A Case Study of University Instructors’ Perceptions and Teaching Practices of Critical Thinking in China

Liu, Xiaoli

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A Case Study of University Instructors’ Perceptions and Teaching Practices of Critical Thinking in China

by

Xiaoli Liu

A THESIS
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Abstract

Cultivating students’ critical thinking abilities has become a national and an institutional priority in higher education in China. Although China has emphasized critical thinking in its educational policy and implementation for many years, Chinese students were still often reported as lacking critical thinking competences. Research is needed to explore how that may transpire in the teaching and learning context in China. However, there is a scarcity of studies about instructors’ perceptions of critical thinking. Particularly, the voice of Chinese instructors is missing. To address this gap, this study explored instructors’ perceptions and teaching practices of critical thinking at one university in China. It drew from Thomas’ (1997, 2002) culturally appropriate pedagogy framework and adopted a qualitative case study methodology. 24 instructors and eight students from NU (WH), China, participated in the study. Data for the study were collected from multiple sources: semi-structured interviews with twenty-four instructors, one focus group with four instructors, and four class observations. Eight students were also interviewed to supplement the instructor interviews. Data were analyzed through open and thematical coding, within the framework of culturally appropriate pedagogy, from contextual, epistemological, personalistic, and process components. Findings revealed that instructors’ disciplinary affiliations were more likely to influence their perceptions of critical thinking. Findings showed that instructors’ interpretations of critical thinking demonstrated Chinese characteristics such as holistic, community-centered, and knowledge accumulation as a foundation for critical thinking. Findings also indicated that Chinese instructors adopted a combination of lecture-based teaching with
student-centered pedagogies to foster students’ critical thinking. This study suggests that there is a need to consider sociocultural contexts in teaching critical thinking. Other implications for policies, curricula, and pedagogies for critical thinking are also discussed.

*Key words:* critical thinking, Chinese instructor, culturally appropriate, pedagogy reform
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Chapter 1 Introduction

1.1 Background

“Critical thinking is reasonable reflective thinking focused on deciding what to believe or do” (Ennis, 2015, p. 32). Recently, critical thinking is widely accepted as a primary goal of higher education all over the world. Effective communication, problem-solving skills, and mastery of content, all require critical thinking (Paul, 2011). The 21st century skills include critical thinking as one of the four “Cs” skills (critical thinking, creativity, communication, and collaboration) as preparation for both higher education and workforce (Kivunja, 2015). In China, the outline of the national medium and long-term educational reform and development plan (2010-2020) (国家中长期教育改革和发展规划纲要 2010-2020年) puts forward the requirement of cultivating creative and innovative capacities (MOE, 2010). Later, the overall program plan of promoting world-class universities and disciplines (统筹推进世界一流大学和一流学科建设总体方案), highlights that the core task of higher education is to strengthen innovation and entrepreneurship education. To achieve the mission, universities should vigorously promote personalized training and enhance students’ international perspective, scientific spirit and entrepreneurial awareness, and creativity (State Council of PRC, 2015a).

Although the exact words of “critical thinking” did not appear in China’s central policies, it showed up in the form of creativity, innovation or entrepreneurship. “Creative” is often considered to be the higher level of critical thinking (Anderson & Krathwohl, 2001; Krathwohl, 2002). The education goals in higher education of China emphasized developing students’
independent learning and thinking abilities, which were the foundations of being innovative (State Council of PRC, 2015b). The National Education Goals Panel of the United States wrote educational goals that college graduates could demonstrate an advanced ability in critical thinking, communication, and problem solving (National Education Goals Panel, 1995). More recently, the common core state standards emphasized critical thinking skills (National Governors Association, 2010). In Canada, the Conference Board declared the necessity of improving Canadian critical thinking skills to keep the competitive advantages in the knowledge-based global economy (Bloom & Watt, 2003; Abrami et al., 2008). In the UK, critical thinking skills were defined as one of the standard achievements and attributes of postgraduates by the Quality Assurance Agency for British higher education (Zhang, 2016).

Not only do world policy makers and educators value critical thinking as outcomes of higher education, they also endorse the instruction of critical thinking in practices. Many North American colleges and universities offer courses to specifically enhance students to think critically, as part of the general education requirements (Halpern, 1999). Educators agree with the essentiality of developing critical thinking skills in academic learning. Institutions put effort on shifting instructional paradigms from “what to think” to “how to think” (Daud & Husin, 2004). Academics in education try to reflect on how to facilitate students’ critical thinking skills through pedagogy.
1.2 Problem statement

Cultivating students’ critical thinking abilities is regarded as one of the most important aims of education (Abrami et al., 2008; Manalo et al., 2015). Recently, with the emphasis of critical thinking in China, many universities started to incorporate critical thinking in different courses. For Chinese instructors, does critical thinking mean the same thing compared to their Western counterparts? How do Chinese instructors understand critical thinking and teach critical thinking in practice?

Meanwhile, the extant literature presented a debate about Chinese students’ critical thinking. On one hand, Western university professors said that Chinese students are less likely to participate in classroom discussions and have difficulty in openly expressing themselves (Robertson et al., 2010). Moreover, some researchers from China stated that critical thinking was not often encouraged in Chinese classrooms. Chinese teachers were trained to focus on the text and do not challenge the types of text approved by the Ministry of Education. Memorizing is a normal routine in Chinese classrooms (Wang et al., 2013). On the other hand, some studies argued that Chinese students’ critical thinking may not be recognized because students express it differently than their Western counterparts (e.g., Durkin, 2008a; Paton, 2011; Lun, Fischer, & Ward, 2010). Lun, Fischer and Ward (2010) reported that Chinese students’ critical thinking style tended to be more dialectical. In their study, they defined a dialectical thinker to be more tolerant of contradictions and perceive more changes and interrelation among things. Dialectical thinkers use more intuitive and experience-based reasoning than formal reasoning strategies.
example, dialectical thinkers would agree with the statements: “When I hear two sides of an argument, I often agree with both”, “I often find that my beliefs and attitudes will change under different contexts” (Lun, Fischer, & Ward, 2010, p. 607).

Personally, I graduated with a master’s degree in foreign language teaching and have been teaching English at the participating university for about twelve years. I have acquired rich experience of teaching and learning the English language in China. Critical thinking was often mentioned in my teaching experience. However, during my study experience in a North American doctoral program, I struggled with how to be critical and how to find my own voice in classes. This brought me to think about why Chinese students were considered lacking critical thinking. In one of my own examples, I wrote a self-reflection assignment in a methodology course. In this writing task, I initially thought all the methods had their limitations and cannot be applied to every circumstance. So instead of discussing the limitations, I focused on finding the relation between the research method and the application. However, my way of expressing opinions was not recognized as self-reflection but as summary, just restating the author’s words. This personal experience inspired me to study about Chinese instructors’ perception of critical thinking and how they actually teach critical thinking.

1.3 Purpose of the study

There is a scarcity of studies about instructors’ perceptions of critical thinking (e.g., Alazzi, 2008; Choy & Cheah, 2009; Stedman & Adams, 2012). Particularly, the voice of Chinese instructors is missing. Students’ perceptions, abilities and practices of critical thinking have been
well studied. Therefore, this qualitative case study intended to explore Chinese instructors’ interpretation of critical thinking and how critical thinking was integrated in their teaching practices. It intended to identify how the instructors’ perceptions of critical thinking influence their pedagogy, and to explore the Chinese features of teaching critical thinking.

To shed some light on Chinese culturally specific critical thinking, this study was undertaken among instructors at a university in China, North University (NU, pseudonym). NU belongs to one of the top tier Project 211 Universities in China. Project 211 means preferentially developing about 100 national key universities and colleges and intends to raise their education and research standards to be first-class in the world in the twenty-first century. The project was initiated in 1995 by the Ministry of Education of China. It had provided financial and strategic supports to 112 universities till now. Therefore, NU served as a good example of how critical thinking was understood by instructors and taught in Chinese higher education institutions. Also, NU particularly emphasized critical and creative thinking in its current five-year academic strategic plan.

This study tried to address the challenge of providing culturally appropriate critical thinking instruction to Chinese students in higher education (both local and international). It also intended to reflect Chinese cultural and educational characteristics through the voice of instructors and to explore how instructors interpret critical thinking in their own teaching practice. Therefore, this qualitative case study was guided by the following three research questions:

1) What are instructors’ perceptions of critical thinking?
2) How is critical thinking reflected in the instructors’ teaching practices?

3) How do instructors’ educational backgrounds and experience influence their perceptions and teaching practices of critical thinking?

1.4 Theoretical framework

To frame this study of exploring culturally appropriate critical thinking instruction, Thomas’ (1997, 2002) culturally appropriate pedagogy was employed. The culturally appropriate pedagogy has drawn interest in educational research since the 1990s. It answered the need for a new pedagogy taking cultural factors into account, especially when importing Western educational concepts and practices into developing areas of the world. More recently, in the field of education, it became a pronounced trend of catching up with the modern or “Western” standards. Developing countries, like China, were trying to reform education systems by applying new educational theories (Nguyen, Terlouw, & Pilot, 2006). Due to the distinctiveness of the local culture of China, Western approaches cannot be simply copied. Culturally appropriate pedagogy regarding critical thinking instruction in China was a good fit to bridge new values and knowledge with local contexts, as it required educators to “develop positive yet critical attitudes” on their teaching practices when adopting new pedagogies (Thomas, 1997, p. 25).

Thomas’ model probed how a culturally appropriate pedagogy could accommodate sociocultural specific values from four essential components (see Figure 1). The epistemological component refers to “the knowledge base which all teachers need” (Thomas, 2002, p. 172). It
also includes a teacher’s pedagogic framework such as a learner-centered or a subject-centered approach. The process component refers to general educational activities related to classroom decision making. The contextual component includes the sociocultural matrix, such as language, religion, and cultural tradition, which give a unique profile to the practice and development of pedagogy in any culture. The personalistic component refers to the teachers’ personal development. The four pedagogy components integrate with one another. They highlight the role that culturally specific knowledge, behavior, attitude, and skills play in pedagogy.

There are six influencing factors that affect pedagogical components in different ways, including political, economic, societal, professionalism, research, and culture innovation factors. The political and the economic factors have the most potent effect on pedagogy, for all of the pedagogy components are influenced eventually by political and economic decisions. Political factors would affect the selection of educational philosophy. Economic factors may determine class sizes and classroom equipment and further influence the process component. Societal factors require the pedagogy and the curriculum to meet the need of societal development. Professionalism and research innovation can ensure the future quality of pedagogy and especially affect the epistemological and personalistic components. The cultural factors play important roles in developing meaningful and effective pedagogy.
This model also suggests two prerequisites; cultural analysis and cultural selectivity. Cultural analysis includes identification of needs and goals, and also examines the cultural context of a particular group. Furthermore, the cultural selectivity stage should employ the outcomes of cultural analysis and provide knowledge and experiences for making the pedagogical components more appropriate to cultural needs. The two pre-requisites help to reinforce the impact of the cultural factors on the pedagogical components.

In this study, all of the four major components were used to guide the discussion section for a deeper understanding of findings. Discussions were constructed in a more comprehensive way, in which the six influencing factors were embedded. Not all subthemes under each component
were applied. And only those themes related to the findings were addressed. For instance, in the epistemological component, the disciplinary differences section presented the exploration of universal and subject knowledge; the “constructivism vs. Chinese social-cultural inheritances” section discussed the approaches to knowledge and knowledge of culture; the knowledge framework was not included in the discussion. The political, economic and societal factors were integrated into the discussion of contextual and process components, focusing on subthemes of value and attitudes, authority and justice patterns, and decision making. Factors of professionalism, research, and culture innovation were more embedded in the personalistic component, particularly related to the subthemes of self-development and self-esteem. Besides, in the discussion, the two prerequisites of cultural analysis and cultural selectivity were also engaged in the pilot study before the top-down policy implementation.

**Summary**

Cultivating students’ critical thinking abilities is considered to be one of the most important educational objectives around the world. Although China has put much emphasis on teaching critical thinking, Chinese international students were often reported to lack critical thinking skills necessary for academic success. Taking a qualitative case study approach, this study was undertaken to explore how critical thinking was taught in China from instructors’ perception. Framed by the culturally appropriate pedagogical model (Thomas, 1997, 2002), this study was expected to provide a cross-cultural explanation of Chinese features of critical thinking and to influence teaching practices by raising cultural awareness. The findings may add
to the current knowledge and practice regarding teaching critical thinking both in China and abroad.
Chapter 2 Literature Review

In this chapter, I try to conceptualize critical thinking, review recent main teaching approaches regarding critical thinking, examine the influencing factors of critical thinking from the Chinese background, and review the research and practice of critical thinking in modern China context.

2.1 Conceptualizing critical thinking

Although critical thinking has been widely accepted as an important goal in tertiary education, the definition of critical thinking as an academic term remains unclear in the literature (Barnett, 1997). Critical thinking does not clearly mean the same thing to different people (McPeck, 2016). The lack of consensus in defining critical thinking may result from different disciplines viewing critical thinking from different perceptions and therefore, drawing distinctive conclusions. Reflection on the literature, three theoretical traditions conceptualizing critical thinking were evident: philosophical, psychological, and educational approaches (Sternberg, 1986; Lai, 2011; Thomas & Lok, 2015).

Philosophical interest on critical thinking can be traced from Plato and Aristotle to more recent philosophers like Ennis, Lipman, and Paul. The philosophical approach evaluates the standards of critical thinking upon the requirement of a logical system (Sternberg, 1986). Ennis (2015) defined critical thinking as “reasonable reflective thinking focusing on deciding what to believe or do” (p. 32). Lipman (1987) stated critical thinking as “skillful, responsible thinking that facilitates good judgment because it relies upon criteria, is self-correcting, and is sensitive to
context” (p. 39). Paul (1992) emphasized critical thinking as the qualities of a thinking model, and defined critical thinking as “disciplined, self-directed thinking that exemplifies the perfections of thinking appropriate to a particular mode or domain of thought” (p. 9). Paul (1990) also stated the importance of morality and ethics in critical thinking. He argued that focusing on lower order thinking prevents understanding and leads to prejudice. However, critical thinking involved developing traits of mind, such as intellectual humility, that led critical thinkers to examine their biases and prejudices. Some working with this approach also interpreted critical thinking from the ideal critical thinker and identifies the characteristics of this ideal thinker. The American Philosophical Association portrays the ideal critical thinker as inquisitive in nature, open-minded, flexible, fair-minded, having a desire to learn, and being willing to consider diverse perspectives (Facione, 2011). By focusing on the qualities or standards of an ideal thinker or thought, the philosophical approach pays less attention to how the critical thinker can behave or think.

The cognitive psychological approach focused more on actions or behaviors critical thinkers can do, and typically included a list of skills or procedures performed by critical thinkers (Lewis & Smith, 1993). For instance, Sternberg (1986) explained critical thinking from the cognitive process, “the mental processes, strategies, and representations people use to solve problems, make decisions, and learn new concepts” (p. 3). Halpern (1998) defined critical thinking as “the use of those cognitive skills or strategies that increase the probability of a desirable outcome” (p. 450). Willingham (2007) defined critical thinking as “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”. However, Sternberg (1986) critiqued two aspects of the psychological approach.
One was that those behaviors or performance often derived from laboratory observations, and
may not apply to other conditions, especially in educational contexts. The other was that a list of
disconnected procedures oversimplified critical thinking from a complexity of knowledge and
skills into a list of disconnected procedures. Viewing critical thinking as a sequence of discrete
steps or skills was a misconception and derived from the behaviorist’s defining constructs
directly through observation (Bailin, 2002).

Unlike the other two traditions, the educational approach based on years of classroom
experience and observations of student learning (Sternberg, 1986), and focused on the critical
thinking development of individual students (Davies & Barnett, 2015). Hence, it provided
internal relationships of critical thinking behaviors, and it explored the sequence of how the
critical thinking skills were developing. For example, Bloom (1956) and his associates provoked
a taxonomy of cognitive information processing skills in hierarchical levels from lower to
higher: Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation. In
Bloom’s hierarchy, the higher level of cognition, the more critical thinking it contains. The last
three (Analysis, Synthesis, and Evaluation) were frequently viewed as critical thinking skills
(Kennedy et al., 1991). This hierarchical level provided a resource for the instruction and
assessment of critical thinking which was not tested as vigorously as in either a philosophical or
psychological approach (Sternberg, 1986). A wider interpretation of critical thinking in educational approaches included both the domain of action and the domain of thought. The ability to critical thinking ability was different from the disposition to do so (Ennis 1985; Facione 1990). The “spirit of critical thinking” referred to “taking nothing for granted or as being beyond question, and it is in an examination of the normally taken-for-granted appearance of the student’s world that we start” (Walker & Finney, 1999, p. 533). In the early 80’s, Ennis distinguished six critical dispositions from the 12 abilities to think critically. He modified the organization and words over years (1987; 1989; 1991; 1996; 2011; 2015), but the main ideas remain (see Table 2.1). Different from hierarchical levels, Ennis gave a “streamlined” definition of critical thinking, which meant that “reasonable reflective thinking focused on deciding what to believe or do.” (2015, p. 32)

Table 2.1 The taxonomy of critical thinking

<table>
<thead>
<tr>
<th>Critical thinking abilities</th>
<th>Critical thinking dispositions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. have a focus and pursue it,</td>
<td>1. seek and offer clear statements of the thesis or question,</td>
</tr>
<tr>
<td>2. analyze arguments,</td>
<td>2. seek and offer clear reasons,</td>
</tr>
<tr>
<td>3. ask and answer clarification questions,</td>
<td>3. try to be well informed,</td>
</tr>
<tr>
<td>4. understand and use graphs and maths,</td>
<td>4. use credible sources and observations, and usually mention them,</td>
</tr>
<tr>
<td>5. judge the credibility of a source,</td>
<td>5. take into account the total situation,</td>
</tr>
<tr>
<td>6. observe, and judge observation reports,</td>
<td>6. keep in mind the basic concern in the context,</td>
</tr>
<tr>
<td>7. use their background knowledge, knowledge of the situation,</td>
<td>7. be alert for alternatives,</td>
</tr>
<tr>
<td>8. deduce, and judge deductions,</td>
<td>8. be open-minded</td>
</tr>
<tr>
<td>9. make, and judge, inductive inferences and arguments (both</td>
<td>a. seriously consider other points of view,</td>
</tr>
<tr>
<td>enumerative induction and best-explanation reasoning),</td>
<td>b. withhold judgment when the evidence and reasons are insufficient,</td>
</tr>
<tr>
<td>10. make, and judge, value judgments,</td>
<td>9. take a position and change a position</td>
</tr>
</tbody>
</table>
11. define terms, and judge definitions, when the evidence and reasons are sufficient,
10. seek as much precision as the situation requires,
11. try to “get it right” to the extent possible or feasible, and
12. employ their critical thinking abilities.

13. attribute and judge unstated assumptions,
14. think suppositionally,

15. deal with fallacy labels.
16. be aware of, and check the quality of, their own thinking (metacognition),
17. deal with things in an orderly manner, and
18. deal with rhetorical strategies.

(Ennis, 2015, pp. 32-33)

A milestone in defining critical thinking from an educational approach appeared later in 1990. A panel of 46 experts from all over the United States and Canada, took part in a two-year research project about critical thinking. They came from different academic disciplines in the humanities, sciences, social sciences, and education. Their research concluded in the Delphi Report (Facione, 1990). In the report, they provided a definition of critical thinking, “purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based” (p. 3). Experts generated six core critical thinking skills (see Table 2.2). Most experts also agreed that besides critical thinking skills, critical thinking also involves dispositions. These dispositions were interpreted as “systematic, inquisitive, judicious, truth-seeking, analytical, open-minded, and confident in reasoning” (Facione, 2011). Although there were still disagreements among experts of the particular role
dispositions play, the Delphi Report provided a relatively clear and detailed definition of critical thinking. Additionally, the critical thinking framework based on the experts’ years of classroom experience and observations of student learning provided a rich source for critical thinking instruction and assessment.

Table 2.2 Core critical thinking skills

<table>
<thead>
<tr>
<th>Skill</th>
<th>Experts’ Consensus Description</th>
<th>Sub-skill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interpretation</td>
<td>“To comprehend and express the meaning or significance of a wide variety of experiences, situations, data, events, judgments, conventions, beliefs, rules, procedures, or criteria”</td>
<td>Categorize, Decode significance, Clarify meaning.</td>
</tr>
<tr>
<td>Analysis</td>
<td>“To identify the intended and actual inferential relationships among statements, questions, concepts, descriptions, or other forms of representation intended to express belief, judgment, experiences, reasons, information, or opinions”</td>
<td>Examine ideas, Identify arguments, Identify reasons and claims.</td>
</tr>
<tr>
<td>Inference</td>
<td>“To identify and secure elements needed to draw reasonable conclusions; to form conjectures and hypotheses; to consider relevant information and to reduce the consequences flowing from data, statements, principles, evidence, judgments, beliefs, opinions, concepts, descriptions, questions, or other forms of representation”</td>
<td>Query evidence, Conjecture alternatives, Draw logically valid or justified conclusions</td>
</tr>
<tr>
<td>Evaluation</td>
<td>“To assess the credibility of statements or other representations that are accounts or descriptions of a person’s perception, experience, situation, judgment, belief, or opinion; and to assess the logical strength of the actual or intended inferential relationships among statements, descriptions, questions, or other forms of representation”</td>
<td>Assess credibility of claims, Assess quality of arguments that were made using inductive or deductive reasoning.</td>
</tr>
<tr>
<td>Explanation</td>
<td>“To state and to justify that reasoning in terms of the evidential, conceptual, methodological, criteriological, and contextual considerations upon which one’s results were based; and to present one’s reasoning in the form of cogent arguments”</td>
<td>State results, Justify procedures, Present arguments.</td>
</tr>
<tr>
<td>Self-Regulation</td>
<td>“Self-consciously to monitor one’s cognitive activities, the elements used in those activities, and the results educed, particularly by applying skills in analysis, and evaluation to one’s own inferential”</td>
<td>Self-monitor, Self-correct.</td>
</tr>
</tbody>
</table>
judgments with a view toward questioning, confirming, validating, or correcting either one’s reasoning or one’s results”


2.2 Movements of critical thinking research and practices in higher education

Paul (2011) summarized three overlapping waves of critical thinking research and practice since 1970. Each wave represented a different study schedule and led to a different emphasis in practice. Each wave always laid the foundation for future work. The next wave can only accomplish its goals through the mastering of insights of the previous ones.

2.2.1 The first wave


- the design of individual courses in critical thinking or informal logic; the critique of formal logic as a tool for the analysis and assessment of “real world” reasoning and argumentation;
- the development of theories of fallacies in thought; the development of theories of informal logic, reasoning, persuasion, rhetoric, and argumentation, etc.; the exploration of philosophical issues raised by theories developed to account for informal logic, reasoning, and argumentation (para. 12).

Paul (2011) summarized the first movement as the stage of theory development. This wave emphasized skills in the identification and evaluation of logical structures, argumentation, and reasoning. Philosophers and their concerns mainly facilitated research and practice in this period. First wave researchers tended to focus only on examples of clear persuasion and argumentation and analyze them within a minimal context. They often perceived reasoning and logic from a
relatively narrow and technical way. In much of the research, critical thinking was not used as a core concept but a tool to analyze and evaluate how thinking worked in human feeling and behavior. Therefore, they may ignore the critical part of critical thinking, the logic of the language and the logic of the problem. Their research frameworks tended to be narrow and specialized.

