than passively so as to cultivate an appropriate attitude to using CT. Secondly, the interviewees, such as Eric (M), Emma (M), and Edward (L), thought they had gained more confidence of using CT as they became clearer about how to think critically in an actual task and how to evaluate their thinking that revealed in their performance. With the given instruction and guidance, they began to view CT as a practical tool rather than an abstract term.

In addition, the participants’ feedback concerning the relationship between CT and L2 writing also reveals their enhanced understanding of the role that CT plays in a writing process. When the participants were asked to describe the relationship between CT and L2 writing, all of them indicated that there was a close connection between CT and L2 writing. For example, Edward (L), Ella (L) and Emily (L) considered that CT played an important role in improving thinking and thus improved writing. Eric (M) described CT as a tool, while Emma (M) and Eva (M) considered CT as a preparation process that led to better writing.

The analysis of the participants’ comments on the CT-oriented brainstorming and peer review activities as well as the analysis of their worksheets completed during these activities and their essay drafts suggest that the CT-oriented brainstorming and peer review activities were helpful for improving CT skills, although some of the participants still encountered some challenges during the learning process. In addition, through observation of participants’ performance during these activities as well as review of their written products, I also identified some evidence that showed the tendency of the participants’ improvement in some of the CT dispositions such as intellectual autonomy, intellectual humility, intellectual empathy, and confidence in reason.
7.1.1 CT-oriented brainstorming and the learning of CT skills

Brainstorming activities were organized in both groups before the participants were required to write their first drafts. However, the brainstorming activities organized in the experimental group were designed with a careful infusion of CT based on the “elements of thought” (Paul & Elder, 2001). In these CT-oriented brainstorming activities, the participants were provided with a brainstorming worksheet (see Table 4.3 on p. 110) that listed the key CT elements as well as the corresponding questions that could guide their brainstorming discussions, so that they were directed to a CT-oriented process of identifying and thinking through the key elements of the given writing tasks. In the control group, however, the participants were not restricted to any specific elements or questions and were allowed to discuss the writing topics freely.

The interviewees from both groups were required to make a general comment on their experience of doing their brainstorming activities. Considering brainstorming activities as a good way to organize ideas, four out of the six interviewees from the control group considered it necessary to do brainstorming before writing their first drafts. Nevertheless, most of the interviewees showed less satisfaction concerning the effectiveness of their brainstorming activities. As they commented, their brainstorming activities were not as effective as expected because they were not quite clear about what to discuss during the brainstorming activities and thus the brainstorming often turned out to be not very helpful. One opponent, Clare (L), who considered brainstorming as unnecessary, indicated that,

It was a hard time doing the brainstorming together with my peer because neither of us actually knew what to discuss. We just discussed the topics and tried to look for some possible ideas. Although we finally came to some ideas after the brainstorming, I later...
found that there was not much relevant evidence to support some of those ideas. The only thing I could do then was to try my best to piece together any possible evidence, relevant or not, in my writing. To be honest, it [the brainstorming] wasted me a lot of time and didn’t show much effect.

Clare (L) was not the only interviewee in the control group who considered brainstorming as a waste of time. So did Chris (L) and Cindy (L), who directly showed their dissatisfaction with the brainstorming activities. As Cindy (L) explained, she would rather be given more time on writing the essay. It seems that Clare (L), Chris (L) and Cindy (L) who had made the least improvement in their CT scores had not achieved much from their brainstorming activities during their learning process.

Although all the three interviewees in the control group who had achieved the most significant improvement in their CT confirmed the necessity of doing brainstorming activities, they showed their concern about the efficiency of their brainstorming activities. Carrie (M), who considered brainstorming as necessary to organize ideas and to keep relevant to the topic, admitted that their discussions in the brainstorming activities were quite time-consuming and not efficient enough. As another supporter, Carole (M) pointed out, the brainstorming activity did not always turn out to be helpful for her.

Different from the interviewees in the control group, the interviewees in the experimental group expressed a much higher degree of satisfaction with their experience of doing the brainstorming activities. They mentioned that this activity allowed them to develop and exchange ideas with their peers and thus exposed them to a variety of viewpoints towards the same topic. For example, one of the interviewees, Edward (L), pointed out that he actually very much enjoyed the process of exchanging ideas in the brainstorming activities with his peer
because it always helped to stimulate new ideas for his writing. Also, Eric (M) indicated that the brainstorming activities were very helpful for activating a deep level of thinking for a systematic and comprehensive analysis of the themes revealed from the writing topics.

Apart from the general comments, the interviewees from the experimental group were also asked to comment on the role of the CT-oriented brainstorming in their learning of CT. The interviewees mentioned that, as I report in the following sub-sections, they had achieved a better understanding of the CT elements after their practice in these brainstorming activities as well as a better understanding of the importance of the CT elements for their idea development.

7.1.1.1 Understanding the meaning of the CT elements

Four interviewees from the experimental group admitted that they achieved a better understanding of the meaning of the CT elements after they practiced using them in the brainstorming activities. Indeed, it was not an easy job for the participants to remember all the eight CT elements and their corresponding questions. Thus, the CT-oriented brainstorming worksheets were provided to guide them through the brainstorming process. During the CT-oriented brainstorming activities, the participants were asked to brainstorm ideas in peers by asking each other questions listed on their brainstorming worksheets. And they were required to write down their answers to each question based on their discussions. According to the interviewees, they began to better understand the meaning of CT elements due to the repeated practice, the interaction between peers, and the guidance of the brainstorming worksheet.

First of all, the brainstorming activities provided the participants with opportunities to practice using the CT elements to develop ideas for their writing tasks. As Eric (M) described,

I thought that I understood all these CT elements, although they were kind of abstract. But when it came to the first practice, I felt quite confused. I had to go back to my notes or ask
my peer or the teacher to clarify the meaning. After several times of practice, I felt that I was much clearer about the meaning of each element and could easily answer the questions that helped to frame my essay.

Eric’s (M) comments correspond to my observation during the study. I remembered that during the first brainstorming activity, many participants paused to clarify the meaning of some of these CT elements. It took them longer than the required time to complete their brainstorming worksheets during the first practice of the CT-oriented brainstorming activity. As they went on discussing the same elements repeatedly in the following brainstorming activities, they spent much less time and could gradually provide answers to the corresponding questions within the required time frame. Eva (M) mentioned that, “Each time when I did the brainstorming, I felt that I had understood these eight elements a little better.” Indicating that these CT elements became more and more familiar, Eva (M) noted that she began to automatically think of these elements while thinking about her writing or even other things in her daily life.

Besides practice, some interviewees considered that the peer interaction in the brainstorming activities also contributed to their better understanding of the CT elements. For example, Emma (M) indicated that she had achieved a better understanding of the CT elements through the question-and-answer process in the brainstorming activities, because “questioning is a good way to activate thinking and is much more helpful than silent reading or silent thinking”. She explained: “Every time my peer asked me questions from the worksheet, I had to think carefully about the relationship between the questions and the elements, and the relationship between the answers and the essay I was going to write.” Similarly, Eric (M) also mentioned the importance of peer interaction by saying that he would not have achieved a better understanding of the elements if he had been required to do the brainstorming alone. As he explained, he had a
lot of discussions with his peer on the meaning of these questions and how to answer them, which helped him to become clearer about the meaning of the CT elements.

According to the interviewees, the CT-oriented brainstorming worksheets turned out to be very helpful for their understanding of the CT elements as well. For example, Eva (M) indicated that she would not have known what to do without the brainstorming worksheets, although she had made detailed notes about all the CT elements. In order to further investigate the participants’ performance of completing these worksheets and to identify proofs of an improved understanding of these CT elements, I reviewed and analyzed the participants’ brainstorming worksheets. As the participants did not have a brainstorming session in their pre-test task (Task 1), they had the chance to use the worksheets for three rounds of practice for Task 2, Task 3 and Task 4. I compared the experimental group’s brainstorming worksheets completed in the three rounds of practice. Two obvious differences were identified from the comparison.

First of all, few questions were left unanswered in the brainstorming worksheets for the second and third rounds of practice, although a few participants could not complete their worksheets during their first practice. To be more exact, for the first practice, seven out of twenty-two participants did not complete their worksheets, with several questions left unanswered. For the second practice, only two of them handed in incomplete worksheets. And for the third practice, there was almost no question left unanswered in their worksheets. Eric (M) was among one of them who had left a lot of blanks during his first brainstorming practice. According to him, he did not know how to answer those questions in the worksheet because he did not think that he really understood those key CT elements. After the first round of discussion, as well as the teacher’s explanation and exemplification in the following instruction sessions, he gradually figured out the meaning of these CT elements so that he could answer all those
corresponding questions in the brainstorming worksheet for the second and third rounds of practice, which also partly led to an improvement in his writing as revealed from his gradually enhanced scores.

Secondly, the analysis of the interviewee’s brainstorming worksheets reveals that the interviewees who made the most improvement in their CT performed quite differently from their peers who achieved the least improvement in their CT. For example, from the answers to the question concerning question at issue (“What is the major question that needs to be addressed in the essay?”) in the brainstorming worksheet for the post-test essay (Task 4), Eric (M), Emma (M) and Eva (M) showed a better understanding of the CT element question at issue than Edward (L), Ella (L) and Emily (L).

Table 7.1

Interviewees’ Answers to “Question at Issue” for Task 4

<table>
<thead>
<tr>
<th>Question at issue: What is the major question that needs to be addressed in the essay?</th>
<th>Answers by the interviewees Who improved MOST in their CT</th>
<th>Answers by the interviewees who improved LEAST in their CT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eric (M)</td>
<td>Should we be encouraged to study abroad?</td>
<td>Edward (L)</td>
</tr>
<tr>
<td>Emma (M)</td>
<td>Whether it is good or not to study abroad</td>
<td>Ella (L)</td>
</tr>
<tr>
<td>Eva (M)</td>
<td>Whether students should be encouraged to study abroad</td>
<td>Emily (L)</td>
</tr>
</tbody>
</table>

As shown in Table 7.1, all the interviewees who improved most in their CT actually showed an appropriate understanding of question at issue and provided their answers in the form of a question such as “Should we be encouraged to study abroad?” without showing any personal preference. However, none of the interviewees who improved least in their CT tended to use the form of a question. In fact, Ella (L) seemed to have confused question at issue with concept. In
addition, Edward (L) and Emily (L) also showed their personal preference in their answers and ignored the objectivity that should be addressed in their answers to this question.