In practice, formal and informal logic was introduced into curricula. The implication was to establish a general critical thinking course for first-year college students. The course aimed to equate new college students with the foundational skills to be successful in higher education. However, there was a contradiction between ideal theory and classroom practice. The ideas were broad and ambitious, while the practice was narrow and of limited success. These courses often used informal logic textbooks with unfamiliar vocabulary and sophisticated distinctions but little foster of deep internalization. Students found difficulties in internalizing too many terms and distinctions in a one-semester course. Furthermore, first-year students typically have a narrow understanding of their field. Consequently, there was the problem of knowledge and skills transfer. Students were often unclear about how to transfer their general critical thinking skills into learning other subjects. Therefore, most students just relied on their lower-order, survival skills, such as rote memorization and cramming again when they finished critical thinking courses (Paul, 2011).

2.2.2 The second wave

Critical thinking across the curricula across the grades, 1980-1993. Research concerned:
the development of a model for teaching critical thinking at some educational level or within some particular subject; the development of a theory of critical thinking within a given domain or subject; exploration of the relation of critical thinking to emotion, to the media, to problem-solving, to creative thinking, to sound business organization and management, to parenting, and to political and ideological agendas; research in cognitive psychology (para. 23).

The second wave was the period of diversity developing from various standpoints, including cognitive psychology, critical pedagogy, feminism, critical thinking in different fields (such as biology, business, or nursing), and missing elements from the first wave (such as emotion, intuition, imagination, creativity, etc.) It viewed the development of the student as a person rather than as a cognitive machine. It regarded critical thinking as an ideological issue, instead of one concerned with validity and reliability of arguments. One major difference between the first and second wave was the understanding of critical. In the first wave, it meant criticism, like identifying weaknesses in and correcting some claim or argument. While in the second wave, it meant critique, such as identifying dimensions of meaning that might be missing or concealed behind some claim or argument (Davies & Barnett, 2015).

In practice, educators began to realize that one critical thinking course did not make college students critical thinkers. The aims transformed from “How to design one isolated critical thinking course for all college students?” to “How to integrate critical thinking into instruction of all subjects and across all grade levels?”; from “What is informal logic, reasoning, and argumentation?” to “What is the role of emotion (or intuition, culture, gender, problem solving,
creative thinking, political and ideological positioning) in thinking?” (Paul, 2011).

Unfortunately, research in the second wave lacked shared intellectual traditions and tended to be more superficial, less integrated, and less coherent. Also, the gain was often too vague. They valued comprehensiveness at the expense of depth and rigor.

2.2.3 The third wave

Depth & comprehensiveness in theory & practice, 1990-present. Research concerned:

integrating the insights of first and second wave research; developing a theory of critical thinking that is rigorous and comprehensive; explicating intellectual standards that have general application both within and beyond academic environments; accounting for the appropriate role of emotion and values in thinking; understanding the leading role of thinking in the shaping of emotion and behavior; integrating the empirical work of cognitive psychology into critical thinking theory; establishing common denominator principles and standards within the field of critical thinking research and practice; developing effective assessment tools; identifying and critiquing pseudo-critical thinking models and programs. (para. 36)

The distinctive feature of the third wave is ongoing transcendence of the weaknesses of the first two waves, especially the first wave’s “rigor without comprehensiveness” and the second wave’s “comprehensiveness without rigor” (Davies & Barnett, 2015, p. 7). It is only just now beginning to emerge, and far from being achieved. Paul suggested the research agendas for the third wave going forward. It required researchers to think beyond their discipline or at least within their discipline but from a broader standpoint. It required that informal logicians move to
a broader conception of logic, a logic which accommodates the role of different disciplines, human emotions, behaviors, and imaginations. In practice, the main task is to provide a framework which could integrate theories into teaching and learning from a wider variety of human contexts.

2.3 Approaches to teaching critical thinking

Critical thinking instructions rose from the three theoretical frameworks and evolved into teaching methods. Here are four different teaching approaches, Bloom’s taxonomy, inquiry approach, collaborative learning and project-based learning, summarized to provide a deeper understanding of how instructing critical thinking can be embedded in higher education and moreover how the instruction can be implemented across disciplines.

2.3.1 Bloom’s taxonomy

Bloom’s taxonomy was one of the most influential works of critical thinking instruction (Paul, 1985). As reviewed before, Bloom’s taxonomy is a multi-dimension model of classifying thinking into linear hierarchical levels according to cognitive levels of complexity (Forehand, 2005). For decades, the levels have often been depicted as a stairway, presenting educators with a frame of instructional objectives of planning, teaching, and assessing.

Anderson and Krathwohl et al. (2001) revised the original version (see Figure 2). The revised version contains two dimensions: knowledge and cognitive processes. The new knowledge dimension mainly resembles the original category of knowledge. It involves the original three subcategories: factual knowledge, conceptual knowledge, procedural knowledge,
and adds the fourth category, metacognitive knowledge: 1) Factual knowledge includes the knowledge of terminology, specific details, and elements; 2) Conceptual knowledge involves the knowledge of classifications, categories, principles, generalizations, theories, models, and structures; 3) Procedural knowledge covers the knowledge of subject-specific skills, algorithms, subject-specific techniques and methods, and criteria for determining when to use appropriate procedures; 4) Metacognitive knowledge includes strategies, appropriate contextual and conditional knowledge, and self-knowledge (Krathwohl, 2002).

Figure 2 Terminology changes in Bloom’s revised taxonomy

The cognitive dimension resembles six categories of the original version. However, they use action words to describe the cognitive processes instead of nouns. The knowledge category was renamed to remembering. The comprehension category is changed to understanding for the teachers’ preference in practice. Moreover, the synthesis category is restated to creating and moved to the top. The six new categories are also arranged in a hierarchical structure, but not as
Bloom’s taxonomy provided a simple and versatile model for critical thinking instruction. It presented a clear, concise visual representation of the alliance between instructional standards and goals, objectives, products, and activities (Krathwohl, 2002). According to this model, the learning process occurred linearly and hierarchically. Before learners can engage in more sophisticated and creative learning such as analysis, synthesis, and evaluation, they must grasp simplistic learning, such as concrete knowledge, comprehension, and application. The clear linear and hierarchical approach was a necessity for helping classroom teachers to make decisions about how to arrange their class. And also, the model could be applied to all levels of education, from kindergarten through higher education, as well as across disciplines (Nentl & Zietlow, 2008).

2.3.2 Inquiry approach

Research shows that the inquiry approach is an effective way to teach students critical thinking across disciplines. The inquiry approach in this study refers to an umbrella term of pedagogical approaches which give students opportunities to address questions, to investigate issues and to solve problems (Aditomo, et al., 2013). As “raising and solving complex issues is an essential component in critical thinking”, inquiry approaches utilize asking questions to find truth and knowledge and to develop the ability to find and to solve complicated problems (Donald, 2002, p. 7).

King worked on how inquiry-based instruction stimulates critical thinking in both K-12 and
higher education (1990; 1992; 1994; 1995; 2002; King, Staffieri, & Adelgais 1998). Her work focused on techniques of using stemming questions as discussion starters to guide learning. King (1995) designed an inquiry-based approach to promote students’ critical thinking. This model emphasized autonomous learning by helping students develop a habit of inquiry. In many inquiry-based approaches, instructors ask leading questions to elicit information, inferences, predictions, and so on. In King’s model, on the contrary, students learn how to ask thought provoking questions by themselves autonomously, no matter if they are in individual study settings like reading at home, or in cooperative learning contexts such as participating in a group discussion in the classroom. “In any classroom, the level of thinking that occurs is influenced by the level of questions asked” (p 13). Critical-thinking questions, such as “how it is different between … and …? Explain how … facilitate problem solving in the following scenario”, could provoke critical thinking. Because it requires students to go beyond facts, and to think in ways different from being explicated in class or the text. Critical-thinking questions activate critical thinking in both the questioner and the responder. Students are not merely looking for correct answers but putting forward or answering questions that address their own lack of understanding, gap in knowledge, and misconceptions. The questioning and answering activity help students make mental connections between concepts, then those concepts are more memorable for them. Meanwhile, such connections contribute to creating complex, higher order cognitive thinking in students which gradually develop inquiry habit to elaborate continuing inquiry into the content area (King, 2002).
Garrison, Anderson and Archer (2001) developed a *Practical Inquiry Model*. The practical inquiry model reflected the cognitive presence of the critical thinking process and provided practical steps for educators in higher education to adopt in curricula. This model states two dimensions, the “continuum between action and deliberation” and the “transition between the concrete and abstract worlds” (p 9). Moreover, the model defines four essential phases of describing and understanding the cognitive presence in educational contexts.

1) *Triggering event* is a problem-posing event. It means to identify or recognize dilemmas, or problems from experience. In educational settings, teachers often explicate learning challenges or tasks that become triggering events. Teachers play a role in initiating, framing and conceivably distracting, triggering events to keep focused on the teaching objectives. Before the “exploration” stage, students are expected to comprehend or seize the nature of the problems for a deeper exploration of related information.

2) *Exploration* is a search for relevant information. It refers to shifting between the private, reflective world of the individual and the social exploration of ideas. “Exploration” happens through inquiry between critical reflection and discourse and is often in the form of brainstorming questions and communication. In the end, students often select issues relevant to the problems.

3) *Integration* depicts the construction of a possible solution. It includes forming meaning of the ideas generated from the exploration stage. Students start with assessing how well these ideas relate and explain the issue or event under consideration. For instance, analyzing
misconceptions, presenting probing questions, giving comments, and modeling critical thinking processes could be applied in instruction.

4) Resolution refers to the process of critical assessment. It usually involves tests using thought experiments and consensus building within the community of inquiry. It also requires applications of the new knowledge. At the end of this phase, students are supposed to acquire enough knowledge to move on to new problems or triggering new events. Therefore, the whole process will start over and form a logical inquiry cycle.

A systematic procedure for categorizing assigning data in text-based educational settings, especially in distance education, are also presented in this model (see Table 2.3). The criteria for categorizing data provides methods and rules to evaluate students’ critical thinking development and to curriculum design and evaluation as well.

Table 2.3 Data categorizing

<table>
<thead>
<tr>
<th>Phrases</th>
<th>Descriptor</th>
<th>Indicators</th>
<th>Sociocognitive Processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triggering Events</td>
<td>Evocative</td>
<td>Recognizing the problem</td>
<td>Presenting background information that culminates in a question</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sense of puzzlement</td>
<td>Asking questions</td>
</tr>
<tr>
<td>Exploration Inquisitive</td>
<td></td>
<td>Divergence within the online community</td>
<td>Messages that take discussion in new direction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Divergence within a single message</td>
<td>Unsubstantiated contradiction of previous ideas</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Information exchange</td>
<td>Many different ideas/themes presented in one message</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Suggestions for consideration</td>
<td>Personal narratives/descriptions/facts (not used as evidence to support a conclusion)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Author explicitly characterizes message as exploration—e.g., “Does that seem about right?”</td>
</tr>
</tbody>
</table>

“Am I way off the mark?”

<table>
<thead>
<tr>
<th>Integration</th>
<th>Tentative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convergence among group members</td>
<td>Reference to previous message followed by substantiated agreement, e.g., “I agree because...”</td>
</tr>
<tr>
<td>Convergence with in a single message</td>
<td>Building on, adding to others’ ideas</td>
</tr>
<tr>
<td>Connecting ideas, synthesis</td>
<td>Justified, developed, defensible, yet tentative hypotheses</td>
</tr>
<tr>
<td>Creating solutions</td>
<td>Integrating information from various sources—textbook, articles, personal experience</td>
</tr>
<tr>
<td>Resolution</td>
<td>Committed</td>
</tr>
<tr>
<td>Vicarious application to real world</td>
<td>Explicit characterization of message as a solution by participant</td>
</tr>
<tr>
<td>Testing solutions</td>
<td>None Coded</td>
</tr>
<tr>
<td>Defending solutions</td>
<td></td>
</tr>
</tbody>
</table>

(Garrison, Anderson & Archer, 2001, pp. 15-16)

### 2.3.3 Cooperative learning approach

Cooperative learning refers to students working in groups to achieve a common goal (Gokhale, 1995). The cooperative learning approach is rooted in Piagetian and Vygotskian traditions in which social interactions were valued for promoting higher-level cognitive thinking development (Dillenbourg et al., 1996; Lai, 2011). Both Piaget and Vygotsky highlighted the potential for cognitive improvement through interaction among students (Dillenbourg et al., 1996; Lai, 2011). Piaget emphasized the instructional value of cognitive conflict for catalyzing
growth, typically achieved by interacting with another person at a higher developmental stage. Vygotsky identified the Zone of Proximal Development (ZPD) as the distance between what an individual can accomplish alone and what he/she can accomplish with the help of a more capable other (either a peer or an adult). Students are capable of performing at higher intellectual levels in cooperative situations than working individually (Vygotsky, 1978).

Group diversity regarding experience and knowledge benefits the learning process (Gokhale, 1995). Through cooperative learning methods, students met different interpretations of the given situation which could improve their intellectual functioning. The peer support system helped students to internalize both external knowledge and critical thinking skills and to convert them into tools for problem-solving (Bruner, 1985). Several studies demonstrated the effect that cooperative learning enhanced critical thinking (Bailin et al., 1999; Cooper, 1995; Gokhale, 1995; Nelson, 1994; Paul, 1992; Thayer-Bacon, 2000). Abrami and his colleagues (2008) conducted a meta-analysis on 117 critical thinking studies. They found that cooperative learning among students appeared to provide some advantages in developing critical thinking skills.

Many cooperative learning structures functioned in the model-practice-feedback loop. Students seek out model information from individual readings, teachers’ lectures, or other sources. Moreover, they practice or apply this information to group members. Meanwhile, they receive feedback from other group members or teachers, who are concerned with the adequacy of their verbal and written responses. In this properly structured cooperative learning, students perform more actively and think more critically with the continuous support and feedback from
both other students and teachers (Cooper, 1995). Nelson (1994) also emphasized the importance of scaffolding and promoted an instructional approach including a three-stage scaffolding process. In the first stage, instructors should equip students with a common background for collaboration, such as assigned readings. In the second stage, instructors should provide groups with questions or analytical frameworks which are more sophisticated than their own. In the last stage, instructors should design the activities to specify student roles and to motivate active participation for all group members.

Many classroom activities were identified as cooperative to enhance learning, such as think-pair-share, round-robin discussions, student interviews, roundtables, gallery walks, and jigsaws (Bonk & Smith, 1998).

2.3.4 Project-based learning

Another approach to teach critical thinking is through Project-based learning (PBL). Projects are designed to engage students in investigating authentic problems over extended periods of time (Blumenfeld et al., 1991, Jones, Rasmussen, & Moffitt, 1997; Thomas, Mergendoller, & Michaelson, 1999; Thomas, 2000). “[E]ngaging in projects can build decision-making skills, foster independence while also enhancing cooperative work skills, challenge students’ creativity, cultivate creative thinking skills, and improve problem-solving skills” (Beckett & Slater, 2018, p. 2).

PBL reflects John Dewey’s experiential learning philosophy, “learning by doing.” It is also based on the constructivist approach of learning (Perkins, 1991; Piaget & Inhelder, 1969;
According to this approach, individuals construct knowledge through social activities which enable the self-awareness of learning (Duffy & Cunningham, 1996; Grant, 2002; Tamim & Grant, 2013). However, doing a project does not necessarily mean PBL (Markham, 2011). Thomas (2000) adopts five criteria for projects: PBL projects should be central rather than peripheral to the curriculum, focus on questions involving major concepts and principles, engage students in constructive investigations, are student-driven, and are realistic.

In PBL, students do not only need to acquire knowledge, but also apply it, therefore they are likely to gain deep understanding. Moreover, students usually need to plan projects, track progress, and evaluate solutions, which may be helpful to improve their thinking skills in “learning and metacognition” (Blumenfeld et al., 1991, p. 373). Research reported the success of PBL in fostering critical thinking skills (e.g. Tretten & Zachariou, 1995; Horan, Lavaroni & Beldon, 1996; Bell, 2010; Markham, 2011; Aidoo et al., 2016). For example, Aidoo and colleagues (2016) reported that students’ critical thinking and problem-solving skills were effectively enhanced in a PBL Chemistry course.

PBL is a student-centered, teacher-facilitated and inquiry-based pedagogical approach (Bell, 2010). Grant (2002) stated seven common features for the implementation of PBL: an anchor of the activity, a task, an investigation, provision of resources, scaffolding, collaboration, and opportunities for reflection and transfer. In detail, introduction refers to setting the stage for the project; task means guiding and to explicating questions; resources refers to providing data; investigation includes “activities that require higher-level and critical thinking skills”;
scaffolding includes “student-teacher interactions, practice worksheets, peer counseling, guiding questions, job aides, project templates, etc.”; collaboration is such as peer reviews and group brainstorming; reflection is for closure or debriefing (p. 2).

Those approaches of teaching critical thinking do not always work separately but more frequently overlap with one another. For example, project-based learning often takes the inquiry-based approach and includes cooperative activities.

2.4 Culture and critical thinking

The extant research on critical thinking was mainly dominated by Western knowledge, culture, historical developments, and educational practices (Tan, 2017a). The view that critical thinking was absent or impoverished in students from non-Western cultures to learn and use (Atkinson, 1997; Fox, 1994) derived from the mono-based tradition of critical thinking. If critical thinking was regarded as logical analysis and argumentation which were prevalent in Western education, it was common to find a deficiency of critical thinking in the non-Western context (Tan, 2017a). However, this culturally biased way of understanding critical thinking ignored non-Westerners’ capacities for rational thinking (Bali, 2015).

Challenging the culturally-biased understanding did not intend to dismiss the evidence of practical difficulties in teaching critical thinking to Chinese students, rather, provide more explanations than linguistic difficulties (e.g., Lun, Fischer, & Ward, 2010; Floyd 2011), lack of relevant knowledge (e.g., O’Sullivan, & Guo, 2011), inappropriate assessment (e.g., Ku, 2009), pedagogical biases in how academics tend to teach critical thinking (Ennis, 1998). Some
suggested that the Chinese critical thinking style demonstrated a different style or form. For example, Lun, Fischer and Ward’s study (2010) found that dialectical thinking styles enhance Chinese students’ critical thinking, compared to students from European backgrounds. Durkin (2008b) showed that East-Asian students prefer a “middle way” compared with the Western norm of argumentation. The middle way of thinking avoids direct challenges or arguments. But it uses dialogues and more holistic thinking to merge the best of both sides without losing the “rigorous quest for truth” (p.51). Some clarify the misunderstanding that Confucian education did not promote thinking (Li & Wegerif, 2014; Tian & Low, 2011). Arguing that critical thinking was not culturally incompatible with Chinese students, the following part explored the Chinese features of critical thinking, including Confucian education and Chinese dialectical thinking.

2.4.1 Confucian education

Traditional Confucius cultures valuing authority, social harmony and deference to elders and teachers left little room to critical thinking (Hu, 2002). This was the main cultural reason that Chinese students were perceived being incapable of critical thinking. Researchers expressed concern that Confucian education heritage in China included more teacher-centered class teaching with little student participation, rote-learning and mimetic methods which were not supposed to be helpful in developing higher-order thinking. According to the prevailing Western pedagogic theory of social constructivist tradition, such methods were typical of a surface learning approach which should lead to a failure of achieving a deep level of understanding. This was one interpretation why Chinese learning culture restricts critical and creative learning.
However, research also showed that some students educated in the Confucian approach can achieve as well as or even outperform their Western peers, especially in many numerate and scientific subjects (Li & Wegerif, 2014).

One understanding about the contradiction was to note the difference between “Confucius” and “Confucianism”. “Confucius” focused what Confucius supposedly meant by learning in education (Tian & Low, 2011). “Confucianism” was a construct designed to harness a diverse and widespread population under unitary political control in the Han and Song dynasties (Clark & Gieve, 2006). “Confucianism” as a political tool values obedience in hierarchical status. While “Confucius” as the classic in education indicated truths of teaching and learning.

Tian and Low (2011) argued that Confucius effectively advocated critical thinking though advocating reflective thinking, inquiring, deep thinking, and equality between the students and the teachers in his work. For example, in the Analects, thinking was treated as an inseparable part of learning, “学而不思的惘，思而不学则殆。(Learning without thinking is a vain effort; Thinking without learning is a dangerous effort)”.

Kim (2003) interpreted that Confucius encouraged his students to reflect on his assumptions and to think critically about his teachings. Also, Confucius required his students to be open-minded, rigorous, and fair when thinking about their own strengths and weaknesses, capacities, and limits. In the process of reflection on oneself, Confucius also emphasized autonomy and the need for strong evidence when reasoning, which, as Kim noted, were both fundamental elements of critical thinking.
Li and Wegerif’s (2014) interviewed 22 Chinese teachers about their understanding of education. The research observed four themes reflecting how heritage Confucian ideas about teaching thinking were inhabited in contemporary Chinese education: inner satisfaction, collective identity, differentiation and active silence.

Inner satisfaction refers to “being honest, keeping one’s promise, practicing what one preaches and being responsible (诚实守信, 言行致, 知错就改, 有责任心)” (p. 28). It is achieved through thinking of self in relation to others.

Collective identity suggests placing one’s own interests behind the interests of the group, the society and the country. Sacrificing oneself to serve the collective is highly valued and recognized. Other members of society need to be taken into consideration in decision making.

‘Self-criticism and peer criticism’ are advocated to cultivate deep moral values. Differentiation means teaching according to students’ individual needs. The depth of coverage of content and curriculum are all guided by this principle. Active silence refers to “digest’ knowledge by thinking and reflecting internally” is connected to ideas of being responsible and inner reflection. “Think three times before you act (speak) (三思而后行)” suggests deep thinking and reflection and inner before speaking up. Silent inner dialogue before engaging in active outer dialogue is expected to be responsible for their own learning and also for others, such as their peers or teachers.

These observations give another explanation for why Chinese international students are observed as quiet and not raising questions in class. “Because they are engaging in inner
reflection and relating their own individual needs and voices to the collective interests” (Li & Wegerif, 2014, p. 29). The “silence” does not mean absence of critical thinking. Rather, it means they are being responsible by reflecting before challenging.

2.4.2 Chinese Dialectical thinking

Dialectical thinking could be best represented in Taoism and Mohism in traditional Chinese culture.

**Taoism** is not just a religion like Buddhism, but more considered as a way to view the nature of the world, life, and knowledge. As well as the role Confucianism plays in Chinese social life, Taoism plays a major role in Chinese mental life. Peng et al. (2006) explained the dialectical thinking of Taoism from three principles: change, contradiction, and holism.

The principle of change holds that reality is a process. It does not stand still; it is in constant flux. The example of the principle of change that most readily comes to mind is the Taoist attitude towards concepts or words that reflect existence and knowledge. Because reality is dynamic and flexible, concepts, such as the reflection of reality, are also active, changeable, and subjective. Zhuang Zi states, “The Tao has never known boundaries (of concepts); words have no constancy” (Watson, 2013, p. 43).

The principle of contradiction holds that reality, especially the life reality, is rather complicated and full of contradiction. According to the 《易经》Yi Jing, the differentiation of things is but an interpretation of the interaction between opposites (yin and yang). The contradictory pair of yin and yang all come from the origin of the universe and may revert to
The principle of holism maintains that instead of isolation and independence, everything, in reality, relates and connects. To fully understand reality, it is to understand the relations and affection to everything else. In other words, even to understand a simple thing depends on complex relationships, for all of the things in the universe are related to each other in some ways. Nothing can be understood through separate pieces. The parts can only be meaningful in relation to the whole. The whole is not just the total of its components. To understand the whole requires an understanding of the parts, too. Anything taken in isolation is out of context and consequently declines.

Peng suggested that three Taoist principles fundamentally influenced the Chinese mental representations. They are interrelated, consistent components of naïve dialecticism.

*The notion of change leads to a belief in contradiction, and contradiction comes as a result of a conviction in change (if all phenomena in the universe are constantly changing, then what is true today may not be true tomorrow). Holism, in turn, is the consequence of a belief in change and contradiction.* (Peng et al., 2006, p. 255)

Different from the Taoist principles, Aristotelian logic builds blocks of naïve Aristotelianism in Western culture (Nisbett, Peng, Choi, & Norenzayan, 2001). Aristotelian logic emphasizes three different principles: the law of identity, the law of noncontradiction, and the law of the excluded middle. The law of identity means that if anything is true, then it is true. For example, “A student is a student” is a true logical statement because “student” and “student” are
identical. The law of noncontradiction holds that no statement can be both true and false. It is impossible for the same thing to be both true and false at the same time. For example, A person is a student, and a person is not a student cannot be both true. The law of the excluded middle expresses that any statement is either true or false. A is B, A is not B, the one must be true, the other false. Between the two members of a contradiction, there is no middle term. For example, “A person must either be a student or non-student” because “student” and “non-student” are contradictory so that anybody must belong to either one of these two categories (Peng & Nisbett, 1999).

In contrast, Taoism tends to be holistic. They are more likely to rely on “dialectical” reasoning, to attend to the entire field and assign causality to it, and to making relatively little use of categories and formal logic. Westerners’ thinking is more analytic. They pay much attention to the object and the categories to which it belongs and tends to use rules, such as formal logic, to understand its behavior. The Chinese thinking process, compared with Westerners, tends to perceive more changes, are more tolerant to contradictions, and perceive things as more interrelated (Peng & Nisbett, 1999).

Mohist is an influential philosophical school originating from the teachings of Mozi and his followers. It flourished in ancient China during the Warring States, roughly contemporaneous with Socrates’ era. Mozi initiated philosophical argumentation and debate in China. They were the first in the tradition to give step-by-step strategies for reasoning and argument. Sun (2006) stated three features of dialectic thinking in Mohists.
同异交得(Tong Yi Jiao De) refers to mastery both identity and difference. Mohists suggest grasping both the same side and the different side, in order to avoid bias and gain comprehensive understandings of truth. Three ways for the logic of “同异交得” are:

1) Define the same from the differences. 《墨子经上》第39条说:“同, 异而俱于之一也。” (The same refers to the different things in common.) Mohists give four ways to find similarities “同: 重、体、合、类”. 重(repeat) means that two names refer to the same entity, such as “Mozi” and “founder of Mohism School.” 体(body) means that different parts of the whole, such as both Beijing and Shanghai belong to China. 合(together) means different individuals stay in the same space, such as two people in the same classroom. 类(category) means different things belong to the same category or nature, such as a small circle and a big circle are both circles.

2) Define differences from the same. 《墨子大取》说:“有其异也, 为其同也;为其同也异。”(Differences derive from the same and based on the same.) Mohists also provide four ways to define difference. “异:二、不体、不合、不类.” 二(two) means that two individuals must be different. In other words, all things are different. One can never find two identical leaves. 不体(not in the same body) means that two components are not in a whole, such as A’s left hand and B’s right hand. 不合(not together) means that not in the same space, such as two people in different classrooms. 不类 (not belong to the same category) means two things do not have similarities in some respects.

3) The identity and differences exist at the same time and interact with each other. For
example, a graduate student instructor, is both a student and a teacher (not a student). In this example, “student” and “not student” exist in the same person. To understand the individual, we need to consider both sides.

两而勿偏(Liang Er Wu Pian) refers to balanced thinking and avoid partiality. All things and concepts in the world are the unity of opposites and differences. In order to pursue truth and prevent fallacies, we should insist on the comprehensiveness of observation and comprehension and oppose one-sidedness. Weigh the interest and harm and take interest as big as possible and the harm as little as possible. For example, on a sinking boat, a man throws his property into the water to gain more time to be saved. Giving up money to save one’s life means taking affordable harm to avoid disaster. The key to making a decision is to establish a standard of measuring the pros and cons.

古今异时(Gu Jin Yi Shi) means past and present differ, and history always evolves. The truth in the past may not necessarily be the truth at the moment. Mohism believes the concepts and propositions are historical. The authenticity accords to the historical circumstances and may shift along with changes over time and space.

Mohist dialectics focus on knowing how to distinguish similarities and differences. The core expression is how to establish rules for making decisions correctly (Cui, 2002). In principle, Mohist believes agreement can always be reached and the Mohist canons provide a set of tools to reach the agreement (Leeuw, 2011). That is quite different from the Western traditional logic Aristotle’s Organon, in which Logic is the foundation of science, and logical deduction the
means to arrive at right conclusions.

2.5 Critical thinking policies research and practices in China

The term “critical thinking” was translated into Chinese, mainly in two forms “批判性思维” and “思辨/思辨能力”. The translation of “批判性思维” appeared earlier and was more influential. However, in the late 90s, researchers from Foreign Language Study argued that “批判” (criticism) contained strong connotations of negativity and neglected the meaning of reflection and reasoning. Also, there was also a possibility that the characters “批判” may bring unpleasant memories of the Cultural Revolution of China. They suggested using “思辨” (thinking and justifying) to represent the rigorous approach of finding the truth (Liu, 2015; Gao, 2016).

Besides the two translations of “批判性思维” and “思辨/思辨能力”, another term often appears in the context China education, “创新思维/能力” (creative thinking/ competence). In terminology, critical thinking and creative thinking were often “inseparable” but not “exactly the same” (Davies, 2015, p. 46). On one hand, creative thinking is widely viewed as the higher level of critical thinking (Anderson & Krathwohl, 2001). On the other hand, creativity emphasizes the “process of making or producing while criticality masters the “process of assessing or judging” (Elder & Pual, 2008, p. 4). Moreover, encouragement of critical and creative thinking in education was a joint and inseparable goals (Bailin, 1987, p. 29).

As mentioned in chapter one, the exact term of critical thinking did not appear in the central education policies in China. Developing creative thinking, became the key educational goal in
the recent policies. However, education policies in China did not define the terminology of creative thinking and led to a “conceptual ambiguity” (Pang & Plucker, 2012, p. 268).

2.5.1 Critical/creative thinking policies

Pang and Plucker (2012) reviewed the education policies promoting creativity and identified three periods, nascent period from 1998 to 2001, developing period from 2002 to 2009, and the transformative period since 2010 to the present.

The nascent period raised the awareness of developing creativity and set it as an educational goal in the Higher Education Law. However, the following educational policies focus on science and technology. Higher education was directed to a crucial role in knowledge innovation and fostering creative talents. A national instructional suggestion for higher education encouraged universities to engage their students in scientific research. Later in the developing period, related policies were refined and extended focused from higher education to compulsory education, and from science and technology to other academic domains.

More detailed instructional strategies, curriculum design and assessment systems of promoting creativity appeared in the central policies in the transformative period, since the announcement of the National Outline for Medium- and Long-Term Educational Reform and Development (2010–2020) (MOE, 2010). The Outline and a serial of following-up policies provide detailed pedagogical suggestions to all education levels. As for higher education, suggestions include: advocating heuristic, inquiry-based, communicative, and participatory teaching methods (MOE, 2010), transforming scientific research results into teaching content,
supporting undergraduates to participate in research activities as early as possible, and reforming the assessment system to pay attention to the study process and student ability evaluation (MOE, 2012), encouraging teachers to integrate the latest research findings and practical experience into classroom teaching, encouraging students to engage in innovation clubs and national innovation and entrepreneurship contests (State Council of PRC, 2015b), promoting small-size online and face-to-face blended teaching, and flipped classes (MOE, 2018).

2.5.2 Critical thinking research in China

Critical thinking research in China began from the late 1980s. From the China National Knowledge Infrastructure (CNKI) database, three earliest research articles were found in 1986, Zhang’s *Critical thinking – a prevailing pedagogy in the US*, Wu’s *Enhancing primary students’ critical thinking*, Qu’s *Cultivating college students’ creative thinking*. To gain a general understanding of critical thinking research in China, I searched the key words, “critical thinking” in CNKI, to the end of 2018, in both the Chinese and English languages. 5,688 academic journal articles were found.

Figure 3 Publication volume of journal papers on critical thinking by years in CNKI

The topic of critical thinking drew more attention from Chinese domestic researchers in the twenty-first century. And research continues to flourish since the announcement of the Outline of
National Medium and Long-term Educational Reform and Development Plan 2010 (see Figure 3).

Wen’s hierarchical model

The theoretical development of critical thinking was less explored in China, and most theoretical research directly adapted Western theory to the Chinese context (Luo, 2002). However, Wen (2009) built a hierarchical model of critical thinking to address Chinese students’ needs.

Wen’s hierarchical model distinguishes two levels of critical thinking: metacognitive skills and critical thinking skills. The first level is the ability to plan, examine, adjust, and evaluate one’s own critical thinking skills. The second level includes cognitive skills and standards, as well as the emotional traits associated with thinking quality. Critical thinking skills in the second level are managed and monitored by the meta-thinking. Wen (2009) defined three core skills and one emotional dimension in the second level: analytical skills, inferential skills, and evaluation skills. Analysis skills include classification, identification, comparison, clarification, differentiation, interpretation; reasoning skills include questions, assumptions, reasoning, elaboration, demonstration; evaluation skills refer to assumptions, demonstration process, and conclusions. The emotional dimension includes five emotional traits: curiosity, openness, self-confidence, integrity, and perseverance. 1) Curiosity refers to being interested in new things, like tracing the root of the problem, challenging the common norms with new questions and having a strong desire to learn. 2) Openness means open-minded, broad-minded, being able to respect
different views, being willing to correct their own errors. 3) Self-confidence refers to being confident in their own analysis, reasoning, evaluation abilities and daring to challenge the authority; 4) integrity, means pursuing of truth and justice, rather than personal interest; 5) determination means the speculators are tough, they are not afraid of setbacks and can persevere.

Wen’s second level divides into two dimensions, skills, and emotions, which is quite similar to the Western taxonomy of skills and dispositions. However, Wen puts meta-thinking on the top of their models to emphasize the importance of personal agency. In contrast, many Western approaches, such as Ennis and APA Delphi include self-regulation as a component skill of critical thinking but do not put it in a higher level in their models. What’s more, “integrity” is a critical thinking feature which rarely appears in Western approaches. The emphasis of meta-cognitive factors reflects the Confusion tradition of learner’s responsibility. In Confucian education, thinking was taught as reflection in the context of relationships that entail responsibilities (Li & Wegerif, 2014). The trait of pursuing truth and justice, not personal interests also represented the Chinese character of “collective identity” which put individual interests behind the groups’.

2.5.3 Critical thinking teaching practices

Some universities in China began to offer specific thinking courses to cultivate students’ critical thinking, such as Tsinghua University’s elective courses “problem-solving strategies and skills,” Beijing University of Aeronautics and Astronautics’ “University Study Guide,” Peking University’s “Logic and critical thinking.” These courses focus on cultivating and improving
college students’ critical thinking abilities (Li, 2014). In 2009, Huazhong University of Science and Technology put the critical thinking education into the curriculum of “seed class” (advanced class). The teaching object of this “critical thinking” course was clearly identified as cultivating critical thinking.

In addition to general courses, Chinese researchers sought to develop students’ critical thinking skills through empirical research in some specific disciplines. Among all of the disciplines, two fields, nursing education and foreign language education, paid particular attention to critical thinking (see Figure 4).

Figure 4 Disciplines distribution of research papers on critical thinking in CNKI

In Medicine, nursing education first introduced the concept of critical thinking from the West to China. Later, more researchers in this field started to put effort into the clinical practice of critical thinking. For example, Wang and his colleague (2006) conducted a “critical thinking and communication” course of 226 nursing students in different levels of higher education.
Teaching methods included discussion-based classroom activities and combining communication skills with clinical practice. They applied the Chinese version of critical thinking disposition inventory (CTDI-CV) (Peng et al., 2004) at the beginning and the end of the course and found that students’ critical thinking skills were significantly improved. You (2007) conducted a critical thinking nursing course of 59 college nursing students teaching experiments. The results showed that the use of problem-based, case-based, and evidence-based pedagogy in nursing education helped students to develop critical thinking depositions. Liu et al. (2008) explored the effects of a nursing case forum to cultivate the critical thinking ability of nursing students. They had randomly divided 154 junior college nursing students into experimental and control groups, and all of them attended regular clinical nursing practice training. Besides, the experimental group also took the nursing case forum for half a year. All the students fulfilled the CTDI-CV before and after the study. Results suggested a significant difference between the experimental group and control group (p<0.05), which meant that the experimental group had improved their critical thinking skills.

However, most of the Chinese research in nursing education was still at the stage of introducing and applying Western critical thinking theories and pedagogy modes. What’s more, most research relied on quantitative surveys as the single evaluation method, which may influence the analysis and further explanation of research results.

In the field of Foreign Language, especially English as Foreign Language (EFL), educators and researchers had integrated critical thinking into classroom practices. Liu (2013) promoted a
model for developing students’ critical thinking skills in university EFL course, including a warm classroom atmosphere, content-based instruction, independent learning and assessment reform to formative evaluation. Moreover, there was much experimental research in EFL sub-courses, like reading, writing, speaking, and translating.

For instance, in reading, Liu and Guo (2006) conducted an experimental study on critical reading in a university level EFL course in Beijing. The main steps of critical reading training in the study included previewing the text, accessing to relevant topics and the background knowledge, determining the purpose and structure, asking questions, reviewing understanding, examining the relationship of the author’s point of view and his/her background, relating to other points of view, writing reflecting content, assessing understanding knowledge and discussing with other readers. The study showed that the training of critical reading increased students’ frequency of using those trained strategies.

In writing, Wen and Liu (2006) explored 120 English argumentative compositions by English majors to investigate the characteristics of abstract thinking of students. According to the basic elements of the thinking process of composition writing, they identified four content parameters, including essay topic, argument clarity, reasoning thoroughness, and text coherence, and set scoring criteria for each parameter. The results suggested that students in the study had obvious difficulties in these four aspects. Li (2011) conducted an action research on cultivating readers’ consciousness in an English writing course to develop critical thinking abilities. The action research plan consisted of writing tasks companying with three stages of writing process.
In the preparation stage, writing tasks focused on raising reader’ awareness. The writing stage was designed with logic error correction tasks. The revision stage applied four types of feedback, teacher feedback, peer feedback, self-evaluation and a teacher-student writing conference to enhance reader awareness and critical thinking. Yu (2014) built up an integrated teaching approach to develop critical thinking skills through writing. The framework of instruction included three stages. The pre-writing stage includes teaching methods like mind mapping, brainstorming, the Socratic approach and critical reading. The writing stage provides a variety of writing tasks and activities, such as group writing, perspective conversion writing, position conversion writing, time-limit writing, and free writing. In the post-writing stage, a critical feedback table was suggested to help for modification. This model was applied in the Shanghai Jiaotong University School of Foreign Languages English writing class. The research suggested that this model could help students improve their English writing and critical thinking skills.

In speaking, Gui et al (2011) applied a STUDIO model in an English debate class. STUDIO refereed to situated, thinking, universal, debating, improvisation and optimization. This model based on situated learning and multi-cultural input and features on using mind maps and phonics in instruction. More than 80 participants conducted a questionnaire survey to discover the effect of the two dimensions of learning and behavior before and after the use of the STUDIO training model. The learning dimension involved learning attitude, learning process, learning diversity, collaborative learning, learning ability, learning methods and skills and other elements. The behavior dimension involved behavioral structure, behavioral intention, behavioral demand,
behavioral initiative, behavioral harmony, behavioral self-discipline, and behavioral diversification. The statistics analysis suggested a significant improvement in both learning and behaviors dimensions. Lin (2012) analyzed 60 reflective journals written by 20 English majors for the English debate course and found that reflective journaling helps to enhance students’ critical thinking ability as well as English language proficiency.

In translation, Yu (2010) suggested using varied approaches to enhance university students’ critical thinking ability in a translation class. He provided examples of how to use error analysis, case study and data-driven model to cultivate students’ critical thinking abilities in translation. Error analysis included five steps: collecting data, identifying errors, misclassifying, analyzing reasons and evaluating errors. Case teaching referred to a student-centered, interactive approach. In the teaching practices, teachers prepared a focus case text and guided students to discuss the case. Through the collaborative study, students formed their own understandings, judgments and translations to the case text. The data-driven model was based on a translation corpus. Students got a large number of translation examples from the corpus, and then classified and summarized them according to translation theories. Yu believed that those approaches in the translation class helped to increase students’ learning motivation and cultivate independent thinking and in-depth critical thinking abilities.

Critical thinking research and practices in the field of EFL went further compared with other subjects. They have stated to place critical thinking both from the theoretical curriculum to classroom practices. Unlike the focus on assessment of critical thinking in nursing education, the
focus in EFL was how to teach critical thinking skills.

2.5.4 Culturally appropriate critical thinking instruction

The recognition of critical thinking research and practice has been under rapid growth since early 2000 and has continued to flourish past 2010. Researchers and educators have made a great effort in introducing critical thinking into the curriculum and classrooms. However, the spread of critical thinking has been slow in many other disciplines besides Medicine and Foreign Language. Moreover, the quality of critical thinking instruction in China was patchy (Dong, 2015). The implementation of critical thinking instruction may face suspicion, resistance or failure if it ignores stereotypes or underestimates Chinese cultural and educational characteristics such as collectivism, traditional exam-orientated goals, rote-learning pedagogies, and inadequate critical training. Therefore, culturally appropriate pedagogy should draw attention to non-Western societies like China, who imported and applied educational theories and practices from the West. The term culturally appropriate pedagogy here indicates a pedagogy that respects cultural difference, focuses on educational competence from an international context, as well as addresses the local cultural context of learners and teachers (Phuong, Terlouw & Pilot, 2005). For example, Ryan and colleagues (2013) adopted a multilevel Socratic method to promote critical and creative thinking skills among Chinese university law students with Confucian roots. Although it was difficult to encourage shy Chinese students to take part in classroom discussion actively, they applied the following seven approaches to create open-minded class atmospheres and get students adapted to new study habits.
1) case-based teaching as compared to theory-based teaching;
2) critical thinking as compared to the “one-and-only-answer” approach to learning;
3) guided inquiry as compared to passive reception;
4) the value of student preparation before class;
5) the focus on reasoning process rather than doctrinal result;
6) the quality of performance sought by our open-book exam compared to the memorization required by a traditional Chinese exam; and
7) the value of prior practical legal experience on the part of their instructors. (Ryan et al., 2013, pp. 328-329)

Ryan and colleagues (2013) modified the Socratic method to honor the Chinese local culture norms. They noticed that Chinese teachers may need to balance Socratic teaching with the traditional form of lecturing because of the pragmatic need of passing professional exams for students’ future careers. They suggested that teachers in China need to explain the new method to students and help them to build up new learning habits. In particular, successful senior students could be role models, for example, by leading peer discussions in the early stage of the class.

2.6 Research gaps

Although many studies provided approaches to teaching critical thinking in higher education in China, few of them gave detailed information about how the instruction was delivered. In assessing whether these teaching methods were successful in promoting critical thinking, most research relied solely on quantitative findings related to certain instructional surveys. However, sometimes changes in students’ behaviors cannot be detected by statistical measures. No statistical significance does not necessarily indicate that the approach is ineffective (Behar-
As for the research objects, most studies focused on understanding and developing students’ critical skills. Few of them explored how Chinese educators viewed themselves in critical thinking instruction in China. What’s more, how cultural factors influence critical thinking development in the Chinese higher education context was less explored.

Summary

This literature review examined five parts: conceptualizing critical thinking from the Western context, historical movements of critical thinking research and practices in the higher education of Western countries, Western approaches to teaching critical thinking, Chinese features of critical thinking, critical thinking research and practices in China. The review illustrated how critical thinking theories can be used in teaching practices, which served to provide a foundation for the study.
Chapter 3 Methodology

This chapter presents the methodology for this study. It starts with a discussion of researcher stance and qualitative paradigm, the selection of a single case study as the methodological approach and is then followed by a description of the specific research processes used in this study. The procedures include the research questions, contexts, data collection, data analysis, validity and reliability, and ethical considerations.

3.1 Researcher stance and qualitative paradigm

Both qualitative and quantitative research share “basic values around and commitments to a systematic inquiry, matching method to questions, conscientious data collection, appropriate analysis, and detailed reporting of the procedures followed” (Patton, 2015, p. 90). To end the paradigmatic wars between “quant and qual,” Flyvbjerg (2011) suggested that research should be problem-driven instead of methodology-driven, which means that those methods are employed to answer the research questions for a given “problematic best” (p. 313). Quantitative methods, such as surveys may help to collect massive data from a large group. In quantitative research, hypotheses are raised based on theories and later tested through mass amount figures. Statistical methods are often used to identify differences, similarities, trends, categories, predictions, and relationships among variables. Also, reproducibility is one of the critical validities of research (Creswell, 2013). Qualitative research turns to establish the meaning of a phenomenon from the perceptions of participants. It often tries to identify a culture-sharing group and studying how it developed shared patterns of behaviour over time. To observe participants’ practices by
participating in their activities is one of the critical elements of collecting data in qualitative research (Creswell, 2013).

This study explored participants’ perceptions and their teaching experiences of critical thinking. The purpose of this research was to gain a deeper understanding of participants’ individual perceptions of critical thinking and how their interpretations influence their teaching practices, other than increasing generalization of instructors’ perceptions of critical thinking. Therefore, I chose the qualitative paradigm to design this study.

Qualitative research is an inquiry approach to study and understand human and social phenomena (Marshall & Rossman, 2016). The strength of the qualitative research method is to provide in-depth, personalized, and contextual understanding (Patton, 2015). Different from quantitative research, qualitative research is usually conducted in the participants’ environment and enables them to share their own stories in their own words. This is crucial for understanding the situation and answering the research questions through the participants’ own perception and experience. Moreover, their perceptions and experience help to shape the research and support practical actions and administer changes (Creswell, 2009). Creswell (2013) also suggested that qualitative methods were the most appropriate research methods that identify factors leading to particular outcomes, determine the usefulness of a specific intervention, or increase understanding of the predictors of outcomes.

Although qualitative research is often context associated and has limitations in generalizability due to the number of participants, it holds its advantages of gathering multiple
forms of data in a natural setting, which is essential to provide a more profound and holistic understanding of a study’s research questions.

3.2 Case study

A case study is defined as “an intensive, holistic description and analysis of a bounded phenomenon such as a program, an institution, a person, a process, or a social unit” (Merriam, 1998, p. xiii). It has become one of the essential methods for researching changes in complex phenomena (Van Lier, 2005). Through investigating a “contemporary phenomenon within its real-life context,” case study methodology enables researchers to analyze the “how” and the “why” of the change in epistemological beliefs (Yin, 2013, p.2).

The essential characteristic of the case study is the limited system of a case (Stake, 1994). An essential feature of the case study is the clear boundaries that “fence in” the study (Merriam, 1998, p. 27). One technique for setting the boundedness of the research is to set the finite of the data collection, which means a limit to the number of participants involved in the interviews or a limited time for observations (Merriam & Tisdell, 2016). To shed some light on the Chinese culturally specific critical thinking in higher education, this qualitative case study was undertaken among instructors and students at one Chinese university, NU. Participants were bounded in a case and represent a good example of how critical thinking is taught in Chinese higher education.