The difference in the understanding of the CT elements revealed from the interviewees’ answers in the brainstorming worksheets actually partly explains the difference in their improvement in CT. To be more specific, in the above example, the personal preference conveyed by Edward’s (L) and Emily’s (L) answers to question at issue reveals their limited perspectives towards the given task. Instead of making a reasonable judgement based on the consideration of multiple viewpoints about “studying abroad”, Edward (L) and Emily(L) tended to be confined to their personal opinions which somehow affected their choice of supporting evidence and thus affected, to some extent, their performance of CT in terms of breadth, depth or even fairness. For example, in Edward’s (L) essay, he opposed the idea of studying abroad by saying that “when we study abroad, our self-esteem may be hurt”. And he gave an inappropriate example to indicate that “American citizens still discriminate Chinese”. Without an effective selection of evidence and appropriate choice of examples, the student did not well support his viewpoint in this essay, and particularly performed poorly in terms of fairness.

Using a different brainstorming worksheet with no required CT elements for discussion, the students in the control group have generated quite different results from their brainstorming activities. A review of their brainstorming worksheets reveals that most of them have discussed only around information, with only one or two of them touched upon other elements such as point of view or interpretation and inference. Many other essential elements concerning the writing tasks were left unconsidered. Without a thorough consideration of all the essential elements involved in the process of thinking through a given task, the ideas generated from their brainstorming might not be helpful enough for fulfilling the purpose of the task or might even
mislead their minds to obscure concepts, false assumptions or irrelevant information, which certainly would not guarantee excellent performance in either CT or writing.

7.1.1.2 Understanding the importance of the CT elements for developing ideas

Besides the understanding of the CT elements, the interviewees from the experimental group also mentioned about having achieved a better understanding of the importance of CT elements for developing ideas in their English writing. As Eric (M) indicated, he used to attribute his low English writing proficiency to a lack of English vocabulary and grammatical knowledge; however, he came to understand that what prevented him from writing better essays were actually the ideas. According to his description, he used to spend less time thinking about a task before writing the first draft and always felt difficult to write longer essays. While after spending much time on a full-rounded discussion of a given task, he was well stimulated with a variety of ideas and this active state of mind lasted for the whole writing process. The length of his essays shows further evidence of his improvement in idea development. He wrote 224 words for his pre-test essay and 537 words for his post-test essay. Indeed, the brainstorming activity with a focus on CT seemed to have successfully stimulated Eric’s (M) thinking to generate more ideas for his writing.

In addition, some interviewees also mentioned that the brainstorming activities helped them to develop ideas from new perspectives. Edward (L) mentioned that “the brainstorming activities stimulated me to think from some new perspectives that I have never thought of and thus to form my theses with more depth”. Similarly, Eric (M) and Eva (M) also indicated that they were impelled to think from some different perspectives during the brainstorming. Indeed, in their post-test essays (Task 4), these three interviewees chose to argue from the perspective that “students should not be encouraged to study abroad” when the majority of the participants tended
to argue the opposite. Although the choice of stance did not directly determine their final scores, being open-minded to a wider range of viewpoints, some of which might differ from the mainstream beliefs, would be considered as one of the most important premises of making sound judgement.

Making a comparison between the CT-oriented brainstorming that focused on thinking through the essential CT elements and their traditional brainstorming that focused more on making outlines, Eric (M) admitted that these CT elements were more helpful for developing ideas. He indicated that outlining could be helpful for mapping the structure of an essay; however, the structure should be based on the ideas that had been developed for writing the essay. In other words, without knowing what to write, the outlining would not be as effective as expected. And these CT elements were exactly what led him to consider what to write in his essays.

7.1.2 CT-oriented peer review and the learning of CT skills

Being required to make some general comments on the experience of their respective peer review activities, all the interviewees from the experimental group reported their satisfaction with their peer review activities and considered themselves as having benefited something from the peer review; however, half of the interviewees from the control group were not satisfied with their peer review activities and would rather to have their teacher as the reviewer to revise their essays. While all the interviewees from the experimental group reported to have learned a lot from the interaction with their peers, half of the interviewees from the control group showed some doubts about their peers’ abilities for improving their writing. As Cindy (L) indicates, it would be hard for her peer to identify her mistakes in the essays, because their English writing abilities were at a similar level. Due to a relatively low English writing proficiency and a lack of
effective training on peer review, these concerns and problems directly affected the efficiency of
the peer review activities organized in the control group, which was in accordance with the
findings of many previous studies on peer review (e.g., Min, 2005; Saito & Fujita, 2004). In fact,
it was the same in the experimental group, concerning the level of English writing abilities
between peers. It is thus interesting to explore how the CT-oriented peer review enabled the
peers in the experimental group to learn from each other during the process even when they had
a similar level of English writing proficiency.

Besides the general comments on the experience, the interviewees from the experimental
group were also asked to comment on the role of CT-oriented peer review in their learning of CT.
The interviewees considered their peer review activities as a good opportunity for them to further
understand the meaning of the CT standards (i.e., the “intellectual standards”). In addition, they
also pointed out that they had a better understanding of the importance to use CT standards to
evaluate and improve their ideas in writing.

7.1.2.1 Understanding the meaning of CT standards

Like the “elements of thought” that have a set of eight elements, the “intellectual standards”
consist of a set of nine standards, which has made them quite difficult for the participants to
understand and remember in a short period of time. The CT-oriented peer review activities
enabled the participants to have opportunities to interact with those standards by trying to use
them in the discussions with their peers. In addition, the peer review checklist provided all the
needed information to guide them through the whole process of peer review.

Although I had provided some concrete examples when explaining each CT standard during
the instruction sessions, the participants were exposed to much more examples when they read
their peers’ essays. And these examples identified in their own essays or in their peers’ essays
turned out to be more understandable as well as more convincing to them. For example, Eric (M) reported his learning of breadth through his own examples in a peer review activity. He said,

When my peer asked me whether I should consider it from another perspective when reviewing my Task 4, I suddenly realized that I was thinking in a narrow-minded way and only considered from the perspective of college students. I tried to add other viewpoints in my revision. From this example, I felt I had a better understanding of the standard of breadth.

In his final draft for Task 4, the post-test essay, besides the discussion from adult learners’ perspectives, Eric (M) added a paragraph discussing from the perspective of younger students in terms of whether they should be encouraged to study abroad, which was an important perspective to be considered yet few students actually mentioned. This part of argument indeed contributed to a high mark for his CT sub-score for breadth.

Another interviewee, Eva (M), indicated that the practice of using these CT standards in peer review activities also helped her to gain a better understanding of the characteristics of good writing. She said, “I gradually realized that good writing should be not only grammatically correct, but also clear and precise, logically correct, and showing significance, etc.” Being able to make a natural connection between CT and writing could be considered as an encouraging evidence of an improved understanding of CT standards as well as their application to writing.

### 7.1.2.2 Understanding the importance of CT standards for evaluating ideas

Having more self-review than peer review in their pre-study English writing class, some interviewees in the experimental group compared these two kinds of review activities and admitted that they preferred peer review to self-review for being able to exchange ideas with their peers, who might help them to identify some mistakes that could not be found in a self-
review. Although their peers might be at a similar level of English writing proficiency, they pointed out that the way of questioning in the peer review activities actually triggered their thinking and enabled them to be more sensitive to the mistakes that they might not have noticed before. In this sense, the role of a peer reviewer in the CT-oriented peer review activities was not a reviser who simply read to identify and revise mistakes, but a prompter who kept reminding the writer to apply the CT standards to his or her writing by asking the corresponding questions. This might also explain why the peer reviewers could help the writers to improve their essays despite their own English writing proficiency.

Having experience in participating in some traditional peer review activities, the interviewees in the experimental group indicated that the standards used in the CT-oriented peer review were quite different. “Instead of checking grammar or spelling”, as pointed out by Ella (L), “we were actually required to pay more attention to the organization of information and the quality of ideas.” And this change of focus allowed them to stand further back from the writing so that they were able to have an overview of the entire essay and to identify the problems hidden in the ideas. As Eva (M) explained, logic of ideas was not quite emphasized due to the fact that they were writing in a second language and thus were always evaluated according to their proficiency of language rather than thinking skills. This lack of emphasis on thinking skills in instruction as well as in evaluation led them to focus mainly on the use of vocabulary and grammar. Having learned the CT standards and having practiced using these standards to evaluate ideas, these interviewees reported to have realized the importance of rational thinking for writing good essays.

A comparison between Eric’s (M) first and second draft of his post-test essay shows how he used the CT standards to evaluate and improve his ideas (see the following two excerpts; revised
texts are highlighted in both excerpts for comparison). There were a lot of revisions in his first draft after the peer review session. Most of the revisions were not about language or grammar, but ideas, in terms of clarity, precision, relevance, breadth and logic, etc.

**Excerpt 1 (Eric (M), Draft 1, Task 4)**

Nowadays, there is always in our scene that numerous students are preparing for studying abroad. It seems that study abroad has been a tendency, which draws a large-number of students in. Some people consider that our students should be encouraged to study abroad. However, I firmly hold this view that it is not a good choice to study abroad.

**Excerpt 2 (Eric (M), Draft 2, Task 4)**

Nowadays, there is no denying that more and more students, whose ages mainly range from 6 years old or even younger to 30 years old, are forced or eager to study abroad. Studying abroad is often considered as a wonderful opportunity which will lead to a bright future in one’s life. It is becoming increasingly clear that studying abroad has been a tendency with people’s increased income and desire for different experiences. However, as far as I am concerned, it might not be a good idea to encourage students to study abroad.

From these two excerpts, it is clear that Eric’s (M) focus was not on revising grammatical mistakes, but on improving his ideas to make them clearer, more precise and broader in view. For example, in his first draft, he mentioned the background in a rather general way by saying that “numerous students are preparing for studying abroad”. While in his second draft, he made it more precise by identifying a specific group of students “whose ages mainly range from 6 years old or even younger to 30 years old”. The revised version not only provided a more precise description of the background for the readers, but also indicated a broader view that he was not
only considering college students, like what many other participants did, but also those younger students. Similarly, he talked about the trend of studying abroad in a general way in his first draft, but elaborated more on the reasons of this trend in his second draft by saying that “studying abroad is often considered as a wonderful opportunity which will lead to a bright future in one’s life”, and that the tendency of studying abroad is due to “people’s increased income and desire for different experiences”. When claiming his own opinions, he made it very strong in his first draft, which is fair enough. However, he seemed to realize that this was only his personal opinion. Therefore, he added “as far as I am concerned” in his second draft before articulating his viewpoint, to make it easier for readers of different opinions to understand. In the end, he also rephrased his opinion to be more relevant to the topic which asked him to decide “whether students should be encouraged to study abroad”, rather than “whether students should study abroad”. It is true that there is no huge difference in these two excerpts, which are actually two short introductory paragraphs of the essay drafts. However, the revisions that Eric (M) made for this part helped to improve the understandability of his writing with more clarity, precision, breadth and relevance. In addition, these revisions reveal the process of his thinking that involved efforts to better express his ideas.