The qualitative case study methodology was used in this study for the following reasons: qualitative case study has been used in previous research of a similar topic; it could address the
gap in the literature; it can provide a deep understanding of the research questions. First, a qualitative case study works as a powerful way to show the complexities of critical thinking. Several empirical studies use the case study method to investigate critical thinking (e.g., Celuch & Slama, 1999; Tsui, 2002; Canagarajah, 2004; Perkins & Murphy, 2006; Miri, David & Uri, 2007; Cheong & Cheung, 2008; Dwyer, Hogan, Harney & O’Reilly, 2014). Their successful use of a qualitative case study as a methodology validated my choice.

Moreover, the literature suggested that more studies were needed to document the actual teaching process (Behar-Horenstein & Niu, 2011), to find out challenges in practice and develop working strategies related to culture (Tian & Low, 2011). By examining instructors’ perception and teaching methods towards critical thinking, this study had the potential to bridge this gap.

Finally, the case study method incorporates analysis of multiple data sources which could provide full descriptions of the phenomenon (Stake, 1994). For this case, semi-structured interviews, focus groups, and classroom observations were applied to explore instructors’ in-depth experiences in critical thinking and pedagogy. Moreover, the three qualitative methods helped to identify the relationship between instructors’ perceptions, culture and discipline domains and to make the evidence of influence and interaction between perceptions and teaching practices robust.

3.3 Research questions and contexts

Three criteria of research questions are often suggested when applying case study method: “(a) ‘how’ or ‘why’ questions are being posed, (b) the investigator has little control over events,
and (c) the focus is on a contemporary phenomenon within a real-life context” (Yin, 2013, p. 2).

The purpose of this qualitative case study was to explore critical thinking in Chinese higher education. It intended to identify the perceptions and pedagogy of critical thinking through the eyes of instructors. Three questions guided the study:

1) What are the instructors’ perceptions of critical thinking?
2) How is critical thinking reflected in the instructors’ teaching practices?
3) How do instructors’ educational backgrounds and experience influence their perceptions and teaching practices of critical thinking?

Context plays a significant role in qualitative studies, for human actions are significantly influenced by setting. “The social and physical setting---schedules, space, pay, and rewards---and internalized notions of norms, traditions, roles, and values are crucial aspects of an environment” (Marshall & Rossman 2016, p. 101). The study used convenience sampling to select the research site, North University. The selection of the accessible research site was based on the geographical proximity and personal network of the researcher. The researcher is a faculty member at North University (NU).

NU has continuously ranked as one of the top 10 universities in China and is a member of the Elite C9 League. It consists of three campuses, the Harbin campus in Heilongjiang Province, the Weihai campus in Shandong Province and the Shenzhen campus in Guangdong Province. In 2018, about 30,000 undergraduate students and over 16,000 postgraduate students attended the three campuses, with 3,000 full-time instructors and scholars. The Weihai campus focuses on
science and engineering and also offers programs in humanities, social sciences, and management. It provides 73 bachelor programs and shares 148 master programs and 83 doctoral programs. This researcher chose the Weihai campus as the research site in China. NU (WH) is located in the east of Shandong Providence, a well-developed area of China. Shandong is the birthplace of Confucius with a long history of emphasizing traditional education.

In 2012, NU(WH) reformed its undergraduate program and amended the education focuses on cultivating research-based innovative abilities through a combination of classroom courses and project-based learning. In 2012, NU also announced an “Elite Leaders in Engineering Developing Plan (工程领军人才培养计划)”. The program plan selected elite undergraduates to join project-based learning to develop innovative leaders. Students were encouraged to attend an innovation team for contests. Professors were required to involve undergraduate students in their research teams, while they mainly recruited graduate students before. However, these policies were only for the elite students. For example, the Elite plan only recruited 100 to 200 students per year. The majority of students still didn’t have the opportunity to experience project-based learning.

Since 2015, NU (WH) has presented strategic goals to develop an innovative NU campus to become a “world-class university” and to have “world-class disciplines” (双一流). It declared a set of new policies to emphasize internationalization and university-industry cooperation. One of the top priorities for NU (WH) was to enhance the international competence of students. Instead of emphasizing knowledge acquisition, the new policies tried to engage students in more self-
directed learning, critical/creative thinking skills, and cooperation and prepare them to study and work in other countries and in multicultural environments. Developing critical/creative thinking skills was emphasized as the prerequisite of international competence and innovation.

### 3.4 Data collection

Using only one method in a study makes the study more vulnerable to errors, such as “loaded interview questions, biased or untrue responses,” than using multiple methods (Patton, 2015, p. 31). Thus, data from this study were collected through multiple methods, semi-structured interviews, classroom observations and the focus group. The multiple research methods served as explanatory tools to comprehend general changes in groups and personal experiences and to answer the proposed research questions.

This study used purposeful sampling for the identification and selection of participants. The recruitment purposely addressed various majors, gender balance and age distribution. The recruitment of diverse majors may help the research to find out how discipline differences contribute to instructors’ perceptions of critical thinking and their teaching practices. Gender and age may influence the participants’ educational backgrounds and experiences. Moreover, instructors need subject knowledge and practical experience to understand and develop their pedagogy, and the first-year instructors are required to be monitored by senior instructors in this case. Therefore, this research only recruited instructors with a minimum of two years of teaching experience and a minimum master’s degree in their fields. The study applied personal contact and later snowball sampling, asking the participants to recommend other participants to recruit.
Before data collection, I provided participants with the choice of using English or Chinese. All participants chose Chinese (the mother tongue of both researcher and participants). Research indicates that interviews using participants’ first language has advantages. Participants are more open and expressive which lead to more fruitful and accurate information (Cortazzi, Pilcher & Jin, 2011). To decrease the meaning loss of translation, I did not translate the transcriptions but analyzed them in Chinese. I only translated the quotations into English. However, interpretation and discussion were written in English. The translated quotations were later sent back to the interviewees to check for accuracy and authenticity (Patton, 2015), for my participants were either university instructors or students who had an English language qualification.

3.4.1 Semi-structured interview

Interviewing is the best method in intensive case studies with a few selected individuals (Merriam & Tisdell, 2016). “The purpose of interviewing is to allow us to enter into the other person’s perspective” (Patton 2015, p. 426). Interviewing provides approaches to observe behaviour, feelings, or how people interpret the world around them, and to understand past events that are impossible to replicate (Patton, 2015). Qualitative interviews also help to find out what is in and on people’s minds and to gather their lived experiences. They also generate relevant and high-quality findings.

This study conducted face-to-face, one-on-one, semi-structured interviews by asking open-ended questions to directly entice verbal feedback of the participants (Patton, 2015). The interviews were conducted either in a meeting room on campus or in the participants’ offices,
according to the participants’ choices.

**Interviews with instructors**

The interviews focused on the instructors’ perception of critical thinking and how they teach critical thinking, including challenges and coping strategies. The interviews were guided by a list of questions (see Appendix II), but neither the exact wording nor the order of the questions was fixed during the interviewing. This allowed the researcher to react to the emerging worldview of the respondent and new ideas on the topic (Merriam & Tisdell, 2016). Interviews lasted from 40 to 90 minutes.

Demographic information was collected before the interviews (see Appendix I). Recording interviews as a form of data collection ensures that all data had been received correctly (Yin, 2013). With the permission of the participants, interviews were audio-recorded and transcribed for further analysis.

Twenty-four instructors participated in the study. Instructors came from eight different departments, including 11 from Languages and Literature (LL), four from Computer Science (CS), three from Marine Science and Engineering (MSE), two from Political Science (PS), one from Automobile Engineering (AE), one from Information and Electrical Engineering (IEE), one from Economics and Management (EM), and one from Mathematics (MS). Altogether, thirteen instructors were from humanities and social sciences disciplines (HSS) and eleven were from science, technology, engineering and mathematics disciplines (STEM). Instructors’ ages ranged from 34 to 65. There were eleven males and thirteen females. Thirteen instructors held master’s
degrees (MA) and eleven detained doctor’s degrees (PhD.). Two instructors had received their
PhD from universities outside of China. As well, eight instructors had academic experience
overseas between three months to one year. Their teaching experience extended from 2 to 30
years. Ten of them had administration duties as well (see Table 3.1).

Table 3.4 Instructors demographics

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Gen</th>
<th>Age</th>
<th>Edu</th>
<th>Dep</th>
<th>Years of teaching</th>
<th>Position</th>
<th>Class size</th>
<th>Oversea</th>
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<tbody>
<tr>
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<td>MA</td>
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<td>Program Director</td>
<td>30-59</td>
<td>3M/US</td>
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<td>F</td>
<td>35-44</td>
<td>MA</td>
<td>LL</td>
<td>15</td>
<td>30-59</td>
<td>3M/US</td>
<td></td>
</tr>
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<td>M</td>
<td>35-44</td>
<td>MA</td>
<td>LL</td>
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<td>Program Director</td>
<td>30-59</td>
<td>3M/UK</td>
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<td>35-44</td>
<td>MA</td>
<td>LL</td>
<td>17</td>
<td>10-29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Daisy</td>
<td>F</td>
<td>35-44</td>
<td>MA</td>
<td>LL</td>
<td>16</td>
<td>30-59/60-99</td>
<td>3M/US</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Mary</td>
<td>F</td>
<td>-34</td>
<td>Ph.D.</td>
<td>LL</td>
<td>2</td>
<td>10-29</td>
<td>4Y/Korea</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>John</td>
<td>M</td>
<td>45-54</td>
<td>Ph.D.</td>
<td>CS</td>
<td>22</td>
<td>100-200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Zoey</td>
<td>F</td>
<td>45-54</td>
<td>Ph.D.</td>
<td>CS</td>
<td>30</td>
<td>Program Director</td>
<td>30-59</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Freya</td>
<td>F</td>
<td>35-44</td>
<td>MA</td>
<td>LL</td>
<td>12</td>
<td>30-59</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>William</td>
<td>M</td>
<td>35-44</td>
<td>MA</td>
<td>AE</td>
<td>15</td>
<td>Vice Dean</td>
<td>100-200</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Ann</td>
<td>F</td>
<td>35-44</td>
<td>MA</td>
<td>MSE</td>
<td>15</td>
<td>Student Counselor</td>
<td>200+</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Ella</td>
<td>F</td>
<td>35-44</td>
<td>MA</td>
<td>PS</td>
<td>12</td>
<td>100-200/200+</td>
<td>30-59</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Ryan</td>
<td>M</td>
<td>-34</td>
<td>MA</td>
<td>IEE</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Olivia</td>
<td>F</td>
<td>45-54</td>
<td>Ph.D.</td>
<td>EM</td>
<td>23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Grace</td>
<td>F</td>
<td>35-44</td>
<td>Ph.D.</td>
<td>MSE</td>
<td>18</td>
<td>Vice Dean</td>
<td>30-59</td>
<td>1Y/US</td>
</tr>
</tbody>
</table>

62
After interviewing two participants, I transcribed the interviews and sent the transcriptions to an expert (my supervisor) to check. The expert provided feedback on the validity of the interview questions and how to probe questions to elicit detailed and in-depth information in the semi-structured interviews. Along with the interview process, I transcribed the interviews shortly after they were done. The transcribing process kept the data fresh in my mind and gave me a chance to reflect on my probing approach, so that I could make changes in the following interviews.

**Interviews with students**

This study added student interviews to triangulate the interpretations of instructors. Students participating in the classroom observations were identified as potential candidates. They were recruited at the same time as the observation recruitments. Paper version of the student consent forms were distributed to interested students. I recruited eight students and conducted one-hour, face-to-face, one-on-one, semi-structured interviews with each of them. Two were in their first year, two in their second year, one in their third year, and three in their fourth year. There were two females and six males, ranging in age from 19 to 25. All of the eight students specialized in different majors, including Material Science and Engineering, Computer Science, Software
Engineering, English, Automotive Engineering, Chinese, Economics and Management, Mechanical Design Engineering (Table 3.2).

Table 3.5 Students demographics

<table>
<thead>
<tr>
<th>Num</th>
<th>Pseudonym</th>
<th>Gender</th>
<th>Age</th>
<th>Major</th>
<th>Years</th>
<th>Courses</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Conor</td>
<td>Male</td>
<td>20</td>
<td>Material Engineering</td>
<td>2</td>
<td>11</td>
<td>first-year project</td>
</tr>
<tr>
<td>2</td>
<td>Simon</td>
<td>Male</td>
<td>25</td>
<td>Computer Science</td>
<td>3</td>
<td>6</td>
<td>supervisor project</td>
</tr>
<tr>
<td>3</td>
<td>Roy</td>
<td>Male</td>
<td>22</td>
<td>Software Engineering</td>
<td>4</td>
<td>1</td>
<td>supervisor project</td>
</tr>
<tr>
<td>4</td>
<td>Sophie</td>
<td>Female</td>
<td>21</td>
<td>English</td>
<td>4</td>
<td>1</td>
<td>supervisor project</td>
</tr>
<tr>
<td>5</td>
<td>Carter</td>
<td>Male</td>
<td>22</td>
<td>Automotive Engineering</td>
<td>3</td>
<td>9</td>
<td>creative team</td>
</tr>
<tr>
<td>6</td>
<td>Ethan</td>
<td>Male</td>
<td>20</td>
<td>Chinese</td>
<td>2</td>
<td>7</td>
<td>first-year project</td>
</tr>
<tr>
<td>7</td>
<td>Emma</td>
<td>Female</td>
<td>19</td>
<td>Management</td>
<td>1</td>
<td>16</td>
<td>first-year project</td>
</tr>
<tr>
<td>8</td>
<td>Harry</td>
<td>Male</td>
<td>22</td>
<td>Mechanical Engineering</td>
<td>4</td>
<td>1</td>
<td>innovative team</td>
</tr>
</tbody>
</table>

3.4.2 Focus group

As another common method of collecting data in qualitative research, a focus group is an interview with a group of people with knowledge of the topic (Merriam & Tisdell, 2016).

Different from the individual interview, the data generated from the focus group are socially constructed within an interactive discussion among the group. “During the group discussion, participants share their views, hear the views of others, and perhaps refine their views in light of what they have heard” (Hennink, 2014, p. 3). In a focus group, participants exchange their ideas and build upon each other’s ideas. In this way, the researcher might get a different set of data.

Critical thinking has been emphasized in the English for Academic Purposes (EAP) course design in NU(WH). Instructors in the EAP program placed extra attention on teaching critical thinking. They experienced many cultural challenges while they were teaching critical thinking in English to Chinese students. They also held different education backgrounds and diverse
perceptions of critical thinking in both English and Chinese. Therefore, bringing them together may help to capture a better understanding of how educational background influence perceptions and teaching practices.

The EAP course in NU(WH) is a two-semester, required course for selected first- and second-year undergraduate students. Students need to pass an exam to show they are qualified to take EAP. The course is 4 hours a week and 14 weeks long. At the beginning of each term, the EAP Program uses its in-house tests for placing students into different levels. Therefore, after the interviews, this study conducted one focus group discussion with instructors from the EAP program.

Four EAP instructors participated in the interviews (P1, P2, P8 and P12), and I invited them to participate in a focus group discussion at the end of the interviews. All four of them agreed to participate. The focus group discussion was organized in a meeting room on campus. The focus group discussion was conducted in Chinese, according to the choice of the EAP instructors. During the discussion, I facilitated the discussion following a guideline of discussion themes (see, Appendix III). I also gave a short presentation to introduce the purpose of the research and process of the focus group discussion. Audio-recording again was used as the data collection method along with the process and was transcribed later. The focus group discussion lasted about one hour and a half.

3.4.3 Classroom observations

Different from interviews in two ways, observations take place in the setting where the
phenomenon is naturally located, and it represents a firsthand data encounter with the secondhand data obtained in the interview (Merriam & Tisdell, 2016). Simons (2009) states five reasons to use observations to accompany interviews: 1) “gain a comprehensive ‘picture’”, 2) “provides ‘rich description’ and a basis for further analysis and interpretation”, 3) discover culture “norms and values”, 4) “offers another way of capturing the experience of those who are less articulate”, 5) “provide a cross-check on data obtained in interviews” (p. 55). The classroom observation provided the study with rich firsthand data in an authentic classroom setting. The firsthand data allowed me to illustrate, verify, and better understand what the participants said. Moreover, the authentic classroom setting provided opportunities to capture the student agents and classroom atmosphere regarding cultural norms of critical thinking in a Chinese setting.

In each interview with the instructors, I asked them whether I could observe their classes. Fourteen of them agreed. I examined the courses that the candidates were teaching and chose four classes (English for Academic Purposes, Metallic Corrosion, Internet Technology, and Contemporary Chinese literature), considering the coverage of disciplines, class sizes and types of classes (required vs. optional, general vs. specialized) (see Table 3.3).

<table>
<thead>
<tr>
<th>Num</th>
<th>Course</th>
<th>Instructor</th>
<th>Requirement</th>
<th>Year</th>
<th>Class size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>English for Academic Purposes</td>
<td>Freya</td>
<td>General Required</td>
<td>1</td>
<td>50-60</td>
</tr>
<tr>
<td>2</td>
<td>Metallic Corrosion</td>
<td>Mike</td>
<td>Major required</td>
<td>3</td>
<td>30-40</td>
</tr>
<tr>
<td>3</td>
<td>Internet Technology</td>
<td>Steven</td>
<td>Major required</td>
<td>2</td>
<td>200+</td>
</tr>
<tr>
<td>4</td>
<td>Contemporary Chinese Literature</td>
<td>Eric</td>
<td>General optional</td>
<td>1-4</td>
<td>10-20</td>
</tr>
</tbody>
</table>

With the permission of the instructors, I came to the classroom to ask the consent of the students before the classes. I explained the research purpose, observation process and the
participants’ right to them. All students in the four classes agreed to be observed, and four observations were successfully conducted. Each observation lasted about 100 minutes. The observations followed the checklist (see, Appendix IV) and written field notes were used to record the observations during the classes. Soon after the observations, extensive notes in a narrative format were written to describe things just observed.

3.5 Data analysis

The analysis of qualitative data is a systematic search for meaning (Atkins & Wallace, 2012). Case study research often contains a tremendous amount of data, which may present disparate, or even contradictory information. All data need to be organized in an easily retrievable database (Merriam & Tisdell, 2016). Computer programs have more advantages in large databases, especially with over 500 pages of text. A computer program can help researchers quickly locate materials (Creswell, 2013). Therefore, I transferred the data into NVivo 12 for Mac to assist the data coding, categorizing and analyzing.

The data analysis of qualitative research is not a linear but interactive process, which allows researchers to produce reliable findings (Merriam & Tisdell, 2016). In this study, I conducted three cycles of analysis, utilizing open coding, thematical coding and the constant comparative method.

In the first wave, I began with thoroughly reading all of the data to get a general sense of the case before breaking it into coded pieces. After reviewing all the data several times, I went to the transcripts to add comments and memos to individual pieces of data. Later, I grouped the
comments and memos to codes (Yin, 2013). I did not assign any preconceived themes in response to the research questions but allowed the themes to emerge from the data sources themselves. And then I assigned codes to descriptive pieces of data, using open coding. Transcription and field notes were coded for common terms or phrases.

In the second wave, I used preliminary research questions, and the related literature reviewed earlier as the guideline for categorizing codes to themes from the first stage (Marshall & Rossman, 2016). Three main themes related to the research purpose and questions, perception, teaching practices and influential factors, were first generated from the research questions. Then guided by the theoretical framework, several subthemes, such as conceptualizations of critical and creative thinking, disciplinary differences, culture influence, communicative activities, inquiry, project-based learning, were generated for subsequent analysis.

In the third wave of data analysis, I used the constant comparative method to develop more comprehensive categories (Marshall & Rossman, 2016). In addition, utilizing the NVivo 12 functions of Case Classification and Coding Query, I explored how gender, education and teaching experience influenced the themes identified in the second wave.

3.6 Validity, reliability and ethical considerations

Understanding starts with accurately representing the phenomenon. To ensure the internal credibility, I applied strategies of triangulation, member checks and expert checks (Merriam & Tisdell, 2016).

“Using multiple investigators, multiple sources of data or multiple methods” could help to
confirm emerging findings (Merriam, 1998, p. 204). When findings are supported by presenting multiple lines of evidence, the “converging lines of inquiry” may strengthen potential findings (Yin, 2013, p.115). In this study, I triangulated data collection through multiple methods, including interviews and focus groups. Moreover, eight students were also interviewed to review the findings for consistency in the instructors’ perceptions and teaching practices. The multiple sources helped to compare and cross-check findings and to confirm or refute thematic categories.

Member checks were applied in this study by taking data and interpretations back to the participants to verify the accuracy (Merriam & Tisdell, 2016). After transcribing the interviews, I sent them back to the interviewee in an email and requested feedback including changes and clarification of their words (meaning or grammar) and asked whether there were some words they did not want used in the study. Member checks were also used in interpreting meaning continuously during the study. I brought the interpretations and translated quotations back to the participants to check their validity. 18 of the 33 participants sent back their revisions, including 15 instructors and three students.

In addition, I debriefed with experts to obtain feedback, helping to rationalize the data analysis. The expert opinions are essential for avoiding assumptions and tacit knowledge (Merriam & Tisdell, 2016). Novice researchers typically struggle to conduct rigorous case studies, especially in the data analysis phase of the research (Yin, 2013). Using an expert check helped me to rationalize the data collection and data analysis. The expert checker in this study is my supervisor, a person who has cross-cultural experiences in higher education. She is familiar
with practitioner research and methods. Additionally, she had no relationship with the participants whatsoever. She provided an outside and expert’s professional perception during the research framework construction, data collection, and data analysis.

Traditionally, reliability refers to replication. In other words, if someone conducted the same case study all over again, the study should arrive at the same results if supported by the same procedures of the original study (Merriam & Tisdell, 2016). However, in qualitative studies, the traditional perspective of reliability is problematic because of the non-static human behaviours and experiences. Failure of replication of a qualitative research does not necessarily discredit the particular study but may lead to alternative interpretations of the same data. Therefore, reliability in qualitative studies means more about “whether the results are consistent with the data collected” than “findings will be found again” (Merriam & Tisdell, 2016, p. 251).

Thus, this study utilized rich, thick descriptions and maximum variation to ensure reliability (Patton, 2015; Merriam & Tisdell, 2016). I gave a detailed description of the research methods, data collection and analysis procedures, and decision-making in carrying out the study. I also contextualized the local institution in terms of local policies and implementations. The detailed and thick descriptions allowed readers to compare or match their situations to the research context (Merriam, 1988). Purposeful sampling of participants with diverse disciplines and backgrounds provided an in-depth understanding of critical thinking in higher education (Patton, 2015). Instructors from other institutes may find similarities in their disciplines. Hence, the transferability of the current research could be extended.
Ethical assurances and concerns are essential parts of research related to human subjects. Ethical practice, for inquiry research, is based on “the moral principle of respect for person, beneficence, and justice” (Marshall & Rossman, 2016, p. 51). Researchers should respect participants’ privacy, anonymity, and the right to participate or not. The research should “not harm” the participants. Moreover, researchers should also consider who get benefits and who does not from the study (Marshall & Rossman, 2016, p. 51). Furthermore, the researcher should not assume what the “harm” to the participants is but keep in mind giving the participants’ choice (Simons, 2009, p. 96). Another, “no harm” to participants may result in “harm” to other participants. For example, in my study, one participant wanted to use his real name instead of a pseudonym, because he/she wanted his/her voice to be heard. However, people who are familiar with the context may figure out the identity of the other participants. That will affect the confidentiality of other participants. The importance of “to build relationships and establish conditions of trust with the people you are studying” (Simons, 2009, p. 100). To build a trusting relationship with the participants helped to solve problems through communication.