7.1.3 CT-oriented L2 writing approach and the cultivation of CT dispositions

Although there were no pre- and post-study tests to evaluate students’ improvement in CT dispositions, due to the fact that the cultivation of CT dispositions requires a much longer time, I observed some development of the students’ CT dispositions through an analysis of the participants’ writing products and their performance in the in-class activities. According to Paul and Elder (2001), CT dispositions include at least eight core intellectual traits, which are fair-mindedness, intellectual humility, intellectual courage, intellectual empathy, intellectual integrity,
intellectual perseverance, confidence in reason, and intellectual autonomy. According to my observation, several intellectual traits, such as intellectual autonomy, intellectual humility, intellectual empathy, and confidence in reason, show some obvious evidence of development among the majority of the participants.

First of all, the participants showed an improved ability of thinking for themselves (intellectual autonomy). In fact, intellectual autonomy is closely related to CT skills. One could not effectively think for oneself until he or she knows how. During the study, the participants in the experimental group were given instruction on the CT skills including not only the key elements to think things through, but also the standards to evaluate one’s thinking. The participants’ performance in class and in their writing practice showed that these CT skills not only helped them to write better essays, but also helped them to think independently. Such improvement was revealed from the change of ways of making decisions on their viewpoints towards the given tasks. At the beginning, it took the participants much less time to decide on their viewpoints, as if they were able to make their decisions immediately after reading the writing prompts. However, some of these viewpoints turned out to be established based on mainstream preference or personal assumptions. In the later practices, I found that some participants took much longer time making decisions and some held their decision-making until the end of the discussions, because, as some interviewees reported, they needed to consider all the important elements before making a sound decision. Although it seemed that the process of CT kind of delayed their decision-making, it actually helped to improve their intellectual autonomy by offering them a tool to think independently in a rational way. Being more aware of why and how to think independently and make reasonable judgements also contributes to the development of students’ confidence in reason, which enables them “to use good reasoning as
the fundamental criterion by which to judge whether to accept or reject any belief or position” (Paul & Elder, 2001, p. 13).

In addition, the participants showed some development in intellectual humility and intellectual empathy from their performance in the interactive in-class activities. As was expected, the interactive activities provided opportunities for the participants to be exposed to other people’s opinions and ideas, which on the one hand helped to broaden their views, and on the other hand allowed them to understand their own limitations in terms of both knowledge and viewpoints. And the broadening of views and understanding of limitations contributed to the cultivation of intellectual humility. For example, in the brainstorming activity for Task 2, the participants discussed about whether printed books should be replaced by e-books in order to save the forests. One participant strongly opposed the use of e-books and thought it was ridiculous for people to read e-books instead of printed books, although she had never used any e-books. Having more experience of using such electronic products, her peer tried to introduce some of the functions and advantages of e-books, which prevented her from making an arbitrary judgement that e-books were useless.

Intellectual empathy is actually highly related to intellectual humility. Only if one could admit one’s own limitations and accept other people’s opinions, would it be possible for one to think from other people’s perspectives or to understand other possibilities even if they are contrary to one’s own expectations. The participants showed obvious improvement in intellectual empathy and intellectual humility after some practices of brainstorming and peer review activities. Providing chances to discuss different points of views and to justify one’s own opinions, these interactive activities showed encouraging effects on enhancing the participants’
awareness of reflecting on one’s own limitations as well as understanding other people’s viewpoints.

The cultivation of CT dispositions might take much longer time than it does for the development of CT skills. It requires not only the tools and exercises, but also the attention to each individual in terms of their needs and feelings. Therefore, to improve students’ CT dispositions, the way of teaching plays a more important role than the content itself. In this study, the joint efforts of the design of tasks and activities and the creation of the constructive learning environment have resulted in some development of students’ CT dispositions, which in turn, have helped them to exert efforts to use CT skills in their writing.

7.1.4 Challenges in the learning of CT

Although all the interviewees in the experimental group considered that they had learned more about CT after following the CT-oriented L2 writing approach and that CT had helped them with their writing, it should not be ignored that there were also some challenges in their learning of CT, particularly for those who made the least improvement in their CT after the study. Two major challenges were identified from the analysis of the interviewees’ feedback and the observation of the other participants’ performance in the in-class activities. First of all, the complexity and abstraction of the concept of CT made it hard for students to achieve a profound understanding during a short period of time. Like what Edward (L) indicated, he was not fully prepared to learn such a complex concept that involved so many abstract sub-concepts. Many other participants would agree with Edward (L). I could tell that many participants were totally at a loss when they were required to actually use the CT elements and CT standards in their first brainstorming and peer review activities. It is true that CT is not an easy concept. It involves the use of metacognition, as well as the change of thinking habits. For those who have never
received any formal CT instruction, it takes much time and particularly practice to understand the concept.

Secondly, the potential prior misunderstandings towards the concept of CT became an obstacle to significant improvement in CT. Considering CT as something “Western”, Edward (L) admitted that at first he did not believe that CT could be applicable to his writing style, because he thought there was a big difference between Western-style writing and Eastern-style writing. Indeed, from my observation and discussion with Edward (L), I found that he was inclined to make a clear division between Eastern and Western thinking. He also showed a rather conservative or narrow-minded view towards such things like studying abroad or online shopping. Although he indicated that he had benefited from the CT activities, the narrow views and misunderstandings he held became an obvious obstacle to his improvement in either CT or L2 writing. Also, some participants, such as Ella (L), seemed to have equated CT with the ability to critique and thus misunderstood the applicability of CT in their learning. As Ella (L) said, she could not do well in the peer review session, because she did not feel comfortable to be very critical. She thought her writing was not good enough, which made it inappropriate for her to be “picky” when reading her peer’s essays. Holding such misunderstandings towards CT, she might have missed some opportunities to practice using the CT standards and to learn from other students.

7.2 Effects on the learning of L2 writing

As the participants in the experimental group also achieved significant improvement in their L2 writing scores, it is worth exploring how the CT-oriented brainstorming and peer review have affected the participants’ learning of L2 writing. The interviewees from both groups were required to comment on their experience in their respective brainstorming and peer review
activities and the effects of these activities on their L2 writing. The difference in their experience contributes to the exploration of the role of CT in students’ L2 writing process.

7.2.1 CT-oriented brainstorming and the learning of L2 writing

When commenting on how the brainstorming activities had affected their first draft writing, only half of the interviewees from the control group reported that their brainstorming activities were helpful for enabling them to make an outline for their writing. According to the other half, the brainstorming activity did not provide substantial help for their writing although it allowed them to have some time to think about the topics before writing. In contrast, the results from the interview with the experimental group reveal that all the interviewees considered they had benefited from the CT-oriented brainstorming in their writing. To be more specific, they mentioned their improvements in such aspects of writing as achieving a deeper understanding of the writing tasks, establishing reasonable thesis statements, and identifying effective supporting evidence.

7.2.1.1 Achieving a deeper understanding of the writing tasks

The interviewees from the experimental group indicated that they were able to achieve a deeper understanding of the writing tasks from the CT-oriented brainstorming discussions. Just as Eric (M) indicated, the CT-oriented brainstorming activities were actually quite different from the traditional brainstorming activities, because they required a full-rounded discussion of the purpose, question, concept, point of view, assumptions, etc. of the writing task. And the full-rounded discussion helped him to carefully analyze the writing tasks so as to achieve a better understanding of not only the task requirements but also how to meet those requirements. Similarly, Emma (M) commented that,
These brainstorming activities directed me to a deeper understanding of the writing tasks. Normally when we were asked to brainstorm ideas, we would mainly focus on the meaning of the writing topics. But in these activities, we had to discuss a lot more, based on the questions in the worksheet. By discussing the required questions, I was able to look at a writing task from many important aspects such as the purpose of the task, the key question to be addressed, the main concept, etc. These questions drove me to keep thinking until I was completely clear.

An investigation of the participants’ essays also reveals the improvement in terms of the experimental group’s understanding of the writing tasks. For example, for Task 1 (pre-test essay), the participants were required to write their opinions on the following issue: “There is a growing concern about the development of tourism due to the damages it brings to local environment and culture. Some people think that the development of tourism should be restricted.” In fact, the key concept in this statement was “the development of tourism”. Thus the participants were expected to discuss the benefits and drawbacks of developing tourism and then decide whether they agree with the statement or not. However, a lot of the participants in the experimental group were actually talking about “touring”, which was a personal activity rather than a business. Therefore, instead of discussing around the development of tourism, they talked more about whether people should travel by using such evidence like “touring makes people relax” or “travelling is good for your health” to show their disagreement with the given statement of restricting the development of tourism. The misunderstanding of the key concept distracted them away from the discussion of the major question that needed to be addressed in their essays and thus partly led to low CT and writing scores in their pre-test.
In fact, such mistakes were inevitable without a careful analysis of the writing task. When the participants in the experimental group were trained to conduct such analysis through their brainstorming activities, they showed a much deeper level of understanding of their writing tasks. For example, in Task 3, the participants were required to provide their opinions on the following issue: “Nowadays, a lot of people enjoy online shopping. However, when shopping for clothes, some people consider it better to buy them in physical stores rather than in online stores.” After their brainstorming activity, most of the participants from the experimental group were able to identify the key concept “shopping for clothes” and successfully identified the most important and relevant information to address the major question in their essays. For instance, some supporters of physical-store shopping used such evidence like “having the try-on experience to see if the clothes fit you or not”, or “being able to know the material of the clothes”, etc. And those supporters of online shopping also indicated that “there is a wide range of choices of clothes online” or “you may know more about the clothes via high-quality photos and detailed descriptions and customer feedback about the size and quality of the clothes”. Their viewpoints as well as the information they provided to support their viewpoints were all relevant to the key concept of “shopping for clothes”. In contrast, an examination of the control group’s essays finds that, without such analysis of their writing task, many of them only talked about the general benefits or drawbacks of online shopping or physical-store shopping, without connecting their evidence to “shopping for clothes” (see Appendix G for two examples of Essay 3, one from each group).

The difference between the experimental group’s performance in dealing with the writing tasks before and after the CT-oriented brainstorming, and the difference in the performance between the two groups in their essays indicate that the key CT elements, which are believed to
be essential dimensions of reasoning (Paul & Elder, 2001), worked well together to shape students’ understanding of the given tasks. Incorporating these CT elements into a brainstorming activity, then, allowed the students to practice their ability to reason along with the discussions about their writing tasks.

7.2.1.2 Establishing reasonable thesis statements

After discussing all the essential elements in the brainstorming activities, the participants in the experimental group were led from a surface discussion of the meaning of the writing topics to a logical reasoning of the writing tasks. Thus, their thesis statements were established based on not only a presentation of their viewpoints but also an examination of their assumptions underneath these viewpoints, or an evaluation of the evidence they had to support their viewpoints. In other words, what the students needed to do in the CT-oriented brainstorming process was not only clarifying their viewpoints but also evaluating their viewpoints based on sound reasoning, and through this process of evaluation, establishing a framework for their essays. In fact, during the interview with the participants from the experimental group, I found that almost all of them claimed that the CT-oriented brainstorming was helpful for establishing their thesis statements.

Gaining a better understanding of the writing tasks, the interviewees indicated that they were clearer about the viewpoints they wanted to present in their thesis statements. Some pointed out that after the analysis of the writing tasks, they changed their original viewpoints and achieved more reasonable thesis statements. For example, Eva (M) reported that,

I sometimes had to change to another viewpoint after the brainstorming discussions, because there was something wrong with my assumptions and thus I could not find relevant information to back up my thesis. Sometimes after discussing the possible implications or
consequences of my writing, I felt I had to change my thesis statement so that it would convey greater significance.

Eva (M) also provided an example of how the brainstorming question concerning assumption led her to revise her thesis statement for Task 2, which asked them to provide their opinions on the statement: “There is a growing concern about the reduction of tree population. To save the forests, some people think that printed books should be replaced by e-books.” She pointed out that at first she intended to agree with the statement, and later in the brainstorming discussion she found her agreement was based on the assumption that the reduction of tree population was mainly caused by the use of paper for printing books, which was not completely true. Therefore, she changed to disagree with the statement and made her final thesis statement as: “In my opinion, it may mitigate the problem, but is doubtfully the optimal solution.”

In fact, the result of the pre-study questionnaire survey (see Item 6) shows that assumption was marked as “do not understand” by quite a number of participants. Considering the difficulty of understanding this element, I put some emphasis on explaining it and presenting concrete examples (like Eva’s (M) example) to show how it can help to clarify viewpoints.

It seems that when these CT elements work together, significant effects occur in the process of forming thesis statements. First of all, thinking through all these eight CT elements allowed the participants to spend time on fully analyzing the writing tasks so as to make reasonable decisions on their viewpoints. Secondly, thinking through these eight CT elements also provided chances for the participants to evaluate their viewpoints before forming their thesis statements. As Emma (M) said, “I have totally changed my way of making thesis statements”. She explained that,
I used to form a thesis statement quickly after I got the topic, based on my own preference. And then I would write according to my thesis statement even if sometimes I found my argumentation was quite vague, not convincing enough. And now I put it off until some later stages. During the [brainstorming] activities, we will clarify the purpose of the task and then discuss different viewpoints and try to find out the most convincing evidence for each viewpoint. After this, I would be pretty sure which viewpoint was more reasonable and easier to be explained and supported. So my thesis statement is actually a conclusion from the analysis made through the discussions.

As Paul and Elder indicate, “Reasoning is a process whereby one draws conclusions on the basis of reasons” (Paul & Elder, 2001, p. 53). Without such analysis via brainstorming activities, the students used to form their thesis statements based on personal preference without sound reasoning. In fact, this order-changing reveals a revolutionary change in the mind that highly values a logical way of thinking, which is one of the most important steps towards effective writing. In other words, this order-changing means that instead of not knowing what would be written following the thesis statements, the students were able to envision the picture of the whole essay when they presented their thesis statements in the introductory paragraphs.

7.2.1.3 Identifying effective supporting evidence

Besides understanding the writing tasks and establishing thesis statements, the interviewees also indicated that they had benefited from the CT-oriented brainstorming activities in finding relevant evidence to effectively support their viewpoints. According to Eric (M) and Eva (M), finding effective supporting evidence used to be the most challenging step in their writing. During the CT-oriented brainstorming activity, the participants were required to ask each other questions, one of which was about information: “What is the most important information that
needs to be considered to support your viewpoint?” The interviewees pointed out that the discussion of this question was very helpful for identifying the most effective supporting evidence. It requires, as Emma (M) indicated, “not only relevance, but also significance”. In other words, this question reminded the participants to first list the related information to support their viewpoints, and then rank them according to the degree of importance.

Although the element information is directly related to evidence, it was the joint effects of many of these CT elements that enabled the students to find the evidence they needed. As Eva (M) explained,

I understand that if I want to make my writing convincing, I need to have effective evidence, which is a challenging job. I used to list all the possible evidence and spend a lot of time evaluating and selecting the supporting evidence. Now the brainstorming gave me a focus. When I was clear about the purpose, the key concept and the major question, I was pretty sure what information I needed to find.

Besides these CT elements, the way of questioning-and-answering in the brainstorming activities also helped the participants to find their effective supporting evidence. According to the participants, questioning triggered thinking and worked better than thinking silently. As Emma (M) indicated,

During the brainstorming, we asked each other questions as listed in the worksheet. When I tried to answer my peer’s questions about my viewpoint or information, etc., I began to think about what evidence I could use to persuade my peer, particularly when she held an opposing viewpoint.
She gave an example of her debate with her peer during the brainstorming for the post-test essay (Task 4) which asked about their opinions on whether students should be encouraged to study abroad. She noted,

I agreed with the given statement that students should be encouraged to study abroad while my peer didn’t. So we went on asking each other questions about information. I got two pieces of evidence to support the idea of studying abroad. However, my peer listed some difficulties that students might encounter when studying abroad, such as culture shock or homesickness. So I realized that I had to provide some solutions to such problems, otherwise my argumentation would not be effective enough to persuade other readers who held different opinions.

In her essay for Task 4, Emma (M) not only indicated the reasons why students should be encouraged to study abroad, but also used a whole paragraph (see Excerpt 3) to provide solutions to the potential challenges when studying abroad, which made her argument much more convincing than those who only addressed one aspect of the issue.

**Excerpt 3** (Emma (M), Draft 2, Task 4)

What’s more, although we might encounter problems such as culture shock and homesickness, we can make an attempt to overcome them. Both teachers and classmates will be friendly to offer help to clear our confusions about cultural differences. Moreover, the host family is a good substitute for family when we miss our parents. By the way, it’s convenient for us to make phone calls or send e-mails to our parents with developed communication products. Therefore, we can try to feel at home while studying abroad.

This example illustrates how the interviewee provided stronger argumentation by increasing the effectiveness and comprehensiveness of her supporting evidence. By questioning, the students
were exposed to different viewpoints and became more aware of the readers as well as the purpose of their writing.

7.2.2 CT-oriented peer review and the learning of L2 writing

As both groups were required to revise their first drafts following their respective peer review activities, the interviewees from both groups were asked to comment on the effects of their peer review activities on revising their first drafts. The feedback from the interviewees of the two groups showed some differences in the type of revisions made as a result of their peer review. The majority of the interviewees from the control group mentioned about the revisions in spelling, vocabulary, grammar and sentence structures. However, the interviewees from the experimental group talked more about how they had revised in such aspects as relevance, logic, depth, breadth, significance, etc. According to the interviewees, the peer review checklist (see Table 4.6 on p. 114) provided them with an overview of the characteristics of good writing as well as objectives to strive for. Basically, the interviewees talked about their improvement from two main aspects of their writing: task response, and coherence and cohesion, which were the two criteria that focused more on ideas than language in the “IELTS Writing Task 2 Band Descriptors” (n.d.).

7.2.2.1 Using CT standards to improve task response

To achieve a high mark for task response, according to “IELTS Writing Task 2 Band Descriptors” (n.d.), the students should fully develop their position in response to the task with well supported ideas. Thus, excellent performance in task response involves writing with great relevance, accuracy, depth, significance, etc. In this view, the CT-oriented peer review checklist, as Emma (M) indicated, worked as a standard to evaluate their fulfillment of the task
requirements by examining if the content was clear and precise enough or if the evidence was relevant and had certain depth and significance, etc.

According to Eva (M), getting familiar with the CT standards also helped to develop her understanding of the purpose of writing as well as her responsibility of being a writer. She gradually understood that writing was not for the sake of writing, but for the purpose of communication, which reminded her to pay special attention to avoiding the use of unclear referents or expressions that might cause any ambiguity, as well as to providing examples or illustrations that were precise and relevant enough so that they were easily understood and strongly convincing.

Indeed, there were much more examples of unclear or vague sentences in the essays for the first few tasks when the participants in the experimental group had not been quite familiar yet with the set of CT standards. For example, there were sentences like “the tourists have done something bad to the local environment” or “Tourism has disadvantages, too. However, those disadvantages are not serious enough to eliminate it.” The lack of clarity or precision as revealed from such sentences lied in both language and thinking. As Eva (M) further explained, she used to use some general words when she could not find the exact words or was not sure about what to say at the time when she was writing. According to her experience, if the sentences were grammatically correct, those vague words would not be pointed out or marked as mistakes. However, in the CT-oriented peer review activity, Eva (M) found that her peer kept picking these words out and asking her “Could you illustrate what you mean?” It seemed that the questions corresponding to each CT standard provided in the peer review checklist were like magnifiers that helped the participants to identify problems that used to be overlooked.
7.2.2.2 Using CT standards to improve coherence and cohesion

Coherence and cohesion, according to “IELTS Writing Task 2 Band Descriptors” (n.d.), concern not only the use of paragraphing and cohesive devices, but also the logical management of information and ideas. A comparison of the participants’ pre-test and post-test essays reveals a distinct difference in terms of coherence and cohesion. Although many of the participants in the experimental group were able to write multi-paragraph essays in their pre-test, they seemed to be too casual in their paragraphing. Within an about-200-word-long essay, some of them had about six paragraphs, some of which consisted of only one or two sentences with neither clear central idea nor examples for further illustration. In addition, there was a limited use of cohesive devices in their pre-test essays which made it hard for readers to follow the thinking of the writers. As mentioned by several interviewees, they got used to a free style of writing and did not care much about the structure of essays. They just wrote down whatever came to their mind and followed their own thinking without knowing where they would be led to. In fact, this lack of control of one’s thinking may lead to illogical ideas in one’s writing. For example, in one of the pre-test essays, the student started with some examples of the damages brought by tourism and then raised her viewpoint that the development of tourism should not be restricted. The viewpoint did not make sense together with the information given and consisted of contradictions that would likely confuse the readers.