Before conducting this qualitative case study, approval from the Institutional Review Board (IRB) are required (Marshall & Rossman, 2016). I applied and obtained ethical approval from the Conjoint Faculties Research Ethics Board (CFREB) at the University of Calgary. The CFREB IRB approval was obtained before data collection.

The whole process of the research was guided by Patton’s (2015) 12 items of “Ethical Issues Checklist” (pp. 496-497). I ethically treated participants by getting consent and strictly
maintaining confidentiality as well as respect. I sent one-on-one personal recruiting letters through email. The protection of separating the research from the school administration delimited its influence on the administration. I informed the participants about the purposes and procedures of the study before the data collection. I gave the consent forms to participants in person. Participants got both English and Chinese versions. Each participant signed a standard consent form before participating in the research privately. During the consent process, I informed participants that they could refuse or discontinue participation at any time. Pseudonyms were used during data analysis, interpretation, and reporting to ensure confidentiality. Only the researcher had access to the information relating to participants’ identities with the assigned pseudonyms. Participants received copies of the consent forms for their records. All the electronic data were stored in password-protected folders in the researcher’s personal computer. All of the hard copy data were kept in a locked file cabinet. After five years from the end of this research, I will erase all of the electronic data and shred the hard-copy data.

My particular concern in this study was my stance as an insider when I recruited participants from where I worked. Although the insider lens could provide many advantages and conveniences for the study, it also set barriers due to my limitations, for instance, my own bias of understanding critical thinking. My previous relationship with the participants may affect the research relationship. Like all the other qualitative research, participants may feel discomfort or embarrassment when they are being recorded. The instructors may worry about others judging their ideas and skills. In this case, my colleagues and I are both friends and competitors. For one
thing, since we know each other so well, they may unconsciously try to say words to “please” me. For the other, seeing me as a competitor, they may hide or modify their words to sound better.

To minimize the insider barriers, I tried to build trusting relationships between my colleagues and me. I began by sharing my research information with participants. I explained my research purposes and procedures. I stated that their participation would help me better understand the teaching of critical thinking in the Chinese context. Besides, I highlighted that their participation was entirely voluntary, and they could withdraw their participation at any time without affecting our relationships. I explained my role as a researcher and their part as participants. I also explained potential benefits from participating in this study. The information they would share could provide them with an opportunity to reflect on their teaching practices in their own classes. Before the data collection, I offered participants opportunities to ask questions. During the interviews and focus group, asking open-ended questions allowed me to explore the experiences without the limitation of researcher bias and predefined answers. During the observation, I did not engage in any class activities. As a researcher, I was critically mindful of my ontological and epistemological stances and continued to reflect on my research within my theoretical framework and methodology. I wrote field journals as a record of data analysis and writing. These journals helped me re-examine whether my beliefs, biases, and assumptions influenced my interpretations.
Summary

In this chapter, I provided the rationale for taking a qualitative case study approach and a detailed description of the case context. I stated the research design and explained the specific research methods, including participant selection and recruitment, and the procedures of data collection and analysis. I provided a discussion of the validity and reliability methods I used to ensure trustworthiness. Finally, I discussed the study’s ethical considerations and delimitations.
Chapter 4 Findings

The following section presents a summation of findings responding to participants’ perceptions and practices of teaching critical/creative thinking.

4.1 Instructors’ perceptions of critical/creative thinking

This section reports findings for the first research question: what are instructors’ perceptions of critical thinking? Three themes were identified to represent the instructors’ perceptions, including conceptualizations of critical and creative thinking, characteristics of students with critical/creative thinking abilities, and the significance of teaching critical/creative thinking.

Data from the study showed significant disciplinary differences in defining critical thinking, critical thinking in HSS (humanities and social sciences) and creative thinking in STEM (science, technology, engineering and mathematics) (see Table 4.1).

Table 4.7 Themes comparison between HSS and STEM instructors

<table>
<thead>
<tr>
<th>HSS Themes</th>
<th>STEM Themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holistic and objective thinking</td>
<td>Knowledge and application</td>
</tr>
<tr>
<td>Cognitive thinking skills</td>
<td>Independent thinking and autonomy</td>
</tr>
<tr>
<td>Questioning</td>
<td>Problem-solving skills</td>
</tr>
<tr>
<td>Thinking for the interests of the community</td>
<td>Innovation</td>
</tr>
</tbody>
</table>

Before interviews, I presented two Chinese translation of the term critical thinking,批判性思维 (“Pi Pian Xing Si Wei”) and 思辨 (“Si Bian”). Participants were free to choose the most familiar and suitable one to their teaching context for the later conversations. Eight instructors from the field of EFL (English as Foreign Language) chose the term of 思辨 (“Si Bian”); six chose 批判性思维 (“Pi Pian Xing Si Wei”), including instructors from Chinese Language,
Korean Language, Economic and Management and Political Science. This finding reflected the same terminology in previous studies (e.g. Liu, 2015; Gao, 2016).

However, when I presented the two terms in Chinese to a STEM instructor from Computer Science (P10 John), he expressed his unfamiliarity with the terms and mentioned “创新” (creative thinking) as an alternative one. According to John’s interpretation, the term “critical thinking” is often used in the domain of thinking. However, in STEM, they focus on solving the authentic problems in the real world.

I heard about “Si Bian “or “Pi Pian Xing Si Wei.” However, I think they usually appear in debate contests. In our class, we do not have time for debate, but we focus on problem-solving. The term “creative thinking/ability” is be more accurate (P10 John, Computer Science) 听说过,但是思辨或者批判性思维，我认为一般关于演讲辩论赛的。在我们课堂上，倒是不太强调这一点，因为没有太多时间进行沟通和辩论。我们更强调解决问题的能力，可能用创新思维或者创新能力更确切。

John’s interpretation was consistent with the literature reviewed in chapter two (Elder & Pual, 2008; Pang & Plucker, 2012). Therefore, in the late interviews, the third choice 创新思维 (creative thinking) was added, and all eleven STEM instructors chose to use it. I brought the term back to the nine participants who already finished their interviews. The nine participants were all from the Department of Languages and Literature, and none of them wanted to change.

4.1.1 Conceptualizations of critical thinking

Altogether, thirteen instructors from humanities and social science provided the four most common themes for conceptualizing critical thinking (see Table 4.2). Some participants’ definitions included more than one theme, so the total frequency was higher than 100%.
Table 4.8 Themes and frequency of critical thinking among HSS instructors

<table>
<thead>
<tr>
<th>Themes</th>
<th>Frequency n=13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holistic and objective thinking</td>
<td>54% (P1, P5, P6, P7, P9, P15, P22)</td>
</tr>
<tr>
<td>Cognitive thinking skills</td>
<td>38% (P2, P3, P4, P6, P20)</td>
</tr>
<tr>
<td>Questioning</td>
<td>38% (P2, P3, P4, P8, P12)</td>
</tr>
<tr>
<td>Thinking for community interests</td>
<td>15% (P15, P22)</td>
</tr>
</tbody>
</table>

“Holistic and objective thinking” was the most popular conceptualization mentioned by seven instructors. “Cognitive thinking skills” appeared in five instructors’ interviews. In addition, five instructors stressed “questioning” as the key feature of critical thinking. Two instructors from Political Science contributed to a unique theme, “thinking for community interests” to conceptualize critical thinking. The findings showed some similar results to a previous study conducted by Chen (2017). From a similar sociocultural context, Chen interviewed 46 Chinese college students to examine their conceptualization of critical thinking. Chen’s study identified the three most common conceptualizations, “cognitive thinking skills, intellectual autonomy, and the omnipresence of positive and negative aspect” (Chen, 2017, p. 140).

**Holistic and objective thinking**

Firstly, seven out of the thirteen instructors in HSS regarded critical thinking as “holistic and objective thinking.” From their understandings, critical thinking meant considering from multiple perspectives, remaining objective and generating a holistic understanding when confronting an issue. This idea was explicated in the following quotes:
My understanding of critical thinking is to consider a problem from a vast multitude of perspectives. It means generating one’s understanding through the integration of other people’s ideas (P1 Sara, English for Academic Purposes). 思辨能力，我个人的理解是对一个问题要有多方面的考虑。在综合其他人的想法的基础上，产生自己对这个问题的理解。

In short, critical thinking mainly means that one can find relevant views about a specific problem, and then through comprehensive thinking he/she could finally generate a relatively objective point of view (P5 Daniel, English Language). 简单来说的话，思辨能力主要就是能够围绕一个问题，自行去寻找相关的观点，然后经过自己的综合思考，最终形成一个相对客观的观点。

I think critical thinking is that you have to think more comprehensively and objectively. You should not be too subjective. You should consider the background, the environment, and so on. In this case, it may lead you to a conclusion that is more objective, fairer, and more correct (P7 Chloe, Chinese Language). 我觉得思辨能力，就是你看待一个事物或者是一个问题，要比较全面客观，不能是过于主观，能考虑到它产生的背景、环境等等，综合的来考虑。这样的话才有可能得出比较客观、公平、正确的结论。

This understanding of critical thinking was consistent with one of Ennis’ (2015) critical thinking skills, which describes how thinkers “use their background knowledge, knowledge of the situation, and previously established conclusions” (p.32). It also reflected Ennis’ dispositions items, like “take into account the total situation”, “be alert for alternatives”, “seriously consider other points of view”, “take a position and change a position when the evidence and reasons are sufficient” (pp. 32-33), which expressed the willingness to be open-minded and consider the alternative. Ennis perceived critical thinking as “reasonable reflective thinking” (p. 32).

Similarly, P9 Mary describes the feature of reflection; through critically considering different perspectives, one could reflect on his/her weakness and achieved better.
After doing something, one can rethink the whole process to find out issues and solutions to overcome similar challenges in the future. (P9 Mary, Korean Language) 做完某件事之后，再去思考整个过程，看看中间有什么问题做的时候没有发现，然后你再做类似的事情的时候，如何去克服这些问题。

However, the instructors’ interpretations contained some special Chinese features, consistent with Taoism’s dialectic thinking (Peng & Nisbett, 1999). Similar to Durkin’s (2008b) middle way of thinking which contains deep inclusive thoughts but avoids confrontations, instructors’ version in this study was not to take a position but to remain objective. These Chinese instructors believed that critical thinking focused on self-reflection and self-adjustment. This thinking process tends to be more tolerant of differences and contradictions. In this way, instructors consider Chinese critical thinking to be helpful to avoid conflict but not very useful for decision making. P7 Chloe further explained how dialectic thinking influenced the Chinese ways of taking positions:

A person with critical thinking competencies understands that starting from a different position may lead to different conclusions. They will not be self-righteous but hold multiple perspectives or be more tolerant of others’ views. That is to say, they are willing to change their perspectives and consider others’ positions. 同一个事物，站在不同的立场，得出的结论可能是不一样的。他在看待一个问题的时候，不会自以为是，而是更多元的或者是更包容别人的这种观点。也就是说他会去变换不同的视角去看待问题。

In contrast, Ennis’ understanding “focused on deciding what to believe or do” (2015, p. 32), which emphasized decision-making and included ideas of taking a position and changing positions when needed. Chinese instructors accepted the existence of multi-positions and were more willing to change positions than take one.
Moreover, in Chen’s (2017) study, Chinese students understanding of “the omnipresence of positive and negative aspect” also showed thinking from different aspects but indicated students’ dualist ontologies (p. 140). However, instructors in this study held a more pluralist and holistic perspective than Chinese students in Chen’s study.

**Cognitive thinking skills**

Secondly, five instructors identified “cognitive thinking skills” as key elements of critical thinking skills, for example, logical thinking, reasoning, argument, evidence, judgment and innovation:

I think that critical thinking is closely related to cognition. It is based on one’s experience, reasoning, judgment, and then there is some creative thinking. (P6 Ruby, English) 我觉得这个跟认知有一定的关系, 其实是个人的经验基础上的推理、判断, 还有创造性的思维。

Critical thinking is thinking about an existing problem. It is more rigorous in thinking, more logical, innovative, and needs speculations. However, it is also includes something else, like intuition and imagination (P20 Eric, Chinese Language).批判性思维是针对既有的一个问题来进行思考。它更讲思维的严谨、比较强的逻辑性、创新能力，也需要思辨这方面的东西。但是它也可以加上一些像直觉，想象这样一些东西。

P3 Bryan directly used English words to discuss the holistic application of critical thinking skills. As an instructor who teaches English writing, he mentioned his understanding was influenced by 英语思维(the way of thinking in English).

(In English writing) students with precise, logical thinking can form a thinking loop, in which their argument, reasoning and evidence relate and support each other (P3 Bryan, English Language). 思维逻辑比较清晰的同学，能形成一个很完整的闭环，你能明显的看到他的 argument、reasoning、evidence 是一体的。
The five instructors’ understandings of cognitive thinking skills were consistent with the conceptualization of critical thinking abilities by many scholars (e.g., Ennis, 1987; 1989; 1991; 1996; Facione, 1990, 2011; Wen, 2009; Chen, 2017). Instructors viewed critical thinking as “higher-order thinking” and “logical thinking,” which consisted of a series of cognitive thinking skills. In addition, instructors stated that identifying the subskills of critical thinking helped to teach critical thinking. They also took actions to train students critical thinking skills in the curriculum. For example, the English Major courses and general English courses for non-English majors used a series of textbooks, which aimed to develop students critical thinking skills as well as language abilities.

**Questioning**

Thirdly, five instructors valued the importance of “questioning” in critical thinking, which means “not take for granted” or “willingness to ask questions.” Instructors illustrated that students should not take the teachers’ words for granted. Instead, they should reflect on the ideas themselves and develop their own understanding. They were more willing to ask for clarification and also to challenge teachers when they had different points of view.

Critical thinking refers to form a unique view through independent thinking, not just parroting. Particularly for students, they may raise questions and challenge what teachers say (P6 Ruby, English Language). 思辨能力就是通过思考，对事物形成独特的看法，不是人云亦云的。尤其是对老师说的一些东西，还可能提出质疑和挑战的。

I think the foundation of critical thinking for students is independent thinking, not accepting everything they were taught. For example, some students do not question. Especially when facing some social phenomena, they do not analyze but are easy to go with the tide (P8 Daisy, English Language). 我觉得思辨最基础的就是学生要善于独
立思考，而不是所有我们教给他的信息都全盘的接受。就像有的学生，不会去质疑，特别是一些社会现象，不会分析，特别容易盲从某一观点。

The theme of “questioning” was also consistent with the “spirit of critical thinking” which refers to “taking nothing for granted or as being beyond question” (Walker & Finney, 1999, p. 533). Moreover, some instructors (P2, P3, P4) combined “cognitive thinking skills” with “questioning.” For instance, P3 Bryan added that “questioning should come along with supporting evidence.” This combination shared many similarities with the taxonomy of critical thinking, abilities/skills and dispositions (Ennis, 1987; 1989; 1991; 1996; 2011; 2015; Facione, 1990, 2011) and Wen’s (2009) hierarchical model, skills and the emotional dimension.

Some instructors also discussed how social-cultural context affected students’ willingness to question. The traditional manner of being respectful may be one of the barriers. For example, P8 Daisy stated,

“we often asked our children to follow regulations. Some behaviours may not be accepted if they do not follow the traditional idea. If children feel that their problems are too difficult for the teachers, they may not ask. I feel that some traditional ideas are not conducive to critical thinking.” 我们经常跟孩子说要听话。按传统观念，很多事情不能做。有时候如果孩子觉得问题太难了，老师可能不知道，他一般就不问了。所以我觉得一些传统观念不太利于批判性思维。

P12 Freya (EAP) mentioned the “face culture,” “to save face” (面子). She explained that the Chinese tend to hide their opinions or feelings when they were different from others because it is rude and may hurt other people’s “face,” or social standing.

In this cultural background, even if I disagree with you, I will not point it out, because it may make you feel awkward (P12 Freya, EAP). 在这种文化里，即使我们的意见不一致，我也不会当面指出来，应为这样会让你觉得很尴尬。
Students’ interviews supported this point. Students all reported that they would not challenge the teachers with different views, especially in public. Instead, they would go to internet or ask senior peers for answers and solutions. S3 Roy explained his reasons, “I feel that I should try to figure it out by myself before bringing problems to the teachers, and if I ask my own questions in class, it may take up others’ time.” Similarly, Li and Wegerif’s (2014) interpreted the “silence of not questioning” as “active silence.” In the Chinese education context, students are encouraged to “engage in in silent inner dialogue” before speaking out. Students should be responsible for their own learning and question “only in a responsible manner and only after reflection” (p. 29). In focus group discussion, instructors argued for “the condition of questioning;” students need time and effort to think before they speak out.

**Thinking for the interests of the community**

Fourthly, two instructors from political science stated a unique understanding of critical thinking, stating that critical thinking should not be focused on the skill of an individual, but on the interests of the community. According to P15 Ella, critical thinking should not just be independent personal thinking. It should relate to the collective and social needs. Making judgments through critical thinking should follow the criterion of moral values.

My understanding of critical thinking can refer to one of Confucius’s sayings: “Do what you want without breaking the rules.” There must be a general criterion for judging, for example, historical development trends, what is the most acceptable, or to serve the interests of the community. Then on this premise, I will consider how I understand the world… it is necessary to hold a mainstream value (P15. Ella, Political Science). 我觉得可以引用孔子的那句话，”从心所欲，但是不逾矩”，就是事情它必然会有一个
The critical spirit is an inclusive term. It is not individualistic, but includes many aspects such as the scientific spirit, the democratic spirit, and the moral spirit…When implemented in real life, it refers to questioning and re-examining the irrational social realities and re-examines it. Examine the reality should be based on the knowledge of the past. That is to examine the process of social development from a historical perspective. Also, questioning should be based on moral criteria (P20, Luke, Political Science). 批判性思维非常广义的，它不是独立的东西，包括科学精神、民主精神、道德精神等各个方面……它落实到现实生活中，就有一种对不合理社会现实的质疑，重新审视。审视现实要立足过去，就是从历史发展的脉络来考察社会发展的过程。质疑要以道德标准为出发点。

Aligning with previous studies about the Chinese culture feature of critical thinking (Pang & Plucker, 2012; Niu & Kaufman, 2013; Li & Wegerif, 2014), instructors in this study stressed a high moral standard of critical/creative thinking as the educational goals in a collectivist society which puts individual interests behind groups. Ella and Luke’s interpretations of critical thinking reflected moral concepts in decision-making, which should consider the majority of others. In this way, teaching critical thinking includes teaching moral responsibility to the communities. Differently, Western norms relate to the morality of developing critical thinking to avoid biases and prejudices (Paul, 1990).

4.1.2 Conceptualizations of Creative thinking

Instructors from STEM indicated their unfamiliarity to the term of critical thinking. Instead, they suggested another, more popular, term in their fields, creative thinking. Different from the HSS instructors who provided clear definitions of critical thinking, many STEM instructors did
not explicitly define the terminology of creative thinking. Instead, they related creative thinking to their disciplinary contents and illustrated with examples from their own teaching experiences.

Four themes were identified from their explanations and examples: Knowledge application, independent thinking and autonomy, problem-solving skills, and innovation (see Table 4.3).

STEM instructors did not talk about the four themes separately. Instead, they put them into a hierarchal process.

Table 4.9 Themes and frequency of conceptualizations of creative thinking

<table>
<thead>
<tr>
<th>Theme</th>
<th>Frequency n=11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge and application</td>
<td>64% (P11, P14, P16, P18, P19, P20, P24)</td>
</tr>
<tr>
<td>Independent thinking and autonomy</td>
<td>55% (P10, P11, P14, P18, P21, P24)</td>
</tr>
<tr>
<td>Problem-solving skills</td>
<td>55% (P10, P11, P19, P21, P23, P24)</td>
</tr>
<tr>
<td>Innovation</td>
<td>55% (P13, P14, P16, P17, P18, P24)</td>
</tr>
</tbody>
</table>

**Knowledge and application**

Seven instructors stated that creative thinking requires knowledge in specific disciplines. They believed that creativity or innovation starts from an understanding of discipline-specific knowledge. Similarly, Bailin and colleagues (1999) noted that domain-specific knowledge is vital to critical thinking since those highly valued skills, like explanations, evaluations, and evidence, vary among domains. For university students, creative thinking does not necessarily require creating new knowledge or inventions but understanding and applying knowledge correctly in different contexts.

Students’ creative abilities depend mainly on their ability to acquire and apply knowledge. Proficient and flexible application of knowledge suggests strong creative abilities (P16 Ryan, Information and Electrical Engineering). 学生的创新能力，主要
Moreover, instructors believed that knowledge accumulation was the foundation to gain creative abilities.

Creative ability derives from daily learning. Reasonable solutions cannot be proposed without a solid professional knowledge foundation. One must stand on the shoulders of your predecessors and ask new questions. Otherwise, how can you innovate without knowing what has been done? (P19 Mike, Marine Science). 创新能力来源于平时的学习积累，没有好的专业基础和知识储备，就不能提出好的思路来。你必须站在前人的肩膀上提出新的问题。否则你连别人做什么东西都不知道，谈何创新？

**Independent thinking and autonomy**

Six instructors associated creative thinking with independent thinking and autonomy. When regarding discipline knowledge as foundations or prerequisites, instructors viewed independence and autonomy in learning as crucial in developing creative thinking/abilities.

After a particular understanding of professional knowledge, students cannot just listen to teachers… Another aspect (of creative thinking) is the autonomy of thinking. He/she is able to think more than others (P14 Ann, Marine Science). 在了解理论基础上，学生不能只听老师的……我觉得其中另一方面是主动思考，对于任何的事情他能够比别人想的多。

Students with creative thinking ability will not rely on teachers to achieve a task. They will think independently and search for solutions from the internet. (P24 Kevin, Computer Science). 给他任务，他不是过度的去依赖你，能想自己办法，去网上搜索找到问题解决方法。

Creative students think independently. In other words, teachers do not need to spend much time on them. The average students would follow what they were told. A good student is not only an executor but also a partner. They can understand the teacher and can present their good ideas based on their mastery of the subject (P19 Mike, Marine
Similarly, in the Delphi Report, Facione (1990) proposed self-regulation as one of the critical thinking abilities, which refers to self-monitoring and self-correcting one’s cognitive activities. Chinese scholar, Wen (2009) put metacognitive skills, such as planning, examining, adjusting, and evaluation in her Chinese critical thinking model. However, Facione (1990, 2011) paralleled self-regulation with other critical thinking abilities, while Wen (2009) considered metacognitive skills as the higher and more dominant skills. Instructors in this study also regarded autonomy as the foundation and dominant component of creative abilities.

**Problem-solving skills**

Six instructors related creative thinking abilities to the domain-specific educational goals in STEM. They stated that the purpose of education and research in STEM was to solve problems in the real world. Therefore, they believed that the aim of developing students’ creative thinking was to solve problems. In this way, problem-solving skills were essential to creative thinking.

For students of STEM, the cultivation of creative thinking/capabilities is a process of solving authentic problems through knowledge and method acquisition (P21 David, Mathematics, Provost Dean). 对理工科的学生，创新思维/能力的培养的，实际上是由知识和方法解决实际问题的一个过程。

When encountering problems, (students with creative abilities) can mobilize various resources to solve them (P18 Grace, Marine Science). 在遇到问题的时候，（有创新能力的学生）能够调动各种资源去解决。
Problem-solving skills were not independent but included how to creatively apply known knowledge and resources to unknown situations.