In the post-test essays, the participants in the experimental group showed great improvement in their writing sub-scores for coherence and cohesion, from an average score of 4.98 to 6.19. In their post-test essays, the participants did much better in their paragraphing. Showing a clear introduction-body-conclusion structure, almost all the participants were able to present a clear central idea for each part. The participants also showed a better control of
thinking in managing their information and ideas and made much less logical errors in their writing. Meanwhile, in the post-test essays written by the participants in the control group, there were still quite a number of such logical errors such as drawing conclusions from inappropriate examples or showing contradictions. In fact, as revealed from the quantitative analysis of their L2 writing sub-scores, the control group did not show significant improvement in terms of coherence and cohesion. As both groups participated in peer review activities, it is interesting to explore how the CT-oriented peer review had achieved better effects on improving coherence and cohesion.

Five out of the six interviewees from the experimental group mentioned that the CT-oriented peer review had been helpful for improving the logic in their writing. As explained by Eric (M), there was a specific criterion in the peer review checklist that concerned logic, so that they were given a chance to pay special attention to the internal connection between ideas to check if there was any contradiction or if the parts of information made sense together. Eva (M) considered that one of the guiding questions (“Does what you say follow from the evidence?”) in the checklist was very helpful for their group to identify logical errors. As she explained, it could have been extremely hard for them to evaluate the essays in terms of logic because they had never been taught how to identify logical errors. With this guiding question, she found that logical errors included not only self-contradictory statements, but also errors like drawing conclusion from irrelevant evidence, which were not rare in her and her peer’s essays.

Besides the guiding questions, the way of questioning-and-answering in the peer review activities also proved to be effective for identifying information gaps in their writing. For example, Emma (M) felt that she benefited from the questioning-and-answering during the peer review activities. In fact, she found the questioning style of peer review very enjoyable because
she was encouraged to think actively during the process. Active thinking, as she described, enabled her to be more sensitive to the errors that she would never have identified before, particularly those kind of errors hidden in the logic of ideas. In summary, it was a joint effect of both the questions and the way of questioning that helped to improve the sense of reasoning in participants’ thinking and the coherence and cohesion in their writing.

7.3 Summary

Although brainstorming and peer review activities were organized in both the experimental group and the control group, the CT-oriented brainstorming and peer review activities conducted in the experimental group have shown comparatively more satisfactory effects on the improvement of the participants’ CT and L2 writing. The effects of CT-oriented brainstorming and peer review activities, as revealed from the post-study interview and the analysis of participants’ essays and worksheets, lied in the following two important roles they played during the process of the participants’ learning of CT and L2 writing.

First, the CT-oriented brainstorming and peer review activities worked as a bridge to connect the abstract CT theories and practical interactive activities. In other words, these activities crystallized the concept of CT in an L2 writing context in terms of both the development and evaluation of ideas in writing an essay, which made the learning and practicing of CT more visible and understandable for the participants. Although I spent certain amount of time in class lecturing on CT, most of the interviewees admitted that they achieved a deeper understanding of the meaning and importance of CT elements and CT standards after practicing using them in those activities.

Indeed, a lot of efforts were made to ensure that the participants could benefit most from these activities. Firstly, the participants were provided with a brainstorming worksheet and a peer
review checklist that provided the CT elements and CT standards as well as the guiding questions. The worksheet and checklist worked as learning and assessing tools, providing both supplement resources and needed help for the participants. Secondly, by creating a constructive learning environment, I ensured that the participants were encouraged to exchange ideas and ask questions during these activities and that when they came across any problems, they could always get help from their peers or the instructor. Together, these efforts proved to be effective for ensuring the implementation and effectiveness of these activities. According to the interviewees’ feedback, the worksheets and checklists, the peer interaction as well as the instructor’s timely explanation on confusing terms all played important roles in helping them to complete their brainstorming and peer review activities.

In addition, the CT-oriented brainstorming and peer review activities also worked as an effective way to infuse the instruction of CT into L2 writing instruction. By comparing general approaches and infusion approaches for teaching CT, many researchers recommend a domain-specific approach that infuses CT instruction into the contexts of specific subject matters (Bailin et al., 1999a; Case, 2005; McPeck, 1981; Silva, 2008). With the integration of CT elements and CT standards into the design of the CT-oriented brainstorming and peer review activities, the instruction of CT was naturally infused in that of L2 writing. As McPeck (1981) remarks, when students think critically, they need something to think critically about. The CT-oriented brainstorming and peer review activities allowed the participants to think critically about what to write for their writing tasks and how to revise their essays to make their writing more accurate, clear, and relevant, etc. Such infusion has led to, as expected, the reciprocal effects between CT and L2 writing, which could be identified from the comments made by the interviewees when they reported being more capable of using CT elements to help them to establish reasonable
thesis statements and identify effective supporting evidence as well as using CT standards to help them to improve task response, coherence and cohesion in their writing. Although most of the participants in the experimental group thought that CT was taught as a tool to help them write better essays, it is true that writing was also a tool to help them to think more critically. The participants benefited from such reciprocal effects to become better writers and critical thinkers at the same time.
Chapter 8. Conclusion

Through an exploration of the conceptual, theoretical and pedagogical issues related to CT, this study is designed to explore effective ways to teach CT in L2 writing. By a clarification of the concept of CT and an exploration of the relationship between CT and L2 writing, the study established a theoretical framework for teaching CT in L2 writing. Based on this theoretical framework, a CT-oriented L2 writing approach was developed, implemented and evaluated in actual teaching practice that involved 44 second-year L2 undergraduates in a Chinese university. A mixed methods approach that involved both quantitative and qualitative research methods was employed in the study. The analysis of the research results not only reveals the effectiveness of the CT-oriented L2 writing approach for improving students’ CT and L2 writing, but also identifies the effects of the approach on students’ learning of CT and L2 writing. The results of this study and the process of conducting this study contribute to the understanding and teaching of CT in L2 writing context, provide some theoretical and pedagogical implications, and suggest directions for future research in both CT and L2 writing.

8.1 Summary of findings

To explore an effective way of teaching CT in L2 writing, the study is designed to answer three research questions. The first research question focuses on L2 students’ previous knowledge of CT and their understanding of the connection between CT and L2 writing. To answer this question, a pre-study questionnaire survey was conducted among the 44 participants. All together 11 items were designed to generate information about the participants’ general knowledge of CT, their levels of CT and L2 writing abilities, their pre-study L2 writing course, and their understanding of the relationship between CT and L2 writing. The results indicate that the participants were not totally unfamiliar with the term “critical thinking”. Nevertheless, their
general knowledge of CT was limited to an incomprehensive understanding, which was mainly due to a lack of formal training in class. Despite a lack of confidence in both their CT and L2 writing, the participants showed a strong belief that they could benefit from CT in multiple aspects of their L2 learning and that there was a positive connection between CT and L2 writing. These findings reveal not only the necessity of providing explicit CT instruction in an L2 writing course, but also the importance of assessing students’ CT and L2 writing so as to provide empirical evidence of the reciprocal effects between CT and L2 writing and to enhance the understanding of the benefits of learning CT in L2 writing.

The second research question examines whether the CT-oriented L2 writing approach used in the study was effective in improving students’ CT and L2 writing scores. A series of statistical analyses were conducted to compare students’ pre-test and post-test CT and L2 writing scores within and across groups. The results show that the mean pre-test CT scores were similar between the two groups before the study; however, there was a significant difference in the mean CT scores between the two groups after the study. Specifically, the mean pre-test CT score of students in the experimental group was 2.58 (SD=0.289), while their peers in the control group scored at 2.69 (SD=0.248). The mean post-test CT score of the experimental group was 3.64 (SD=0.497), while their peers in the control group scored at 2.90 (SD=0.276). The result of one-way ANOVA analysis shows a statistically significant difference ($F_{(1,42)}=37.069$, $p<.01$) between the experimental group and the control group at the post-test CT scores. As revealed from the results, the CT-oriented L2 writing approach was effective for improving students’ CT scores.

Similarly, the two groups were at a similar level in their mean L2 writing scores before the study; however, there was a significant difference in the mean L2 writing scores between the two groups after the study. Specifically, the mean pre-test L2 writing score for the experimental
group was 5.00 (SD=0.49), while the control group scored at 5.16 (SD=0.54). The mean post-test L2 writing score for the experimental group was 6.07 (SD=0.58), while the control group scored at 5.52 (SD=0.57). As revealed from the one-way ANOVA analysis, there was a statistically significant difference ($F(1, 42)=9.899$, $p<.01$) between the post-test L2 writing scores of the experimental group and the control group. The results indicate that the CT-oriented L2 writing approach was also effective for improving students’ L2 writing scores.

In addition, a Pearson correlation analysis was conducted to examine the relationship between the participants’ CT and L2 writing scores. A significant high positive relationship ($r=0.89$, $p<.01$) was found between the participants’ CT and L2 writing scores. This finding suggests reciprocal effects between CT and L2 writing and the importance and necessity of teaching CT in L2 writing so as to improve both skills.

The third research question is designed to explore how the CT-oriented L2 writing approach (particularly the CT-oriented brainstorming and peer review) has affected students’ learning of CT and L2 writing. By analyzing the post-study interview and the participants’ worksheets and essay drafts, I found that the CT-oriented L2 writing approach served as not only a bridge to connect the abstract CT theories and practical interactive activities but also an effective way to naturally infuse the instruction of CT into L2 writing instruction. The implementation of the CT-oriented L2 writing approach, particularly the CT-oriented brainstorming and peer review, showed significant effects on students’ learning of both CT and L2 writing.

In terms of the effects on students’ learning of CT, first of all, the CT-oriented brainstorming helped the students to achieve a better understanding of the meaning of the key CT elements, as well as the importance of using these CT elements to develop ideas for writing. With a particularly designed brainstorming worksheet that listed the eight CT elements and their
corresponding questions, the students were guided to actively think through the essential elements of reasoning in the context of given tasks. Secondly, the CT-oriented peer review helped the students to better understand the meaning of CT standards and the importance of using these standards to evaluate ideas. In the CT-oriented peer review activities, the students were given chances to use the nine standards for CT as a set of criteria to evaluate each other’s essays. Different from the traditional peer review activity, the CT-oriented peer review allowed students to pay more attention to the quality of ideas, which was often neglected by L2 students and sometimes L2 writing instructors. Furthermore, the CT-oriented L2 writing approach has shown some effects on cultivating students’ CT dispositions as well. Evidence of development was identified in such intellectual traits as intellectual autonomy, intellectual humility, intellectual empathy, and confidence in reason among the majority of the participants. As the students reported to have become used to thinking through these CT elements and using the CT standards in their writing tasks, they were on their way to become critical thinkers.

The CT-oriented L2 writing approach also affected students’ learning of L2 writing. First of all, the CT-oriented brainstorming helped the students to achieve a deeper understanding of the writing tasks, to establish reasonable thesis statements and to identify effective supporting evidence. In addition, the CT-oriented peer review allowed students to use CT standards to improve their task response and coherence and cohesion in their writing. When the students were guided to pay more attention to the quality of ideas other than vocabulary and grammar, they gradually enhanced their understanding of the nature of good writing and how to write better essays to achieve effective written communication.
8.2 Contributions of the study

With the objective of providing an effective approach to teaching CT in L2 writing, the present study is of crucial importance to L2 researchers and educators who wish to infuse CT in L2 writing courses. The process of conducting this study and the results achieved from the study provide insights for teaching CT in L2 writing in terms of concept, theory and pedagogy.

First of all, the study contributes to the perception of CT in an L2 writing context. With a thorough review of a number of notable scholars’ definitions of CT, the present study addresses CT as a concept inclusive of both CT skills and CT dispositions. Emphasis is placed on applying a proven model that includes all the essential elements of CT, so that the most relevant, pragmatic and pedagogical implications for teaching CT are clearly illuminated. Based on Paul and Elder’s (2001) CT model and the ultimate objective of L2 writing, I provide a working definition for CT in L2 writing, which is: *A mindful application of a structured mode of thinking which aims to improve the quality of thinking to achieve intellectual standards of excellence in L2 written communication.* Establishing a connection between CT and L2 writing, this definition also highlights the significance of applying CT to L2 writing and implies the objective as well as methods of teaching CT in an L2 writing context.

Secondly, the study lays down a theoretical foundation for the design of effective approaches to teaching CT in L2 writing. The theoretical framework established in this study provides a shared understanding of CT concept and pedagogy that will improve the quality of teaching, learning and assessment of CT in L2 writing. Although the teaching of CT should cover both skills and dispositions, different approaches should be employed when focusing on each of them. Based on the difference between CT skills and CT dispositions, the proposed
theoretical framework draws insights from Skill Acquisition Theory and Constructivism that imply a variety of principles and strategies for teaching CT in L2 writing.

Thirdly, the CT-oriented brainstorming worksheet and peer review checklist developed in this study greatly facilitate the implementation of the CT-oriented L2 writing approach. These pragmatic tools make it possible for infusing CT elements and CT standards into the process of idea development and idea improvement in a writing process, thus create valuable opportunities for students to practice using CT in L2 writing. Besides, they also allow students to make a natural connection between CT and writing during their CT-oriented L2 writing practices and thus better understand the core nature of both.

Fourthly, with the development of the “criteria for evaluating CT in L2 writing” in this study, the gap in the assessment of CT in L2 writing is filled. Without a set of criteria that are specifically developed for evaluating CT in L2 writing, CT was rarely assessed in previous studies on teaching CT in L1 and L2 writing, which not only makes the previous studies fall short in the validity of their outcomes, but also prevents them from drawing insights from the assessment results that could greatly inform both teaching and learning. In this respect, the “criteria for evaluating CT in L2 writing” developed in this study contributes to not only this study, but also future studies that explore an infused approach of CT and L2 writing.

Finally, by employing a mixed methods approach that involves both quantitative and qualitative research methods, the study also provides some methodological insights for evaluating the effectiveness of CT-oriented approaches. Among the limited empirical studies on teaching CT in L2 writing, most of the studies have involved only a single research method, which has limited the findings that could have been contributed to the issue. The teaching of CT for L2 learners is a complex issue that requires special attention to both the results that can be
revealed by quantitative data, and the process that can be interpreted by qualitative data. The present findings about how much and in what aspects the students’ have improved in their CT and L2 writing, as well as the effects of the approach on students’ learning process are extremely important for researchers, teachers as well as students. Using both quantitative and qualitative methods in the present study not only increases the reliability of the research results, but also enhances the understanding of teaching CT in an L2 writing context.

8.3 Pedagogical implications

The results of the present study indicate that the proposed CT-oriented L2 writing approach is effective for promoting students’ CT and L2 writing. Presenting a possible solution to the integration of CT and writing in one L2 writing course, the study provides some pedagogical implications for both the teaching and assessment of CT in L2 writing.

8.3.1 Implications for teaching CT in L2 writing

First of all, explicit instruction of CT should be provided in an L2 writing course to develop students’ understanding of CT and enhance their awareness of applying CT to L2 writing. As implied by Skill Acquisition Theory, students need to go through a process of reconceptualization of the meaning of CT and reflection on their own thinking habits when they are at the early stage of acquiring CT skills. An explicit exposure to the knowledge of CT plays an extremely important role in this process and greatly affects students’ development of performance strategies at later stages. Although some researchers (e.g., Li, 2011; Zeng, 2012; Zheng, 2011) have realized the importance of explicit CT instruction and included the discussions about the meaning of CT or the significance of learning CT in their instruction, such discussions are far from enough for providing a comprehensive view of CT for the students. The CT instruction should include not only an initial interpretation of the definition of CT, the
principles of CT and the standards for CT, etc., but also an infused application of the knowledge into the design of teachers’ instruction, writing tasks and learning tools.

Secondly, combining abstract rules and concrete examples is an effective strategy for teaching such a complex concept as CT. Compared to many other CT definitions, Paul and Elder’s (2001) CT model provides sufficient information about what CT is and how to think critically, which shows great advantage in its application to specific tasks. Nevertheless, the model involves many sub-concepts which, as some interviewees reported, are difficult for understanding and remembering. Although the students may note down the meaning of each CT element and the interpretation of each CT standard, they tend to get confused when they try to apply these elements or standards to their writing. Therefore, it is extremely important that the teachers carefully choose some concrete examples that connect the concepts to the students’ previous knowledge or real-life experience so as to allow students to fully understand them. For example, using students’ previous essays as examples to illustrate and explain the meaning of certain CT elements or CT standards could be an effective strategy for enhancing students’ understanding.

Finally, creating a constructive learning environment helps cultivate students’ CT dispositions. As indicated by many researchers (e.g., Facione, 1990; Halpern, 1999; Paul & Elder, 2001), CT involves not only intellectual skills but also intellectual traits, which are the dispositions or habits of mind that not only recognize when CT skills are needed but also exert the mental efforts to apply the skills (Halpern, 1999). To my knowledge, little attention has been paid to the cultivation of L2 students’ CT dispositions among the limited relevant empirical studies. Different from the teaching of CT skills, the cultivation of CT dispositions requires not only longer time, but also a learning environment that encourages the development of these
dispositions. To create such a learning environment, the teacher should not only encourage interaction and collaboration among the students, but also provide scaffolding during the learning process. Besides, the teacher should also self-present as a good model of a critical thinker who is intellectually humble, courageous, empathetic, honest, persevering, independent, confident and fair-minded. As the development of CT dispositions is an inexplicit process, explicit discussions about the dispositions and frequent reflections on the development of students’ thinking habits could have some positive effects.

8.3.2 Implications for assessing CT in L2 writing

The study also provides some implications for the assessment of CT in L2 writing. Although many existing L2 writing rubrics include some criteria that are highly related to such aspects of CT as logic or coherence, it is not possible to present a holistic view of students’ level of CT by using these rubrics. Without a holistic assessment of CT, many of the previous studies fell short in examining the effectiveness of the teaching strategies for improving students’ CT. The gap in the previous studies and the results of the present study reveal that a particularly designed rubric that assesses students’ CT in their L2 writing products is actually indispensable. Based on my understanding of Paul and Elder’s (2001) “intellectual standards”, and the commonly used standards for L2 writing, I developed such a set of criteria for evaluating CT in L2 writing (see Table 4.7 on p. 116) and used them in the present study for the evaluation of students’ improvement in CT scores. Including nine CT standards, the rubric interprets each standard in an L2 writing context in terms of five degrees from “very good” to “very poor”. With both an overall score and sub-scores for CT, the criteria help to identify students’ strengths and weaknesses in their CT in an all-round way. Contextualized in L2 writing, the CT rubric is particularly applicable to the evaluation of CT based on L2 writing products, and is easy to use
for L2 writing instructors and researchers. I believe the rubric can be applied to assessing CT in L1 writing as well. It can also serve as an assessment instrument for future studies that wish to test the effectiveness of using CT in teaching writing.

**8.4 Suggestions for future research**

Aiming at exploring effective ways to teach CT in L2 writing, the present study also suggests some directions for future research. First of all, the present study involved participants from one Chinese university, which is also a limitation of the study. Future studies of similar purposes can be carried out among participants who are selected from more universities or even countries. Hypothesizing a wide applicability of the CT-oriented L2 writing approach, I consider it interesting and important to evaluate its effectiveness from a cross-cultural perspective.

Secondly, although the study emphasizes that CT includes both skills and dispositions, the interpretation of the research results in this study focused more on students’ improvement in CT skills. As the cultivation of CT dispositions takes longer time than the training of CT skills, future studies could be carried out for a longer period of at least a year so as to explore students’ development in their CT dispositions after the study.

Moreover, in light of the increasing reliance on web-based learning environment in L2 education, further studies could also be designed to modify the proposed approach for its applicability in a more dynamic medium of teaching and learning. Different research methods can be used to further investigate students’ experience of learning CT in L2 writing in a virtual learning community.