Innovations

Six instructors attributed innovation as the highest requirement of creative thinking. According to them, higher education carried the responsibility of leading society for theoretical innovation and technological innovation, such as creating new theory or new technology. Moreover, cultivating problem-solving skills would eventually lead to innovations.

I believe that the final stage of creative thinking should be different from or even beyond the convention, which others have not done before, or which can bring progress in a specific field. (P3 William, Automotive Engineering, Vice Dean) 我认为创新思维最终应该是有异于常规的，超出常规的，别人以前没有做过的，然后能够在某一领域带来进步的。

We consider a student with independent analysis and problem-solving abilities to be competent in creative thinking. If they can solve any problem, and then they will dig deeper and develop something more innovative. This is creative ability. (P10 John, Computer Science) 如果学生具有独立分析问题和解决问题的能力，我们认为他可能也就具备了创新力。什么问题他都能解决了，然后会顺着某条线感兴趣的深挖下去，开发出来比较创新的东西，这也就是创新力。

Although the term of critical thinking seemed alien to instructors from STEM, their understanding of creative thinking shared many things in common with Bloom’s taxonomy of critical thinking. In the revised version of Bloom’s taxonomy, the development of critical thinking follows a linear and hierarchical approach. The learning process starts with remembering and understanding knowledge and later applying knowledge. After that, learners are able to engage in a more sophisticated learning process of analyzing and evaluating, and, in
the final stage, creating (Krathwohl, 2002). STEM instructors’ understanding of creative thinking also emphasized that the primary function of knowledge and creative thinking cannot be developed without knowledge. Moreover, instructors agreed that before creating, students should practice how to apply knowledge by solving real-world problems. The creative act is driven by technological development and various needs in human life.

4.1.3 Characteristics of a critical/creative thinker

Instructors in this study all recognized the significance of teaching critical/creative thinking. On the one hand, some instructors related critical thinking to personal development. For example, P4 Bryan believed that critical thinking could transfer into learning skills and also working competencies in future careers. P5 Daniel reflected on personal needs. He argued that China had entered into a new era when the subsistence was no longer the issue. Therefore, according to Maslow’s hierarchy of needs (McLeod, 2018), the Chinese are now seeking for higher thinking abilities when lower-level needs had been satisfied. On the other hand, some valued the importance of critical/creative thinking relating to the responsibilities of social development and national progress.

Human beings must always be innovating and surpassing themselves and continuously creating new things to improve our lives. Therefore, for the whole society, and even the entire human race, creative thinking is essential. (P14 Ann, Marine Science) 人类要进步，只有通过不停的去创新，不停的去超越自己，不停的去创造一些新鲜的事物，去改变我们的生活。所以为了整个社会，甚至整个人类的进步，创新非常有必要。China has a large population. It is impossible to develop the country through consuming resources. Therefore, it is necessary to resort to innovation, especially technological innovation. (P21 David, Mathematics, Provost Dean) 中国是一个人口大国。国家要
Instructors were also asked to give examples of students with strong critical or creative thinking abilities. According to their descriptions, the characteristics of students with critical thinking abilities are listed below (see Table 4.4).

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>STEM N=11</th>
<th>HSS N=13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autonomy and agency</td>
<td>8 (P11, P13, P14, P18, P19, P21, P23, P24)</td>
<td>6 (P3, P4, P6, P8, P9, P12)</td>
</tr>
<tr>
<td>Questioning</td>
<td>4 (P10, P13, P17, P23)</td>
<td>5 (P2, P4, P8, P9, P12)</td>
</tr>
<tr>
<td>Intrinsic motivation</td>
<td>2 (P16, P17)</td>
<td>6 (P1, P4, P7, P8, P20, P22)</td>
</tr>
<tr>
<td>Logical thinking</td>
<td>0</td>
<td>2 (P3, P5)</td>
</tr>
<tr>
<td>Interdisciplinary</td>
<td>0</td>
<td>2 (P6, P7)</td>
</tr>
<tr>
<td>Persistence</td>
<td>2 (P13, P17)</td>
<td>0</td>
</tr>
</tbody>
</table>

**Themes**

**Autonomy and agency**
Students are responsible for their studies; they can self-regulate their learning process; they do not need the teacher to monitor their study; they are actively engaging in-class activities; they can achieve their course tasks.

**Questioning**
They do not take what the teachers said or information from the textbooks for granted; they are willing to raise questions when they do not understand or when they have different understandings; they communicate with teachers and their peers about their questions.

**Intrinsic motivation**
They enjoy the learning or inquiry processes; they learn for interest rather than passing exams.

**Logical thinking**
Students can think logically; they can propose their arguments, find substantial evidence and give rigorous reasons to support their ideas.

**Interdisciplinary**
Their interdisciplinary background attributes to their critical or creative thinking ability.

**Persistence**
Students will not give up when confronting challenges.

Although instructors from STEM and HSS were interpreting different terminologies, creative thinking vs. critical thinking, their examples shared many similarities. Autonomy and
agency and questioning are highly recognized as the traits of strong critical/creative thinking by both groups. Especially, autonomy and agency were considered the key elements or the foundations of critical thinking. Instructors’ views were consistent with Wen’s (2009) critical thinking model, which put meta-cognitive skills before other subskills.

Instructors believed that teaching methods of cultivating critical/creative thinking requires more effort outside the classroom compared with the traditional lecture-based classes. Also, the disposition of questioning was the key spirit of critical/creative thinking. More instructors from HSS stressed intrinsic motivation than STEM instructors. The difference may lie behind the different forms of courses they were teaching. Most HSS instructors taught the required general courses or optional courses while most STEM instructors taught required major courses which were more valued by students.

Also, some instructors contextualized students’ performances in their learning situations. Two English instructors (P3, P5) noted how good logical thinking is reflected in students’ writings. Two HSS instructors (P6, P7) mentioned that students with interdisciplinary background, for instance, Engineering students who took Linguistics as their minor, often approached questions from a different perspective and provided more critical thoughts. Moreover, some STEM instructors, who were leading project-based learning groups, added persistence as a trait of creative ability. If students give up seeking solutions easily, they will most likely not make innovations.
Instructors also critically discussed the over-generalized and stereotypical views of Chinese students’ critical/creative competencies. They proposed individual differences, regional differences, and social/economic capital differences among students’ critical/creative competencies. Instructors reflected on students’ academic performances and reported that students from economically developed areas, such as big cities or coastal provinces, often performed better in critical/creative thinking and problem-solving.

I think it has something to do with personality. Some people have ideas, but they do not like to say it. For example, when watching a sports game, everyone is very excited. However, someone felt excited in heart and did not express it. (P12 Freya, EAP) 我觉得跟性格也有关系，有的人有想法，但是不喜欢说出来。

Students from cities may perform better, especially from big cities like Beijing. I have read reports that (in Beijing) from the elementary school, they have started to introduce various research projects into the textbooks. So, these students were more flexible and active than rural students. (P1 Sara, EAP) 城市来的学生可能会做得更好一些，尤其是北京这种大城市的。我看过报道，从小学他们就开始有各种什么研究项目引入到教材当中。所以这些学生就不那么固化，思维会更活跃一些。

I think that the degree of economic development will affect the cultivation of creative abilities. The south is more developed, and their innovation consciousness appeared relatively early. Students from the north often prefer to be stable, while students from the South are often more active. I remember a student from a wealthy family in Wenzhou. His family owned a big shoe company. During his time at the university, he showed an extreme sense of innovation. For example, at that time, he organized department activities which were short of funds. When most other students just followed the budget, he started to find sponsors. He would make every effort to do it better, even if there were no resources in hand. (P14 Ann, Marine Science) 我觉得经济发达程度会影响到创新能力的培养。南方地区经济相对发达，创新的意识确实是比较早。北方的孩子整体上求安稳，南方的孩子普遍思维非常活跃。我以前接触的一个孩子，他是温州
Students from more developed areas often had project-based research experience in middle schools, like S6 Ethan from an experimental middle school, and S7 Emma from a middle school in Hangzhou. These experiences helped them to perform better in their critical/creative competencies.

4.2 Instructors’ teaching practices

This section reports findings on the second research question: How is critical thinking reflected in the instructors’ teaching practices?

Although participants had different interpretations of critical thinking, they all believed that critical thinking was teachable. They believed that Chinese students were able to develop critical thinking skills through appropriate instructions. Data analysis showed that instructors’ teaching practices were highly related to the institutional curriculum setting. Instructors reported two major forms of developing critical/creative thinking. These forms were projects outside classrooms required by new curricula and new pedagogies that appeared in more traditional classes. Therefore, the following parts include findings from two aspects: the UN curricula reform and instructors’ teaching practices.

4.2.1 The curricula reform in NU(WH)
As a result of the increasing promotion of critical/creative development in higher education by the central policies (Pang & Plucker, 2012), undergraduate curricula in NU have undergone remarkable shifts, from individual interests, to extra-curricula for elites, and explicit educational goals in curricula.

Before 2010, NU(WH) did not set developing critical/creative thinking as educational goals. Instructors did not focus on critical/creative thinking in their classroom teaching. Some instructors (P10, P13) recalled that they thought that to develop critical/creative thinking abilities was the responsibility of the graduate program at that time. At the grassroots level, students joining professors’ research groups and student leading innovation clubs were considered a means of cultivating creativity abilities. However, without systematic policy supports, opportunities for undergraduate students to engage in those activities were minimal. Professors would accept only a few students with strong interests and expertise in a particular field. Moreover, the innovation clubs at that time were pure student-led interest clubs. P13 William gave an example of the first innovation club in his department. In 2009, a group of students who loved automobiles, started a racing car club aiming to attend the first national formula contest, Formula Student China (FSA). William was invited to be the supervisor of the students. In HRT, students worked together to design, build and prepare small formula-style racing cars. William recalled that the club did not receive any support from the university during the first few years.

Later, in responding to the Outline (MOE, 2010), NU(WH) added “developing creative talents” into its undergraduate program requirement in 2012. In the same year, the university
announced an “Elite Leaders in Engineering Developing Plan (工程领军人才培养计划).” The Elite Plan selected elite undergraduates to cultivate into innovative leaders. Only the top 20% students in GPA got the chance to attend the program. According to the Elite Plan, departments were responsible for providing places, funding, and technological and academic supports. Moreover, it required professors to involve undergraduate students in their research teams, while formerly most research teams recruited only graduate students. Still, the majority did not have the opportunity to experience creative development. Instructors (P10, P13) also recalled that developing critical/creative abilities were not the teaching goal in the classroom and not for every undergraduate student at that time.

Since 2015, the university changed its focus from developing the critical/creative thinking of a few top students to all undergraduate students. The education methods of developing critical/creative thinking were also changed from extra-curricular activities to integrated curricula. In 2016, the NU(WH) modified its undergraduate curricula. The new curricula consist of three systems: Regular course-based learning, project-based learning, and leadership plans (see Figure 5).
Among the three systems, the leadership plan is mainly an updated version of the Elite Plan (2012), which was designed for a few top students. The other two relate to all undergraduates.

The most significant change of the new curricula was the explication of developing creative abilities as an educational goal for undergraduate students. The new system of project-based learning was added. Students need to take project-based learning to get innovation credits for
graduation. The new regulations of innovation credits require four for graduation, six for graduated program recommendation, and ten for honour graduation. Students can earn innovation credits through four approaches: a) participating in innovative contests, b) completing a first-year project (大一年度项目), c) taking innovation courses, and d) getting involved in professors’ research teams. Usually participating one project-based learning activity accounts for 2 credits, which means that students have to attend at least two projects for graduation.

**Innovative contests**

Attending innovative contests was used by instructors as the key method to develop critical/creative thinking before the curricula reform. It provided a platform for students to make use of the knowledge they learnt in classes and to solve problems in an authentic context. However, previously only a few elite students had the chance to represent the university in the national or international contests. In the implementation of the new curricula, NU(WH) continued the traditional approach, but expanded it to engage more students in innovation contests.

To extend students’ engagement, NU(WH) held many department-level and university-level contests. Winners get the chance to attend higher level contests, representing the departments or the university. Participating in university or higher-level contests will award the students 2 innovative credits.

Beside organizing contests, the university also provided department-based supporting plans. Departments need to render consultations for first-year students to choose a contest team and
help to match supervisors to teams. They provided and coordinated with experimental sites and equipment. They evaluated the quality of contests and provided guidelines. They also discussed with teams and come up with an overall plan about which team attends which contests to avoid internal contests. In addition to the funding, working sites and technical supports, departments also organize orientation workshops for first-year students. For example, in the Department of Information Engineering, the workshop took 4-hours every Saturday from October to December. Current innovation teams lead the workshop. The workshop may be ahead of the curriculum but firmly related to the projects those teams were working on. P16 Ryan, a director of innovation contests, recalled that in the Fall Semester of 2017, almost every first-year student (about 600) in his department attended and about 360 students completed the workshop.

**An example of the innovative contest team**

The following part gives an example of an innovative contest team in NU(WH), demonstrates how peer-support learning groups are formed and how such groups help to develop critical/creative abilities and problem-solving skills.
Introduction

The HRT is a student club about small formula-style racing cars. In 2009, P13 William and about 20 students founded the team to attend the first national formula student contest, Formula Student China (FSA). They designed, built, and prepared their vehicles for the contest (see Figure 6). During the next nine years, HRT moved from an unbranched product to become a flagship product now. By 2018, the HRT had 236 student members from ten departments and about 100 are from the Department of Automobiles. In the 2018 racing season, the HRT consisted of four teams: the fuel team, the electric team, the off-road team, and the driverless team.

Each team works independently. They build their cars and attend different contests. However, besides the horizontal car teams, students also join a vertical technology group, car body, chassis, engine, electronics, and commercial group (see Figure 7).

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Figure 7 The horizontal and vertical blended team structure

When they encounter problems, they can go to the cross-team group for consultation. The horizontal and vertical blended structure helps students focus their inquiry and communicate
across groups.

The recruitment and training

Figure 8 Team members of HRT in 2018

HRT is an interdisciplinary team. Recruitment is open to first-year and second-year students from all departments, through media on campus and online, such as posters, WeChat and Weibo. For example, in December 2017, HRT announced 67 positions and over 800 students joined the information event, and about 300 students submitted their applications. In the application form, students can indicate two positions of interest and write about their expertise in specialized or specific fields. Applicants get access to resources of learning materials; for instance, papers and books, and prepare for an exam one or two weeks later. One student, S5 Carter, recalled how he joined the team.

At the information event, I signed up for recruitment. After submitting the application form, I joined a QQ group. In the group, I was given some study materials. Then I participated in a written examination after independent learning. I was quite prepared at that time. I read the two books, “Car Theory” and “Why Can the Car Run?” I only spent a week to read the books. Later, I passed the written test and an interview.
Students who pass the written test and interviews have to attend a one-month training during the winter vacation (winter vacation in the participating university lasts about two months, from January to February). Senior group members are in charge of the training. Every technical group prepares for lectures about the knowledge they need. Besides lecture training, candidates have a chance to take internships in the position in which they are interested. After the training and internship, students who choose to remain become full members and are matched with a position in which to work.

**Figure 9 Training for new HRT members**

Management and the role of the supervisor

The HRT is a student-led team. The founder and supervisor, P13 William, used to work side by side with students and set up the system for peer-learning. When the system was well found, he chose not to engage in daily management or project progress anymore. His primary role was to provide financial and technical support. He helped to apply for funding from the university, the government and sponsors. He also monitored the spending and decision-making of critical
techniques. When the students could not overcome technical challenges, he would contact professors who were experts in those fields and invite them to help students. Wang explained the situation in the following words,

The operation of HRC is actually like a company. I am the founder. We have a sophisticated system and are no longer in the beginning anymore. We built four departments and got four managers in charge while I do not need to worry about daily management.

A supervisor also worked with team leaders to decide which contests to attend. According to the requirement of contests, each team leader came up with a yearly plan, including four stages: establishing the design goals, designing the process, verifying the experiment and fabrication, and on-road testing. In each team, there was also a technical director and a manager (see Figure 10). The three leaders worked together to set timelines and decide detailed tasks for each stage. Every week, they held a team meeting. Team members communicated their progress and challenges, and, through discussion, they decided their tasks for the following week.

Figure 10 The HRT management system of each department
They used online tools to track progress (see Figure 11). In the group meeting, members were assigned to specific tasks. Students needed to put their tasks in the online charts and add their progress every day. In HRT, online task tracking is done in English. As they now attend many international contests, English is the working language. They need to submit files in English. It also helps them to be familiar with the academic English terms and expressions.

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Figure 11 Online tasks tracking chart

In addition to the work schedule, there is also a monthly performance assessment. The assessment includes self-evaluations, peer comments, and team leaders’ grading. The grading
includes four levels: A. excellent, B. good, C. not working hard sometimes, and D. warning (see Figure 12). The three leaders discuss their performance in respect to task achievement and work endeavours. Members who continue to get warnings may be expelled from the team.

Figure 12 The monthly assessment table

The tenure of leaders is one year. Then they pass their duties to the next period leaders. The new leaders are not elected. The process was called “two-way selection” (双向选择). Members who were interested in being new leaders expressed their interest to the current leaders. Current leaders gathered together to discuss potential successors. They considered from two prime aspects, technical skills, and leadership. Later, they chose one potential successor for each position and started to train their successors by handing over some work. After a period of training, the leaders
consulted with their members about the performance and leadership of potential successors. Then they got together again to decide their successors. Carter talked about how he became a team leader.

I engaged in the project a lot in my first year, and not humbly I did pretty well. But I also felt that we could be better in some ways. If I could be in the management position, I would make some changes. At that time, the former captain happened to ask if I was willing to be the next captain. The leader group had a shortlist, and I was on the list. When asked, I expressed my willingness and ideas about changes. After that, the leader group asked some other members’ opinions, and finally, they discussed and chose me to be the captain. 大一的时候我参与的比较多，不谦虚的说自己那部分做的也比较好。但是我感觉在有些方面，我们做的还不够。我想如果自己担任管理层的话，可以把我们团队之前的一些不良的东西改善一下。当时上任队长也来问我有没有当队长的意愿。上任领导层先选了几个人，然后挨个问大家的意愿。我表达了自己的想法。之后的话管理层他们找一些我们同届的队员，询问他们的意见，然后最终他们一起讨论决定我当队长。

A previous study (Ross & Wang, 2016) observed that many Chinese universities regarded innovative contests as a common approach to developing creative abilities. They also expressed their concerns about such a method. However, six key elements contributed to the development of creative abilities through peer-support groups in innovative contests.

Intrinsic motivation ensured students’ engagement. Students join innovative teams because of their interests.

I saw the school teams were training in the car... I felt very excited. I hoped that I could participate in such a team at the university and learn a lot. Of course, the main reason is that I love automobiles and feel it is very cool. That was why I signed up at the recruitment. (S5 Carter) 当时我看见学校车队的一些人在练车，... 感觉非常的激动，就想着我自己在大学也能参加这样一个团队，去学会很多东西。当然最主要原还是喜欢汽车，觉得挺帅的。所以我就报了纳新。
Joining the team also meant many commitments. Only the students with real interests can gain satisfaction from hard work and continue to work on it.

Although it is very glamorous to win the prizes in the contest, besides the endeavours of problem-solving there are many chores, such as attending the school showcase, training new students and so on. (P13 William)参加比赛获奖是很荣誉的事，但实际上学生除了要解决比赛遇到的难题，还要承担很多其他琐碎的工作，比如说参加学校展览、给新同学做培训等等。

Although their experience in the team could account for “two credits” (two hours per week course), students still needed to take regular courses. For first-year students, they were required to take at least 30 hours of classroom courses each week. They had to work for the teams in the evenings and on the weekends. During the contest seasons, they spent all of their spare time in the team lab.

*Pragmatic benefits* Although the students joined the innovative teams for intrinsic motivation, this experience did bring practical benefits to their future career and further education. For example, in high-level contests, job hunters and human resource specialists gave offers to outstanding participants. William mentioned one of his team members was offered a position with a $40,000 annual salary in FSA. Even if the students did not win any prize in contests, their practical experience was favoured by employers, because they could directly work on professional jobs without receiving extra training. P16 Ryan also remembered one team member got $4000 in his internship, while the average was about $200. Moreover, some members obtained patents on their inventions and some published journal articles, which are valuable for their graduate application. Therefore, many of them got graduate recommendations and gained early admissions to graduate
programs without sitting for the graduate entrance exam.

Real-world problems drove the development of problem-solving skills. The innovative contests create a real-world scenario and timeline. In the process of completing the project, students encountered various problems that they did not expect. They had to figure out how to solve the problem or the project could not advance. In order to solve the problem, students resorted to different resources.

I tried all the ways I can, borrowing books from the library, searching online, and asking my classmates and teachers. And through the process of trying various ways to solve the problem, I got the experience and abilities of problem-solving. (S8. Harry) 要尝试各种方法，到图书馆借书，还是到网上查资料，还是问同学还是问老师。然后就尝试各种方法，会得到一些经验和解决问题的能力。

Senior-led collaborative learning ensured that students engage in, monitor and modify strategies for tackling tasks during the project. In the beginning, seniors provided a model for identifying and solving problems. The new members learned to apply the model to their project or practice what they learned. Meanwhile, new members received feedback from the seniors, which helped them to reflect on what they were doing and modified their coping strategies. Later, when the junior gained knowledge, skills, and experience, they took the responsibility to lead the project and guided new students. During the process of providing support and feedback, the seniors themselves perform more active critical thinking skills. Moreover, the senior-led collaborative learning forms a loop structure to guarantee continuous learning and technology improvements.

S5 Carter stated his experience of learning and innovating in the HRT.
The seniors passed on what they learned, what they did, and even the manuscripts they wrote down. On this basis, we learned about their experiences. In the second and third year, we began to take professional courses. New ideas gradually generated from their experiences and knowledge. Then the HRT provides us with funds and platforms to implement our ideas and to test them. For me, learning and innovation are slowly accumulated during the process.学长把他们学的东西、做的一些事情、写下来的一些手稿资料传给我们，我们一点一点的去学习。在这个基础上我们学到他往年的这些东西，把往年的这些东西都夯实了。到大二大三的时候，我们也开始上一些专业课，开始有了自己的一些想法，想去做更多的实验。然后车队会给我们提供资金和平台，去实现我们新的想法，去做测试。我觉得学习和创新就是这样慢慢积累起来的。

*Sense of belonging.* Although these “innovation teams” aimed to attain various contests, it created a united goal for the group members to work together. Moreover, these contests provided opportunities for communication.

Learning needs goals, and more importantly, a platform for comparison. Otherwise, you would not know how well you are doing. Contests provide a stage for everyone to show off. It is also a platform for communication. After the contest, there were exchange meetings, in which everyone shared their (experience and technologies). As long as you entered our platform, you were in contact with the international level, or at least national level technologies. It is much more than just participating in various contests. (P16 Ryan)学习需要目标。光有目标还不够，得有一个对比的平台。自己在闷头做，也不知道自己做的怎么样。比赛就是一个舞台，大家好不好，拉出来遛遛。也是一个交流的平台，竞赛之后都有交流会，大家都共享出来。只要进入到我们的平台，接触的就是国际级别的，最起码是咱中国这个级别的技术，而不是说仅仅参加各项比赛。

Students who joined the teams were recognized as a part of a group. Consequently, they have the opportunities of learning and sharing within the group. Group members shared interests, experiences, knowledge and skills. They also gained friendships and developed a sense of
belonging in the group.