The exploration of the best ways to integrate the teaching of CT with L2 writing or other L2 courses is a challenging task that calls for special attention from more researchers who are willing to get involved in this journey of exploration and practice. These endeavors will be well
rewarded with successful cultivation of L2 learners who are not only proficient language users for effective communication, but also independent critical thinkers for their life-long learning.
References


Appendices

Appendix A
Questionnaire on Critical Thinking and English Writing

Please fill in the blanks or check the appropriate box. Please note that all the personal information collected from this questionnaire survey will be kept strictly confidential.

Grade: ☐ One ☐ Two ☐ Three ☐ Four  Gender: ☐ Male ☐ Female
Birthday (YY/MM/DD): __________________________. Email: ____________________________

1. How often do you hear about the term “critical thinking”? Please check one that applies to your situation.
   ☐ All the time. ☐ Sometimes. ☐ Once or twice. ☐ Never. (→ Skip to Item 6.)

2. According to your understanding, what is “critical thinking”?
   ☐ Thinking skills. ☐ Dispositions. ☐ Both of them. ☐ Neither of them.
   ☐ Other: ____________________________________________.

3. There are some commonly used translated versions of “critical thinking” in Chinese. Please indicate which ONE you would prefer.
   ☐ Pi pan si wei (评判思维) ☐ Si bian neng li (思辨能力) ☐ Other _________ ☐ Do not know.

4. Have you ever received any formal instruction/training related to critical thinking in class? If yes, please provide the course title(s).
   ☐ Yes. Course title(s): ______________________________________. ☐ No.

5. In which aspect of English learning do you think you will benefit (or have benefited) MOST from critical thinking? Please choose ONE that applies to your situation.
   ☐ Reading. ☐ Writing. ☐ Listening. ☐ Speaking.
   ☐ All of the above. ☐ None of the above.

6. Please evaluate the degree of difficulty for the various elements involved in planning your first draft for a writing task. Please circle the appropriate number based on the degree of difficulty. If you do not understand the meaning of certain elements, please tick “Do Not Understand”.

<table>
<thead>
<tr>
<th>Elements</th>
<th>Very Easy</th>
<th>Easy</th>
<th>Neither Easy Nor Difficult</th>
<th>Difficult</th>
<th>Very Difficult</th>
<th>Do Not Understand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identifying the purpose of a writing task.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>☐</td>
</tr>
<tr>
<td>Identifying major questions that need to be addressed.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>☐</td>
</tr>
<tr>
<td>Gathering information.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>☐</td>
</tr>
<tr>
<td>Making inferences of possible solutions.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>☐</td>
</tr>
<tr>
<td>Clarifying key concepts.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>☐</td>
</tr>
<tr>
<td>Identifying assumptions that lead to inferences.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>☐</td>
</tr>
<tr>
<td>Tracing the implications and consequences that follow from your reasoning.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>☐</td>
</tr>
<tr>
<td>Considering multiple viewpoints.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>☐</td>
</tr>
</tbody>
</table>
7. Please make a self-evaluation of your critical thinking as revealed from your English writing based on the list of criteria. Please circle the appropriate number according to your regular performance in your English writing assignments. If you do not understand the meaning of certain criteria, please tick “Do Not Understand”.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Very good</th>
<th>Good</th>
<th>Average</th>
<th>Poor</th>
<th>Very poor</th>
<th>Do Not Understand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free from distorted information.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>☐</td>
</tr>
<tr>
<td>Free from confusion or ambiguity.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>☐</td>
</tr>
<tr>
<td>Appropriate amount of details.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>☐</td>
</tr>
<tr>
<td>Being relevant to the matter at hand.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>☐</td>
</tr>
<tr>
<td>Having substantial meaning.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>☐</td>
</tr>
<tr>
<td>Free from bias.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>☐</td>
</tr>
<tr>
<td>Implying thoroughness in thinking.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>☐</td>
</tr>
<tr>
<td>Encompassing multiple viewpoints.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>☐</td>
</tr>
<tr>
<td>Keeping with the principles of logical reasonability.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>☐</td>
</tr>
</tbody>
</table>

8. Please tick all the standard tests in the list that you have taken and provide your writing score(s).

- ☐ College Entrance Exam, writing score: __________
- ☐ Test for English Majors-4 (TEM 4), writing score: __________
- ☐ Test for English Majors-8 (TEM 8), writing score: __________
- ☐ TOEFL, writing score: __________
- ☐ IELTS, writing score: __________
- ☐ Other, writing score: __________

9. Please evaluate your English writing proficiency.


10. Here is a list of some pre-writing and post-writing learning activities. Please tick the one(s) that is (are) regularly organized in your current English writing class. If there are some other in-class activities that are not listed below, please indicate them.

> **Pre-writing activities**
> - ☐ Brainstorming.
> - ☐ Debating.
> - ☐ Other: ________________________.
> - ☐ None of the above.

> **Post-writing activities**
> - ☐ Self-review.
> - ☐ Peer-review.
> - ☐ Other: ________________________.
> - ☐ None of the above.

11. How will you describe the relationship between critical thinking and English writing proficiency? Please choose one that you think is right.

- ☐ Positive. ☐ Negative. ☐ No relation. ☐ I don’t know.
- ☐ Other, ________________________.

Thank you!
Appendix B
Consent Form

THE UNIVERSITY OF BRITISH COLUMBIA

Department of Language and Literacy Education
Faculty of Education, UBC
2034 Lower Mall
Vancouver, B.C. Canada V6T 1Z2
Tel: 604-822-zzzz
Fax: 604-822-zzzz
Email: xxxx.xxxx@ubc.ca

Consent Form for the Participants
“Critical Thinking in L2 Writing: Concept, Theory and Pedagogy”

Principal Investigator: Dr. Ling Shi
Professor, Department of Language and Literacy Education, Faculty of Education, University of British Columbia. Phone: (+1) 604-xxx-zzzz. Email: xxx@ubc.ca.

Co-Investigator: Yanning Dong
PhD Candidate, Department of Language and Literacy Education, Faculty of Education, University of British Columbia. Phone: (+1) 778-xxx-zzzz. Email: xxxxx@gmail.com.

Dear student,

You are sincerely invited to participate in the project entitled “Critical Thinking in L2 Writing: Concept, Theory and Pedagogy”. This study intends to explore effective ways to guide second language learners to explore the meaning of critical thinking and to apply critical thinking to the development of ideas and the evaluation of the quality of ideas in writing. The study aims at helping second language learners to write better in that language by improving their critical thinking abilities.

Questionnaire: If you are willing to participate, you will complete a questionnaire. The questionnaire takes about 15 minutes to complete. The questionnaire collects information on your knowledge of critical thinking and your understanding of the connection between critical thinking and second language writing.

Interview: You may also be invited to participate in an interview to talk about your learning experience. The interview will take about 30 minutes.
Study procedure:
If you choose to participate in the study, you will be asked to fill out a questionnaire on your knowledge of critical thinking and some related information concerning your learning of English writing. You will be asked to write four 250-word essays in the following seven weeks. Your essays and your in-class worksheets will be collected and analyzed. Some of you will also be invited to participate in an audio-recorded interview at the end of the study.

Amount of time required:
About 15 minutes for the questionnaire and 30 minutes for the interview. If you decide to participate in the study, you will also attend a 100-minute English Writing course each week for six weeks. The total time involved will be 11 hours at most.

Participation and confidentiality:
Your participation is completely voluntary and there are no consequences for choosing not to participate in the study or withdrawing from the study at any time. All the information collected from the questionnaire survey and interview will be kept strictly confidential. Only the researchers will have the access to the information you provide. All the research data will be kept in secure storage and will be destroyed after the completion of the whole project.

Compensation and potential benefits:
To thank you for your participation in the study, I will provide you with some small gifts such as beautiful bookmarks or Canadian souvenirs. I will also provide free tutoring to comment on your writing or answer your questions about your learning of writing.

Contact for further information about the study:
If you want to know more about the study, please contact the researcher Yanning Dong at xxxxx@gmail.com.

Contact for concerns about the rights of research subjects:
If you have any concerns about your rights as a research subject, please contact the UBC Office of Research Services at (+1) 604-822-8581, or send emails to ors@ors.ubc.ca.

Please sign on the next page of the consent form if you decide to participate in the study and then return a copy of that page to the researcher.

Thank you in advance for participating in this study!

Sincerely,
Yanning Dong
Dear researchers,

I have read the consent form and understand that my participation in this study is completely voluntary and that I have the right to refuse to participate in or withdraw from the study at any time during the study without any consequences. I understand that my identity and the information that I provide will be kept strictly confidential and in secure storage. I realize that I can also ask for further information if I have questions about the study or concerns about the rights as a research subject.

I agree to participate in this study. I acknowledge having received a copy of the consent form.

Name (print): ________________________

Signature: ___________________________

Date: _______________________________
## Appendix C
### IELTS Writing Task 2 Band Descriptors