Team culture construction, we call it the sense of belonging. The most straightforward expression is that the team is the most preferred place a student wants to stay. This is also the most straightforward expression of a sense of belonging. The other is that the atmosphere of friendships and team belongings. Each of these teams has its characteristics, such as “technical first, willing to give,” it is also a sense of glory. (P16 Ryan) 团队文化建设，我们叫归属感。最直观的意思就是他上完课，首选的地点就是那个团队所在地。另外就是包括朋友或者整个团队的氛围非常浓厚。每个团队都有它的特色，比如说“技术第一，乐于奉献”，也是一种荣耀感。

Challenges

One of the challenges was that the new form of learning required more flexibility and support from the university administrators. Unlike traditional lecturing classes, innovation teams need more financial support to prepare for and to attend contests. The need is increasing every year to engage more students.

Funds, venues, and incentives, if you want to develop well, there will be increasing demand year by year. At present, there are still relatively few teachers involved in the lack of encouragement policies. Students often lost opportunities because of the conflict between contests and course exams. Some other universities have corresponding policies, such as postponing the exam or giving contests participants credits instead of taking classes and exams. We still do not have policies yet. (P16 Ryan) 资金，场地，鼓励政策，要想发展好，每年都会对这方面有更多的需求。但是目前来说，咱们学校对这个老师的鼓励上面还是比较欠缺。现在参与的老师还是比较少，没有完全调动教师的积极性。我们比赛的时候老是跟着考试冲突，就造成学生到现场的机会比较少。其他学校有相应的政策，认可比赛就可以缓考，或者可以不上课考试，就代替学分。咱们学校还没有。

This study observed a gap between institutional policies and practice or implementation. The new curricula have many conflicts with the original curricula system.
**First-year project**

Although the innovative contests have been expanded, they still only covered about half of the undergraduate students. NU(WH) conducted a “first-year project” to engage every student in project-based learning. The action plan of the first-year project introduced how the project-based learning was going to develop students’ critical/creative abilities from the following six aspects:

- **Autonomy:** Students are encouraged to independently build teams, choose project topics, design and plan their projects, and autonomously learn, study and innovate.
- **Systematic thinking:** Students’ systematic thinking is trained through systematic project design and application.
- **Interdisciplinary skills:** Due to the comprehensiveness of the project topics, students often need to solve problems in an interdisciplinary context and learn and improve the ability to solve problems using various interdisciplinary knowledge.
- **Collaboration ability:** Since the project works in a team form, it can train students’ teamwork and communication skills.
- **Self-confidence and sense of accomplishment:** The first-year project not only can cultivate students’ interests in professional research but also improve students’ self-confidence and sense of accomplishment by completing project tasks.
- **Leadership:** Since the project team works together under the leadership and coordination of the team leader, it can cultivate the leadership and responsibility of some elite students, such as project leaders.

The first-year project was launched as a university-level strategy in 2016. It requires first-year undergraduates to participate in a one-year project in their fields. The first-year project includes four stages, the topic selection and grouping, proposal defense, progress report, and the final defense. The following is the guided timeline, and each department may have their variations (see Figure 13).
The “first-year project” was a group project. Each team included four to five students. Departments recruited professors to be the project supervisors. Professors could bring their ongoing research projects or just research topics and questions they were interested in. Departments started to organize orientation events about the first-year project for first-year students. Senior students were invited to the events to share their experiences. Supervisors were also invited to introduce their research. After the orientation, specific student academic counsellors helped students to decide which project was appropriate for them, and to evaluate the possibility of student-prompted projects. The counsellors also helped with forming groups, determining the group leader and matching students and supervisors.

Once the topics and supervisors were confirmed, project groups worked on writing a proposal with the help of their supervisors. The department organized a committee to examine whether the proposal was valuable or not and determine the amount of funding for each group. The university provided about $400 of funding to each approved project.

After that, the group leaders led the project. They defined the project direction, determined the tasks for each member, and played a leading role in project planning, time management, coordination. They need to submit a monthly report to their supervisors, including problems

Figure 13 The timeline of “first-year project”
occurring, reflections of problem-solving, and plans for the next month. Supervisors need to meet with their students at least once a week and help to keep the projects going. Most of the time, students need to cooperate with their peers and work together. Students should submit a progress report in the middle to the department committee.

When completing projects, students were required to submit a final project report and attend an oral defense. The committee evaluated the projects from the following criteria: literature review; independence in project design and completion; problem-solving abilities; workload; innovation consciousness; and active cooperation. Students who passed the final oral defense can get “two innovative credits”.

Moreover, the implication of “first-year project” provided students with more research experiences. Therefore, it prepared more qualified candidates for the professors’ research groups. Students can also take their “first-year project” to register for contests.

*The practice of first-year project*

The first-year project was only launched for two years since the time of this research data collection. Although there are clear outline and regulation for the first-year project, most participants in this research state their dissatisfaction with the on-going strategy. P14 Ann, the student academic counsellor, commented,

I think it is a necessary way to develop students’ critical/creative thinking, but from the current implementation, the effect is not apparent. 我认为培养学生的创新能力是很有必要的，但是从实施的情况来看，效果不是那么明显。

In the beginning, first-year students were all curious and excited to participate in a real project.
Almost every first-year student will join or lead a team. However, few teams could pass the final oral defense. S1 Conor participated in the first-year project from 2016 to 2017. He remembered, in my class, everyone registered the first-year project in the beginning. Thirty-five students formed into eight project teams. However, my group was the only one that made it to the end. Most of my classmates gave up. 我们班所有的同学都参加了，35 个人组了 8 个队，但是只有我们组真正完成了，其他组最后都放弃了。

Among the 25 instructors, six of them had taken part in supervising first-year projects, and only four of them show interest in continuing in the following year.

S1 Conor’s group was the only one who finished the project in their class. He attributed much of his success to the help of senior member in the group. Conor’s project was to weld steel and glass together, derived from his supervisor’s project. Conor and his group had little knowledge of materials and welding. In the first month, they were supposed to learn the necessary knowledge to launch the project. They got learning materials from the supervisor and were asked to learn by themselves. Their supervisor also assigned them to one of his graduate students. The senior students then helped them through the whole project.

The senior students usually stay in the laboratory after class. If there is a problem, you may ask the seniors at any time without going to the teacher. Besides, as new students, we are still a little scared of the teacher, and the seniors are more likely to get closer. If the seniors do not know the answer, the seniors will usually accompany us to the teacher. (S1. Conor, G2, Material engineering) 学长课余时间一般都会呆在实验室，跟学长比较熟的话，有问题不用直接去找老师，可能随时间学长。另外大家对老师还是一点害怕，学长更容易亲近一点。如果学长也不知道，学长一般会陪着你去找老师。

Conor addressed leadership as an essential factor for success. He experienced a changing of
leadership, from a foreman to a hero who did everything and ended as a coordinator. He reflected that in the beginning, he assigned the tasks and set a deadline. Then he did nothing but keep reminding them of their progress. For a while, he felt that the reminding and pushing took too much time, and he would instead do it by himself. However, there were so many tasks that he could not finish them all by himself. He then started to think about how to be a good leader and figured out through practice. As a leader, he did not only need to identify and assign tasks but also understand the features of the tasks and his team. He learned how to be a listener, a supporter, and a role model in teamwork.

I will think about which tasks are suitable for the teamwork, and which tasks are more efficient for individuals. Through discussion in the group, everyone chose their tasks and deadlines. As a leader, I need to take on more work or more difficult duty, so others would be convinced. Tasks in the project were all in a chain process. I did not need to push them anymore. The students in charge of the next chain tasks will take the initiative to remind those who have not completed. (S1. Conor, G2, Material engineering) 我就不急于分配任务，开始考虑哪些任务适合团队去做，哪些任务一个人做效率更高。然后跟大家讨论不同的任务需要的投入，让大家自己去决定任务和需要的时间。作为组长，我会多承担一点，起个表率作用，其他人也会更信服。很多任务都是一环扣一环的，我也不需要再去催，下一期的人就会主动去催促没完成的人。

When considering the benefits of gaining from the first-year project, Conor valued skills rather than professional knowledge. He now felt more confidence in communication, critical thinking and problem-solving skills. Through the project, Conor built social relationships with senior and peers. He feels more comfortable communicating with teachers. When encountering problems, he will not resort to personal reverie or take them for granted. He learned how to find reliable and valuable information, how to compare references to current problems, and how to
Instructors’ interviews indicated many factors resulting in the failure, such as unfeasible topics, time, lack of recognition, pragmatic reasons resulting in losing engagement, and lack of support.

As stated before, the university encouraged students’ learning autonomy. However, according to P14 Ann, who was in charge of the “first-year project” in her department, it was difficult for first-year students to propose a feasible project. Most first-year students had no previous experience with project-based learning. Their K-12 education experiences were more exam-oriented and lecture-based teaching. Moreover, they had limited knowledge of their majors. Therefore, the student-proposed topics were often unfeasible for further study. Even though supervisors could help students to modify their topics, there was still a deficiency in most projects. Students knew little about their project, and they needed more help, like hands-on instruction, which supervisors may not be able to provide. In practice, project topics from supervisors turned out to be more suitable. Supervisors listed some research topics from their research interests or their ongoing projects, and they may modify to suit the level of first-year students. Students choosing the same topic became a team. In this way, students could benefit from the precious resources of the supervisors. Ann suggested the department could accept both of the student-led and supervisor-led proposals.

Both students and instructors mentioned some pragmatic reasons that hindered the implementation of the “first-year project.” For first-year students, they need to take about 12-15
required courses and at least two optional courses in one semester, which means that they spend 30-40 hours every week in classrooms, as well as extra hours for completing after-class assignments. Students valued their tasks and decided how much effort they would spend on the tasks.

Frankly speaking, there are so many tasks that we have to deal with every day. This (the first-year project) is just one of many. If we pay particular attention to it, our energy will be dispersed. If there are more practical benefits, we may pay more attention to the first-year project. (S6, Ethan, G2, Chinese) 坦白说，我们生活中每天要交的任务非常多，这(大一创新项目)只是众多任务中的一个。如果对它特别重视了，我们的精力就会分散。我们只能权衡一下，有选择的做一些东西。如果有更高的功利性的东西在里面，大家可能会更重视它。

Students also need to meet the deadlines of the required tasks. Many course assignments were due by the next class, usually a week, while the first-year project took a whole year. Students turned to meet the nearest deadline and the first-year project was often postponed until they realized that it was too late to achieve it. S1. Conor explained why many of his classmates gave up their projects.

When approaching the final examinations, many of us told supervisors that we need to focus on preparing for exams and could not work on the project this month. However, the examination month is followed by a two-month winter vacation. Many of us did not work on the project for almost three months and it was hard to pick up. Alternatively, some students felt embarrassed to meet with the supervisor after such a long pause, and then they did not go and gave up the project. (S1. Conor, G2, Material engineering) 快到期末考试的时候，会和导师说我这个月就不参与项目了，我要准备考试。但是考试月过了之后再加上寒假有两三个月的时间没做，就接不上了。然后还有很多同学就不好意思找导师，后来干脆就不去了，就这样放弃了。

For instructors, being supervisors were more volunteering than paid duty. According to the
university strategy, the workload of supervising one first-year project equals ten-hour lecturing. However, the strategy also suggests the supervisors meet with the group at least once a week in the year-round process. In practice, supervisors often took more hours than suggested. For example, P17 Olivia supervised two groups in the 2017-2018 academic year. Every weekend, she met with each group for about 4 hours regularly. If the students had questions, they could ask for extra meeting hours. Olivia recalled that in the last semester, she spent 60 to 70 hours supervising per group. Instructors felt that supervising the first-year project was time-consuming and less recognized. Therefore, most instructors were not interested in supervising first-year projects. P23 Steven supervised two groups in the 2016-2017 and decided not to continue. He mentioned that first-year students have little pre-knowledge and pre-experience of research and projects. Participating in the first-year project required much engagement that just curiosity cannot sustain. However, it was difficult for supervisors to always be there to help unless the supervisors have their research teams. Some instructors (P14, P17) indicated that professors who already had research teams were more suitable to supervising. For the senior students in the research, teams could help to develop a cooperating learning system.

**Innovation courses pedagogy reform**

The new curricula reduced required courses and added more optional courses, which provided more choices for students. From 2015-2018, the *University Yearly Focuses* (年度工作重点) all mentioned about designing courses for developing innovation. Instructors were encouraged to design new “innovation courses.” Dramatically different from the traditional
lecture-based courses, innovation courses emphasized “practice(实践)” and often took the form of project-based learning in real-world contexts (see Table 4.5). Three instructors (P13, P16, P20) in this study had designed and taught “innovation courses.”

Table 4.11 New Approved Innovation Courses for 2019 Spring Semester

<table>
<thead>
<tr>
<th>Num</th>
<th>Innovation Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aerospace Flexible Structure Tribology</td>
</tr>
<tr>
<td>2</td>
<td>Artificial Intelligence and Machine Vision</td>
</tr>
<tr>
<td>3</td>
<td>Application of Wireless Charging Technology in Intelligent Unmanned Equipment</td>
</tr>
<tr>
<td>4</td>
<td>New Molecular Detection Technology for Harmful Microorganisms</td>
</tr>
<tr>
<td>5</td>
<td>New Energy Vehicle Power Battery Energy Management</td>
</tr>
<tr>
<td>6</td>
<td>Innovative Methods and Practices</td>
</tr>
<tr>
<td>7</td>
<td>Image-Based Intelligent Detection and Recognition Technology</td>
</tr>
<tr>
<td>8</td>
<td>Vehicle Test Design Method and Application</td>
</tr>
<tr>
<td>9</td>
<td>Advanced Composite Materials and Lightweight Construction</td>
</tr>
<tr>
<td>10</td>
<td>Power Electronics Technology and Innovation Practice</td>
</tr>
<tr>
<td>11</td>
<td>Smartphone Application Development</td>
</tr>
<tr>
<td>12</td>
<td>Plastic Micro-forming Technology</td>
</tr>
<tr>
<td>14</td>
<td>Academic Paper Writing Practice</td>
</tr>
<tr>
<td>15</td>
<td>Engineering College Students’ Innovation and Academic Cultivation</td>
</tr>
<tr>
<td>16</td>
<td>Friction Stir Welding and Processing Technology</td>
</tr>
<tr>
<td>17</td>
<td>Millimeter Wave Radar Environment Sensing Technology</td>
</tr>
</tbody>
</table>

Along with adding “innovative credits” into the curricula, the traditional courses hours were reduced to 30% from 50% (P21 David, Provost Dean). Instructors had to apply pedagogy reforms to cope with the steep deduction of course hours, as well as reflect the goal of cultivating critical/creative thinking abilities. The new curricula encouraged pedagogy reform, transiting from teacher-centred, lecture-based to student-centred, inquiry-based pedagogy. Project-based learning and blended learning were two main approaches provoked by NU(WH). All the instructors reported that they had made changes to their classes according to the new curricula.
4.2.2 Teaching approaches

As the new curriculum required instructors to take action in their teaching practice to develop critical/creative thinking, NU(WH) provided many spaces and supports as well. However, instructors encountered many challenges in their teaching practice. In this study, all 24 instructors reported their experiences of fostering students’ critical/creative thinking. Thematic analysis identified four approaches articulated by instructors in this study, including the communicative approach, synthesis writings, inquiry approach, and project-based approach (see table 4.6). Followed by the four approaches, the challenges that the instructors were facing and their strategies to overcome challenges are also presented.

Table 4.12 Themes and frequency of pedagogy approaches

<table>
<thead>
<tr>
<th>Pedagogy approach</th>
<th>STEM N=11</th>
<th>HSS N=13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communicative approach</td>
<td>6 (P14, P17, P18, P19, P23, P24)</td>
<td>13 (P1, P2, P3, P4, P5, P6, P7, P8, P9, P12, P15, P20, P22)</td>
</tr>
<tr>
<td>Synthesis writings</td>
<td>3 (P10, P18, P23)</td>
<td>3 (P4, P15, P20)</td>
</tr>
<tr>
<td>Inquiry approach</td>
<td>5 (P10, P14, P18, P19, P23)</td>
<td>1 (P20)</td>
</tr>
<tr>
<td>Project-based approach</td>
<td>3 (P11, P17, P23)</td>
<td>6 (P1, P2, P3, P8, P12, P20)</td>
</tr>
</tbody>
</table>

The four approaches helped identify instructors’ beliefs and methods in teaching. However, these approaches overlapped and did not appear separately. Instructors comprehensively integrated different approaches in their teaching practice, and they continually made changes to meet the requirements of the university and the students.

Communicative approach

Many instructors mentioned that they often applied communicative activities such as discussions and presentations to develop students’ critical/creative abilities. They expressed
that communicative activities brought different views. For example, in EFL, all instructors reported the communicative approach as their primary teaching methods. They stated that the traditional grammar-translation approach was not suitable for the new curriculum. As P3 Bryan, Vice Dean of the Language and Literature Department, said

instructors cannot continue teaching vocabulary, grammar, and explaining texts. We have to shift from teaching language points to cultivating language using abilities. Therefore, all of the English courses changed the textbooks to a series called “College English Critical Thinking Courses.” With the new textbooks, we have adopted a more communicative way to promote language in use and critical thinking abilities. 大学英语老师想像以前那样教教单词和语法, 解释解释课文已经不行了。我们现在要从教语言点转到培养语言应用能力上， 所以现在我们要换了这套《大学英语思辨教程》，通过互动性更强的方法促进语言的应用和思辨能力的培养。

Although instructors both from HSS and STEM were using discussions and presentations, their teaching purposes and approaches appeared to be quite different. Two classroom observations of P12 Freya and P19 Mike provided examples of the differences (see Table 4.7).

Table 4.13 Observation comparisons of communicative activities

<table>
<thead>
<tr>
<th>Topics</th>
<th>EAP: avoiding plagiarism by summarizing</th>
<th>Metallic Corrosion: preventing corrosion from seawater</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>Regular class (every class).</td>
<td>Once per month (three times per term)</td>
</tr>
<tr>
<td>Preparation</td>
<td>Watch a 10-minute video recorded by the instructor and write a summary for a given article.</td>
<td>Find a paper related to the topics. Prepare for presenting the paper in the form of an academic conference presentation.</td>
</tr>
<tr>
<td>Presenting</td>
<td>Two groups (four members each). What is a summary? What were the problems we met in writing our summaries? How can we avoid plagiarism in our writings?</td>
<td>Five individual presentations. Which technology or knowledge was applied in the paper? How did technology solve the problem?</td>
</tr>
<tr>
<td>Discussions</td>
<td>Share understanding of summary, conditions of plagiarism, experiences of writing, challenges and solutions.</td>
<td>Ask for clarification of the technology or knowledge and the problem-solving procedure. Question the choices of the techniques in use. Discuss choices and how to improve the current solutions.</td>
</tr>
</tbody>
</table>
In the observation, P12 Freya was teaching an EAP course focusing on “avoiding plagiarism by summarizing.” The communicative teaching approach was Freya’s primary pedagogy that she used. Freya stated that the main purposes of designing presentation and discussion activities were to enable the effectiveness of self-learning and group work. Besides, it encourages students’ critical thinking, and arouse proactivity to solve problems.

In the observation, I noticed that Freya asked the students to “share” their learning process, discuss the scenarios of plagiarism, and exchange how they overcome challenges in writing. The “sharing” parts related to students’ personal knowledge and experience with the content. Freya believed that it helped to explicate the value of self-learning and promoted the co-construction of learning in groups. To act as a facilitator, she asked guided questions and comparisons to deepen the understanding instead of imposing her expertise. In addition, Freya fostered the students’ critical thinking skills through revision, peer feedback and reflective journals.

All of the EAP instructors reported a similar teaching approach with Freya in the focus group discussion. The only variation lies in the methods of knowledge input. Besides providing videos, articles, and papers, lectures were often used to teach knowledge-based content.
Mike, from Marine Science, was teaching a third year required course, Metallic Corrosion. The observed class was a “discussion class,” focusing on “preventing corrosion from seawater.” Different from the communicative routine of HSS courses, Mike only had the “discussion class” once per month. In other words, the majority time of his course, about 70%, was lecture-based. In the observed “discussion class,” Mike chose the topic, “preventing corrosion from seawater,” which was the recent learning content in the regular lecture-based class. Then he asked the students to find a related academic journal paper and prepare a conference-style presentation. The presenter summarized the paper they chose, commented on the problem-solving and proposed their solution, as well as discussed unsolved problems. After the presentations, they facilitated discussions by raising good questions. Mike sometimes joined the discussions to share his knowledge and research experience, comment on the solutions and give tips about presentation skills.

According to Mike, the purposes of the discussion were to deepen understanding of the lecture content, to learn the knowledge application in the real world, and to practice academic presentation skills. The whole process was student-led, which gave students a strong sense of autonomy. In addition, the question-and-answer part could help students to develop creative perspective and problem-solving skills. Hence, the “discussion” was a more practice and application process than a passive learning process.

Mike’s “discussion” approach was typical among STEM instructors (P17, P18, P23, P24). However, they also admitted that they did not apply the communicative approach very often in
their STEM classes because discussion or presentation was too time-consuming, which may delay their teaching plans.

**Challenges: similarity, silence and authority**

Instructors also reported challenges they met when applying communicative teaching approach. For instance, some students often hold similar ideas and the discussion could not go deeper; some students were silent and less likely to engage in communicative activities. For instance, P5 Daniel, who taught first-year English major, said,

I think the most effective way (to develop critical thinking) is the discussion, which allows students to share their ideas. However, first-year students often came up with similar ideas, and sometimes, their discussion did not go in-depth. 我觉得最有效的方法是讨论，让学生可以表达自己的观点。但是大一新生的观点常常很相似，讨论很难深入下去。

In this situation, Daniel added that his teaching strategy was to ask some follow-up questions according to what the students said, and then gradually guide them to think deeper. Similarly, Mike also found it was hard to engage all the students to in-depth discussions.

About one-third students could think deeply, ask good questions, look for new recourse and promote collisions of thoughts; one-third middle students only read the reference I gave but are not proactive in finding problems or solving problems; the rest take this course for passing exams and do not even engage at all. 前面的 1/3 的同学，他们就能做到，深入思考，提出问题，并且能产生讨论的碰撞。中间的 1/3 有一定的思考能力，但是比较不太花心思，提出好问题，提出好东西，要看大量的文献。我们在课上会给出一些文献，我的 PPT 当中会列出一些重点文献，这些同学可能重点我先看，但是他们并没有再继续深入地自己去思考。可能占到 1/3 的同学就是学习课程，学习知识，考试合格。把全部的同学都发动起来，就是工作的难点。
Many instructors (P3, P4, P12) attributed students’ unwillingness to engage in communication to the lack of previous knowledge and experience. Freya also related the silence to culture character of being implicit. Hence, Chinese students need more time and encouragement to speak out. Similarly, Li and Wegerif (2014) explained the silence of Chinese as a process engaging in silent inner dialogue.

If students are unfamiliar with the topics, they have nothing to share in the discussion. (P3 Bryan)

If students got the questions in-class and did not have time to prepare, the discussions could not go more in-depth, and sometimes it became chatting. … I had tried once, that I gave one class 5 minutes for discussion, and the other 20 minutes. The effect was completely different … I think this is also related to the national character. Chinese are implicit. The process takes time, from thinking, willing to speak out, trying to say something, to intense discussion. (P12 Freya)

They addressed the importance of knowledge “input” before communicative activities. The “input” brought students to the same context. Listeners compared the presentations to their understandings. When in discussions, students could recall their previous knowledge to the extensive discussions. Moreover, P4 Eric pointed out that it is essential to provide students with choices in the writing tasks. When students make decisions and explain their choices, they are practicing their critical thinking.
In responding to the unwillingness to participate, some instructors (P1, P2, P3, P6, P7) mentioned that students’ silence did not necessarily mean that they were not thinking. Chinese students need a safe learning environment to speak up.