<table>
<thead>
<tr>
<th>Band</th>
<th>Task response</th>
<th>Coherence and cohesion</th>
<th>Lexical resource</th>
<th>Grammatical range and accuracy</th>
</tr>
</thead>
</table>
| 9    | • fully addresses all parts of the task  
      • presents a fully developed position in answer to the question with relevant, fully extended and well supported ideas  
      • uses cohesion in such a way that it attracts no attention  
      • skillfully manages paragraphing | • uses a wide range of vocabulary with very natural and sophisticated control of lexical features; rare minor errors occur only as ‘slips’ | • uses a wide range of structures with full flexibility and accuracy; rare minor errors occur only as ‘slips’ |
| 8    | • sufficiently addresses all parts of the task  
      • presents a well-developed response to the question with relevant, extended and supported ideas  
      • sequences information and ideas logically  
      • manages all aspects of cohesion well  
      • uses paragraphing sufficiently and appropriately | • uses a wide range of vocabulary fluently and flexibly to convey precise meanings  
      • skillfully uses uncommon lexical items but there may be occasional inaccuracies in word choice and collocation  
      • produces rare errors in spelling and/or word formation | • uses a wide range of structures  
      • the majority of sentences are error-free  
      • makes only very occasional errors or inappropriacies |
| 7    | • addresses all parts of the task  
      • presents a clear position throughout the response  
      • presents, extends and supports main ideas, but there may be a tendency to over-generalise and/or supporting ideas may lack focus  
      • logically organises information and ideas; there is clear progression throughout  
      • uses a range of cohesive devices appropriately although there may be some under-/over-use  
      • presents a clear central topic within each paragraph | • uses a sufficient range of vocabulary to allow some flexibility and precision  
      • uses less common lexical items with some awareness of style and collocation  
      • may produce occasional errors in word choice, spelling and/or word formation | • uses a variety of complex structures  
      • produces frequent error-free sentences  
      • has good control of grammar and punctuation but may make a few errors |
| 6    | • addresses all parts of the task although some parts may be more fully covered than others  
      • presents a relevant position although the conclusions may become unclear or repetitive  
      • presents relevant main ideas but some may be inadequately developed/unclear  
      • arranges information and ideas coherently and there is a clear overall progression  
      • uses cohesive devices effectively, but cohesion within and/or between sentences may be faulty or mechanical  
      • may not always use referencing clearly or appropriately  
      • uses paragraphing, but not always logically | • uses an adequate range of vocabulary for the task  
      • attempts to use less common vocabulary but with some inaccuracy  
      • makes some errors in spelling and/or word formation, but they do not impede communication | • uses a mix of simple and complex sentence forms  
      • makes some errors in grammar and punctuation but they rarely reduce communication |
<table>
<thead>
<tr>
<th>Band</th>
<th>Task response</th>
<th>Coherence and cohesion</th>
<th>Lexical resource</th>
<th>Grammatical range and accuracy</th>
</tr>
</thead>
</table>
| 5    | • addresses the task only partially; the format may be inappropriate in places  
      • expresses a position but the development is not always clear and there may be no conclusions drawn  
      • presents some main ideas but these are limited and not sufficiently developed; there may be irrelevant detail | • presents information with some organisation but there may be a lack of overall progression  
      • makes inadequate, inaccurate or over-use of cohesive devices  
      • may be repetitive because of lack of referencing and substitution  
      • may not write in paragraphs, or paragraphing may be inadequate | • uses a limited range of vocabulary, but this is minimally adequate for the task  
      • may make noticeable errors in spelling and/or word formation that may cause some difficulty for the reader | • uses only a limited range of structures  
      • attempts complex sentences but these tend to be less accurate than simple sentences  
      • may make frequent grammatical errors and punctuation may be faulty; errors can cause some difficulty for the reader |
| 4    | • responds to the task only in a minimal way or the answer is tangential; the format may be inappropriate  
      • presents a position but this is unclear  
      • presents some main ideas but these are difficult to identify and may be repetitive, irrelevant or not well supported | • presents information and ideas but these are not arranged coherently and there is no clear progression in the response  
      • uses some basic cohesive devices but these may be inaccurate or repetitive  
      • may not write in paragraphs or their use may be confusing | • uses only basic vocabulary which may be used repetitively or which may be inappropriate for the task  
      • has limited control of word formation and/or spelling; errors may cause strain for the reader | • uses only a very limited range of structures with only rare use of subordinate clauses  
      • some structures are accurate but errors predominate, and punctuation is often faulty |
| 3    | • does not adequately address any part of the task  
      • does not express a clear position  
      • presents few ideas, which are largely undeveloped or irrelevant | • does not organise ideas logically  
      • may use a very limited range of cohesive devices, and those used may not indicate a logical relationship between ideas | • uses only a very limited range of words and expressions with very limited control of word formation and/or spelling  
      • errors may severely distort the message | • attempts sentence forms but errors in grammar and punctuation predominate and distort the meaning |
| 2    | • barely responds to the task  
      • does not express a position  
      • may attempt to present one or two ideas but there is no development | • has very little control of organisational features | • uses an extremely limited range of vocabulary; essentially no control of word formation and/or spelling | • cannot use sentence forms except in memorised phrases |
| 1    | • answer is completely unrelated to the task | • fails to communicate any message | • can only use a few isolated words | • cannot use sentence forms at all |
| 0    | • does not attend  
      • does not attempt the task in any way  
      • writes a totally memorised response | | | |

Appendix D
Interview Guidelines

Interview guideline A (for the experimental group)

1) Do you think you have a different understanding of critical thinking now? (If yes, what’s the difference?)

2) Please comment on your experience of the brainstorming activity.

3) What’s the role of brainstorming on your drafting?

4) What’s the role of brainstorming on your critical thinking?

5) Please comment on your experience of the peer review activity.

6) What’s the role of peer review on your revision?

7) What’s the role of peer review on your critical thinking?

8) What do you think is the relationship between critical thinking and English writing? (Why?)

9) What’s your overall evaluation of this approach that you have just followed?

Interview guideline B (for the control group)

1) Please comment on your experience of the brainstorming activity.

2) What’s the role of brainstorming on your drafting?

3) Please comment on your experience of the peer review activity.

4) What’s the role of peer review on your revision?

5) What’s your overall evaluation of this approach that you have just followed?
访谈提纲 A（实验组）

1) 你是否觉得现在自己对 critical thinking 有了不同的理解？
   （如果是，不同之处是什么？）

2) 请评论一下你对于头脑风暴活动的体验和感受。

3) 头脑风暴活动对于你写初稿有什么影响？

4) 头脑风暴活动对于你训练 critical thinking 有什么影响？

5) 请评论一下你对于同伴互评活动的体验和感受。

6) 同伴互评活动对于你修改初稿有什么影响？

7) 同伴互评活动对于你训练 critical thinking 有什么影响？

8) 你认为 critical thinking 与英语写作之间的关系是怎样的？（为什么？）

9) 你对于这几次课中使用的教学方法的总体评价是什么？

访谈提纲 B（控制组）

1) 请评论一下你对于头脑风暴活动的体验和感受。

2) 头脑风暴活动对于你写初稿有什么影响？

3) 请评论一下你对于同伴互评活动的体验和感受。

4) 同伴互评活动对于你修改初稿有什么影响？

5) 你对于这几次课中使用的教学方法的总体评价是什么？
Appendix E
Letter of Initial Contact

THE UNIVERSITY OF BRITISH COLUMBIA

Department of Language and Literacy Education
Faculty of Education, UBC
2034 Lower Mall
Vancouver, B.C. Canada V6T 1Z2
Tel: 604-822-xxxx
Fax: 604-822-xxxx
Email: xxxx.xxxx@ubc.ca

Prof. Shi Gengshan
Hebei University of Technology
No.8 Guangrongdao, Hongqiao District
Tianjin, 300130, P.R. China

June 10, 2013

Dear Prof. Shi,

I am a PhD student from the University of British Columbia. I am writing to ask for your permission to conduct my doctoral study in your university. The study, which is entitled “Critical Thinking in L2 Writing: Concept, Theory and Pedagogy”, intends to explore effective ways to guide second language learners to explore the meaning of critical thinking and to apply critical thinking to the development of ideas and the evaluation of the quality of ideas in writing. The study aims at helping second language learners to write better in that language by improving their critical thinking abilities.

I am looking for some second year English major undergraduate students to participate in this study. I believe that the participants of the study will get an opportunity to know more about the concept of critical thinking and get some chances to practice using it in their writing process. Attached is the procedure of the study. Please let me know if we can meet to discuss the details.

Thank you very much for your consideration. Your support is highly appreciated.

Sincerely,

Yanning Dong
Language and Literacy Education
Faculty of Education, UBC
Appendix F
Letter of Permission

No.5340 Xiping Road, Beichen District,
Tianjin, 300401, P.R. China

June, 20, 2013

Dear the UBC Office of Research Ethics:

This letter is to show our permission to Yanning Dong to conduct her doctoral study titled “Teaching Critical Thinking in L2 Writing: Concept, Theory and Pedagogy” in our university. Our university offers English Writing course for English major undergraduate students. I believe that Ms Dong will find rich resources in our university to conduct her study. The exploration of the conceptual, theoretical and pedagogical perceptions of critical thinking in an L2 writing context is certainly a meaningful topic and the result will be a great contribution to actual teaching practices. My colleagues and I will provide any possible convenience to Ms Dong for her research in our university. Should you have any questions regarding this letter, please do not hesitate to contact me.

Sincerely,

Shi Gengshan
Director
School of Foreign Languages
Hebei University of Technology
(Email: shigengshan1972@163.com, Tel: 86-022-60435659)
Appendix G
Two Example Essays for Task 3

Task requirement (Task 3):

You have been invited by 21st Century to write your opinion on the following issue for a column called “Opinion” in this newspaper:

*Nowadays, a lot of people enjoy online shopping. However, when shopping for clothes, some people consider it better to buy them in physical stores rather than in online stores.*

To what extent do you agree or disagree? Give appropriate reasons and try to persuade your audience of your viewpoint. Write about 250 words.

Example 1 (An essay written by a participant from the experimental group)

With the development of the Internet and the rising of living standards, shopping online becomes more and more popular. Nowadays, many people prefer to shop on the Internet. But some people think it is better to buy clothes in physical stores rather than in online stores. In my opinion, shopping for clothes online has more advantages than shopping in physical stores.

First of all, many people do not have enough time to go shopping outside. Many people, especially youngsters, who are busy working or studying the whole day and sometimes work overtime or even stay up late, tend to buy clothes online so that they can have more time to rest. For them, shopping for clothes online is much more convenient.

Secondly, clothes in online stores are usually cheaper than those in physical stores. In general, online stores do not need so much cost as physical stores. Physical stores have to pay for the rent, tax and a lot of other expenses. So the sellers need improve the price of clothes to ensure their profits. Moreover, online stores often take the clothes directly from the factories. In a word, shopping for clothes online is much more economical.
Finally, although online shopping has some disadvantages, we can avoid these problems. For example, you can consult the sellers about the size and other important information in detail and look through the remarks of the clothes, so that you can find the right clothes for you even if you cannot actually see them before buying.

To conclude, shopping for clothes online is convenient and economical. You can spend less time, energy and money. As far as I am concerned, when shopping for clothes, it is better to buy them online rather than in physical stores.

Example 2 (An essay written by a participant from the control group)

Nowadays, the development of science and technology is more and more quickly, the internet is becoming more and more popular. A lot of people enjoy online shopping today, so do I. There are many benefits.

When shopping online, you do not need to go outdoors. With only a few clicks of the mouse, you can go online to buy just about anything you want. It is quick, easy. How convenient!

Shopping online is much cheaper than shopping in physical stores. Except for the product fee itself, there are much less other fees on it. That is very economical.

Shopping online can save a lot of time for you. You do not have to spend a long time going shopping, just stay at home you will buy the things you want to buy.

Besides, in online stores, there are a wide range of products, you can buy whatever things you want, even though they cannot be found in physical stores. That can save a lot of troubles.

Online shopping has become an indispensable part of people’s life. It is convenient, economical, can save both money and time and so on. I hope everyone can enjoy their online shopping experience.