The precondition of communication is to create a safe learning environment, in which teachers and students are equal. Then the students can be brave enough to speak up in class. (P6 Ruby) 交流的前提是开放的氛围，老师和学生是平等的，然后学生才能放心大胆的说出来。

They believed that the situation of “teacher as the authority figure” no longer exists in their classes or even in most Chinese universities. However, some instructors (P2, P5, P7, P12, P20) criticized giving a standard answer after discussions. They argued that they are influenced by exam-oriented teaching, and some teachers took the purpose of discussions as finding the right answer. Students who did not think in the standard way were wrong. Discussions in this way were not promoting critical thinking at all. P7 Chloe believed it was vital to inform the students that not all the questions had the right answer, and she suggested that instructors should model the thinking process rather than just giving a standard answer. P5 Daniel also suggested,

We should give students time and space to communicate with each other in classes. And then, teachers serve the function of a go-between to help students get rid of a mindset that each question must have a correct answer. In critical thinking, opinions should be pluralistic, and all opinions should be respected. The guidance we give students should be more about whether the process of critical thinking is rigorous and whether the supporting points are reliable, instead of leading students to a unified answer. 在课堂上给学生留出时间和空间，让他们去相互交流，然后老师在这个过程中起到一定的这个穿针引线的作用。让学生摆脱就过去一种思维定式，每一个题肯定有一个正确答案。在思辨的时候，观点应该是多元化的，而且各种观点都应该得到尊重的。
Students in this study recognized the values of the communicative approach in developing their critical/creative thinking abilities. S7 Emma, a first-year undergraduate, recalled one classroom activity, presentation in her Management and Communication course as the most helpful for developing critical/creative thinking abilities. Emma stated that the instructor provided students with the freedom of choosing presentation topics. Moreover, she recognized that the fact that the instructor valued personal voice rather than factual knowledge in his feedback was a helpful method for her to develop her creative abilities.

The teacher wanted you to express your own opinions, emotions, instead of saying something that is copied and objective. If the presentation could not express personal opinions, it will be denied or be failed. I think this is the best exercise for speaking abilities and creative abilities. 老师想要你表达自己的观点、自己的情感，而不是照搬地讲一些东西，客观的那些东西。然后很多没有内心表达，没有个人观点的东西都是会被否定，要 pass 掉。我觉得这就是对演讲能力还有创新能力最好地锻炼。

I remembered the first one talked about Chinese dance. The teacher said, “I do not want to know the types of Chinese dance. You can talk about your understanding or personal experience of Chinese dance. Do not talk about some things on Baidu Encyclopedia.” The excellent example I remembered was about opinions on homosexuality. He expressed his feelings and was very passionate. He quoted videos and examples and explained his views through the proofs. It made me felt that he made sense. I started to think about why it causes these problems in human nature. The teacher said that you touched me deeply. 我记得第一个同学拿一个 PPT 讲中国的舞蹈。老师就说: “我不想知道中国舞蹈的种类, 要么讲讲你自己中国舞蹈的看法、切身体会。不要讲一些百度百科上的东西。”还有好的, 我记得当时是有一个同学讲对同性恋的看法, 他就表达了自己的情感, 很激情澎湃, 他就是引用了视频、事例, 通过举证后阐
In Emma’s class, the communicative activities took half of the classroom time. The instructor gave students full freedom to choose topics and give presentations. Following the presentations, the instructor would elaborate the topics from the students by adding feedback and comments. In the other half of the time, the instructor would give a lecture according to the course plan.

Emma also highlighted how she learnt from her classmates’ critical spirit. The instructor encouraged and welcomed the critical spirit and valued it by giving a high score.

I remember that there was a very interesting classmate who shocked me. He said, “classmates, I am going to talk about management today. Why should I talk about management? Because in this Management and Communication class, our teacher only talked about communication and did not talk about management.” Then he was particularly powerful, using the book of the Three Kingdoms to explain the management. He talked about the relationships between the three countries, and the relationships between the three Kings, Liu Bei, Cao Cao and Sun Quan. He also quoted various ancient texts to interpret Management. He was very critical. I feel very beneficial, for that is what I lack.

Interviewer: What did the teacher say?
Emma: The teacher did not say anything. It was a big laugh at the time, and the teacher laughed together and followed the applause. In the end, the student seemed to have a quite high score.

Answer: 我记得当时有一个很有趣的同学，他真的震撼到我。他说同学们，我今天给大家讲讲管理，为什么我要讲管理的？因为你们有没有发现我们的老师这个课是管理沟通课，我们的老师只讲了沟通，没有讲管理。然后他特别厉害，用三国志这本书来阐释了管理，三国之间的关系，还有刘备、曹操、孙权的关系。
Emma was impressed by her classmate who used references and evidence to make a strong argument. She learned one way of critical thinking from this example. Emma commented that she was surprised by her classmate’s critique of the course. Such practice was encouraged by the instructor.

**Synthesis writing**

Some instructors (P4, P10, P15, P18, P20, P23) reported a large class size as a constraint of applying communicative approaches in their local context. They argued that it was impossible to ask every student to present in a 200-student class. Moreover, it was very challenging to facilitate discussions in large classes. They suggested that synthesis writing may be an alternative approach to develop critical/creative skills in large classes. Through the writing task, some instructors, like P18 Grace, ask students to reflect on the knowledge, to summarize the lecture content, to form a more in-depth and systematic understanding and even to visualize their thinking processes through writing tasks. P18 Grace recalled that when she was teaching a second-year major class, Biology, to about 100 students, she asked her students to write synthesis notes, after completing a chapter. Students were required to summarize contents into a knowledge system, such as drawing a picture, or a table. Grace believed that reflective writing tasks could help to relate knowledge to previous learnings and hence brought students to a
deeper understanding. The deeper understanding was then the foundation for students to gain creative abilities.

Some instructors valued the importance of practicing synthesis and holistic thinking and problem-solving skills and incorporated it into course assessments. For example, P23 Steven was teaching a second-year major course, Internet Technology for about 150 students. He asked students to write a final term paper. Students could choose one topic from the course outline and review relevant literature before writing their reports. In the report, they should describe “What are the current methods? What are the advantages and disadvantages of each method?” After the description, students should come up with a solution for the current problems. Steven emphasized that this writing task consisted of many aspects of training creative abilities. First, students needed to decide what they want to write. It was not just according to their interests. Students also considered whether they could find good literature and whether there were valuable questions to explore. Then, the writing task itself was a practice of finding and solving problems. Steven encouraged students to use their imagination and creativity to think about their solutions.

Similarly, P20 Eric stated that in his course, History of Chinese Literature, he had a synthesis writing task in the final exam:

During the Chunqiu Period, there have been many wars of hegemony between Qin and Jin, but why did the ruling families of the two countries maintain the relationship of intermarriage for a long time? How does this relate to the marriage system and pattern of feudalism at the beginning of Zhou? 春秋时期，秦与晋两国间发生过不少争霸战
争，但为何两国的统治家族却长期维持着通婚的关系？这与当时的婚姻制度及周初封建的总体格局有何联系？

With this task, Eric intended to encourage students to critically analyze the historical situation, find evidence and connections, and have a holistic understanding. Moreover, Eric gave a hint to analyze in the second question provided, “waging war and having marriages at the same time.” Eric indicated that the synthesis writing tasks, in this way, help students to practice the critical thinking process and writing skills.

Moreover, instructors stated the importance of including the writing tasks in the course assessments. The inclusion helped to “engage students to achieve the writing task” (P4, Jenny).

Grace argued,

The current evaluation system (the final exam) is not conducive to the cultivation of students’ innovative and critical thinking skills because most of the content is concerned about remembering. The standardized final exam has little space for knowledge application.” 现在的评价体系，对学生创新和批判思维能力培养是不利的。因为它很多的内容关注的是记住了答出来了。实际过程中有一些事需要你背完之后还会用的。但卷面考试在这个方面的考察空间就太小了。

Therefore, Grace reduced the account of final exam from 70% to 50%, and included the writing tasks in the course assessment, “so that other aspects of ability can be reflected in the results.” (这样其他方面的能力就能体现出来了。)

Challenges: assessments

The synthesis writing tasks required more analysis than describing facts. Therefore, they brought more challenges for assessment. The evaluation of the tasks is more subjective than standardized exams. In particular, some instructors (P4, P10, P15) pointed out that the evaluation
of the writing tasks could be subjective in general courses. General courses usually had different instructors teaching different classes but using the same materials. It was hard to be consistent in marking as each instructor had their own standards. In this situation, one suggestion was to specify the rubrics for both instructors and students to delimit the worries of fairness in assessments.

I focus more on the thinking process, the logical thinking about this problem. Is the logic self-consistent? Is this argument used adequate? Is the evidence superfluous? ….. In general, I consider whether the logical thinking is rigorous…… I tell my students how I mark the writings to help their writing. 我会去把整个思路看明白。是按什么思路、什么逻辑来思考这个问题？逻辑是不是自洽的？用的这个论据是不是充分？是不是足够？有没有画蛇添足？…… 综合的来看，看思路是不是清晰。…… 我会把评价标准告诉学生，这样对他们的准备也有帮助。

Eric further stated that it was necessary to explain his rubric of marking to students. Then students could have a chance to prepare for the exam.

**Inquiry approach**

Some instructors developed critical/creative thinking skills through modeling the inquiry processes of knowledge and skills. Instructors stated the significance of inquiry rather than knowledge acquisition. P17 Olivia stated that knowledge learning should be the method rather than the purpose of higher education.

In fact, university education should aim to develop students’ abilities in discovering, analyzing, and solving problems through the process of learning knowledge. (P17, Olivia) 实际上大学教育是一个通过学知识的过程，最终培养的是学生一种发现问题、分析问题、解决问题的一个能力。
P18 Grace argued that knowledge was not fixed. Therefore, instructors should teach the process of knowledge development and not just teach fixed knowledge.

When I was lecturing about knowledge points, I told them how this knowledge came, and whose work contributed to such a conclusion. Sometimes, I also told the students where the textbooks had been changed. In the process, I told the students that what they learned was not necessarily correct. Learning knowledge is a process of perfecting, which students may also contribute to. (P18 Grace) 我在给学生讲知识点的时候，会告诉他们这个知识点是怎么来的，说经过了哪些人的努力证实了这样一个结论。还有的时候我也跟学生说，我们现在课本的东西已经被改了。那这过程中实际上告诉给学生，我们现在学到的东西都不一定是正确的，知识是一个完善过程。那这个完善过程，实际上学生也可以做。

P20 Eric used a Chinese saying to explain his teaching philosophy, “授人以鱼，不如授人以渔。It is better to teach a man fishing than to give him a fish.” More specifically, Eric said, my class does not aim to teach knowledge or conclusion for students to remember, but to learn (research) methods in the process of analyzing a problem. I tell the students many things that have no conclusions or no definite conclusions so that everyone can think deeply. Sometimes I add my analysis, that is, how do I look at this problem, and then what information is used, what kind of logical thinking process, to conclude. 我的教育理念是，上课主要不是说记住了多少知识点或结论性的东西，而是在分析一个问题的过程当中，慢慢学会这种方法。所以我给学生讲的很多东西，实际上是把一个没有结论或者没有明确结论的东西拿出来，让大家思考。有时候也加上我的分析，就是我怎么看这个问题，然后用了什么资料，什么样的逻辑思辨的这个过程，达到一个什么样的结论。

The classroom observation of P20 Eric explicitly showed how he applied the inquiry approach. Eric was teaching Contemporary Chinese Literature with 12 students. Similar to Garrison, Anderson and Archer’s (2001) Practical Inquiry Model, Eric also applied four steps of teaching approach, starting with trigger events, exploring through discussion, modeling the
integration and resolving new inquiry tasks (see Table 4.8). Eric started by presenting background information to trigger the inquiry problem “writers’ value of love and marriage.” Then Eric leads students to compare “marriage autonomy” and “arranged marriage.” During the discussion, when students’ views focused on the problems of “arranged marriage,” Eric raised the issue of “gender inequality” to question the “marriage autonomy” in specific social-cultural condition. Later, Eric analyzed two contradictory cases to model critical thinking processes. In the end, he gave students an inquiry task to analyze writers’ value of love and marriage.

Table 4.14 Classroom observation of Contemporary Chinese Literature

<table>
<thead>
<tr>
<th>Inquiry processes</th>
<th>Teaching methods</th>
<th>Contents: marriage autonomy vs. arranged marriage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triggering event</td>
<td>Lecturing with PPT</td>
<td>Presenting background: during the May-Fourth Movement 1919, many people advocated free love and marriage autonomy, opposed the traditional arranged marriage. Eric then told a story of Yu Dafu (郁达夫) a writer at that time and discussed with students tragedies of arranged marriages.</td>
</tr>
<tr>
<td>Exploration</td>
<td>Organizing discussion</td>
<td>Different ideas: Eric and students discussed “is marriage autonomy better than arranged marriage?”</td>
</tr>
<tr>
<td>Integration</td>
<td>Lecturing with PPT</td>
<td>Modelling: Eric analyzed two writers’ cases in the time of the May-Fourth Movement. One showed how free love caused problems under the social and cultural condition of gender inequality. Women often suffered without the protection of “Marriage Law.” The other revealed the tragedy of two young lovers who could not be together because of the arranged marriage system.</td>
</tr>
<tr>
<td>Resolution</td>
<td>Giving inquiry task</td>
<td>Inquiry task: Eric asked students to choose a writer and look for their marriage experience and explore how their experience influence their works. Then he asked students to write an essay about “is marriage autonomy better than arranged marriage?” in their writers’ cases.</td>
</tr>
</tbody>
</table>
**Challenges: knowledge-centered lecturing**

Instructors were also critical about knowledge-centred lecturing. Eric also mentioned that the challenge lies in how to trigger students’ interests in the inquiry. Eric’s method was to include students in the decision-making process. In his class, he provided an extended version of writers and their works, while students chose what to read and discuss. Students could also add their favourite writers’ works to the reading list.

Most STEM instructors reported that the main form of their instruction was lecturing. Student participants (S3, S5, S8) in this study also reported that teacher-centred and knowledge-centred lecture-based classes were least helpful for critical/creative thinking development. In those classes, learning happened through understanding and rotating. Therefore, higher-level thinking skills were less developed. S5 Carter and S8 Harry confirmed that most classes they took were lecture-based, inhibiting their critical/creative thinking skills. Their critical/creative skills were developed through participating in projects. S3 Roy described,

the bad example is a typical “PPT-only” instruction. No matter what the students are doing, playing their phone or listening carefully, he has no concern and was focusing on his lecturing. In many cases, if students do not understand, there will be some unusual sounds. At that time, I did not know if the teacher did not hear or pretend. He kept reading his PPT. (S3 Roy, Software Engineering, fourth) 反面的例子就是典型的面向PPT式教学。无论学生在讲台下是在玩手机还在认真听讲，他都是毫无关注的，只是专注于自己所讲的内容。因为很多情况下，如果学生对某一节的知识内容不懂了，会明显地感觉课堂上会产生一些额外的声音。那个时候我不知道老师是真的没听见还是假装，他就不管我们学生的那种感受，就自顾自的照着PPT往下讲。
Solutions: provoking questions in lecturing

Hence, the form of lecturing itself does not constrain the development of students’ critical/creative thinking. Some instructors fostered students’ critical/creative thinking through raising provoking questions during their lectures. P23 Steven’s course gave an example about how to promote critical/creative thinking through provoking questions in lecturing. In the observation, P23 Steven was teaching a course called Internet Technology Web 2.0, to over 200 students in one class.

Steven’s teaching purposes were for students to learn how problems drove the development of the internet. He started with a review question “What problems of Web 1.0 were solved by Web 2.0?” In the whole class, this was the only question that Steven asked three students to stand up to answer. All the rest time, he stood in the front and gave lectures. However, during his lecture, he kept raising questions. After each question, he paused and waited for students’ responses. Most students murmured their answers, and sometimes, some raised their voices. After reviewing, he explained the process of Web 2.0 and asked about if there were any problems. Then he set a scenario:

you wrote a letter to a girl to express your love. But the girl did not receive the letter for some reasons, and you took the no-respons as a refusal. How can you avoid that situation on the internet?

Later, he explained how the problem was solved in Web 2.0. Through talking about history, Steven set an example of how to find problems and how to solve problems. Then he asked students to identify problems in current internet technology and think about possible solutions.
Similar to King’s model (1990; 1992; 1994; 1995; 2002; King, Staffieri, & Adelgais 1998), Steven always asked provoking questions to engage students in the habit of inquiry, and his lecture demonstrated the problem-solving process in a real context. Students did not aim to get correct answers to the questions but make connections between concepts and applications, in which approach concepts were more memorable. Moreover, the practice of asking questions also activates students’ critical thinking skills (King, 2002). In after-class assignments, Steven did not only ask students to answer questions but required students to ask questions and to solve their questions as well.

Students’ comments illustrated how provoking questions develop their critical/creative thinking in lecture-based classes.

His lecturing is mainly in the form of “question-and-answer.” That is to say, he did not write answers directly (in his PPT), but asked questions, then lead us to find solutions in classes, and in the end, he allowed us to ask questions. This method brings us a sense of urgency or a sense of presence. And then you will follow the teacher’s pace. (S3 Roy)

Solutions: blended learning

Besides the instructions’ personal attempts of inquiry approach, the university administrators also advocated pedagogy reform to change the knowledge-based lecturing to inquiry-based teaching and learning. The institutional strategy was to encourage instructors to apply blended learning in their courses. P24 Kevin, the vice dean and the provost, explained the purpose of the strategy from the perspective of university administrators.
Students already learned the knowledge in the online course. Teachers do not need to waste the face-to-face time on it again. They can use their class time to facilitate collaborative discussions, problem inquiry and any other activities which can help to construct knowledge. However, the teachers’ organization is vital in this process... The online learning could develop students’ autonomous learning competencies. In the long run, this will help students become life-long learners. 学生已经在在线课程学过知识性的东西，老师就不需要在面授的时候把时间浪费在这上面了。他们可以利用课堂的时间组织小组讨论、问题探究和任何帮助吸收知识的活动... 当然，教师的组织也很重要。混合式学习能培养学生的自主学习能力。从长远角度，可以帮助学生学会终身学习。

The university administrators believed that blended learning could convert the knowledge content to online instruction. The face-to-face instruction had to change from lecture to discussion. Therefore, blended learning could become a driving force of student-centred, inquiry-based pedagogy. Some instructors raised some issues of the implementation of the blended learning strategies. Some instructors suggested that blended learning may not be suitable for all subjects or courses. P15 Ella integrated on-line videos into her Political Science Course. After a while, Ella decided not to use blended learning anymore.

The advantages of MOOC are that students can watch them repeatedly to grasp the knowledge. However, our course emphasizes the understanding of theories. Students cannot understand the theories just through watching videos several times. Our courses are more in need of specified dialogue and communication with students of different disciplines. The monotony of MOOC may not be suitable to my course. 我感觉不同的课程情形是不一样的。一些理工类的课程，强调对知识点的把握，学生可以通过反复的去看。但是我们课程，强调对整套理论的理解，它并不是说反复看几遍视频，就能理解了。我们课程还是更需要针对不同的学科，不同学龄段的学生的对话和交流。MOOC 的千篇一律可能不是特别的适合。
Different from the administrators’ points of view, some instructors (P4, P11, P12) argued that blended learning could not automatically change teaching into inquiry-based pedagogy. They explained that teachers were the designers and executors of pedagogy. If they could not accept the student-centred, inquiry-based pedagogy, adding online instructions might make no difference to the face-to-face instructions. Even if instructors accept the value of blended learning pedagogy, they may not know how to conduct it. Most instructors did not experience communicative and inquiry-based pedagogy in classroom instructions. Therefore, more follow-up supports were needed to change teachers’ epistemology and enhance their expertise.

**Project-based approach**

Project-based learning is one of the major pedagogies promoted by the university administrators. In the curriculum reform of NU(WH), the project-based learning had two forms, added-on projects, such as the innovative contest team and the first-year project, and project-based courses. As presented in the previous section, the added-on projects are extra-curriculum activities, in which students take the initiative and instructors play a limited role. In project-based courses, instructors were still the principal designers and operators. The following section focuses on how instructors apply project-based approach in classrooms to develop critical/creative thinking skills.

Scholars argued that project-based learning does not refer to the supplementary activities to support learning, but the basis of learning in curriculums (Bell, 2010). In this study, the English for Academic Purposes and Software Design courses applied project-based learning as the primary teaching approach. However, the two courses used different approaches to conduct project-based
learning in their teaching practice. The following sections present how the instructors of two courses applied project-based learning and the challenges they faced as well.

**English for Academic Purposes**

The EAP course adopted an integrated way that combined the content-based lecturing and projects. Instructors combined the first-year project into their course design. Like the first-year project, EAP was also a two-semester course. Instructors designed activities and tasks along with the different stages and related academic English to the students’ projects. In the beginning, instructors gave simple tasks like finding the top journals to lead students to academic writing. Later, they led the discussion to go deeper. For example, P1 Sara designed an activity called “is Wikipedia a reliable academic resource for your research.” Students applied the knowledge of academic resources they learned in EAP class to their project context. They were also asked to find evidence to support their opinions. When learning how to write a summary, P2 Quinn asked the students to summarise an article relevant to their project. At the end of the first semester, the first-year project required students to report their progress to the committee. Instructors then gave a course task of presenting your research. Students needed to prepare a presentation about their research questions, why they chose their project, what their project intended to achieve, and their progress in the project. By the end of the second semester when the projects were due, students needed to submit a final report and attend oral defenses. The EAP program also asked students to write a research report in English.

To engage students, the EAP program organized an academic conference in English each year,
following with the task of students’ project reports. They invited professors from all departments to be the reviewers. Students were encouraged to send their abstract to the conference. Successful candidates had a chance to talk to the panels of their fields and win awards. The panels also evaluated the presentations or the oral defense and determined the level of awards.

In the focus group discussion, EAP instructors stated that the fundamental purpose of EAP was to develop students’ critical thinking skills. However, they felt that the traditional lecture-based class focused on teaching grammar, language form, structure, and so on. In that way, students’ academic literacy was more developed, while students’ thinking skills were less developed.

A: Academic English is not just a language course. In fact, it is a kind of thinking training, critical thinking, and academic thinking. ... For example, last class, I let students evaluate two articles. Students cannot say by feeling, “I think this is good.” It should be based on critical thinking... Of course, everyone has their points of view, but the formation of ideas has a process of thinking and choice, based on facts.

B: Our positioning of EAP is distinct. It is not to teach some specific grammar. We want to cultivate an academic accomplishment or improve their academic awareness. This will be useful for them to write a thesis in the future.

C: But the academic accomplishment you mentioned is not just about papers. Remember that we have surveyed graduates. One graduate said that when he presented his report to the company, the boss immediately asked him whether he had been trained. Even if you are writing a company report like this, your critical thinking and academic thinking can be reflected. (Focus group discussion)

A: 学术英语,不仅仅是语言课。其实是一种思维训练,批判性的思维、学术思维。……比如说我们上节课让学生评价两篇文章,哪一个写的更好？你不能凭感觉说,我觉得这个好,而是建立在 critical thinking 之上,……当然每人有自己的观点,但是观点的形成有一个思考和选择的过程,是建立在事实的基础上。
B: 我们自己的定位是很清楚的，并不是要教你具体的某个语法语言点是什么，我们只是要培养一种学术修养，或者提高你的学术意识。这对他们将来写论文，至少近期的来讲写毕业论文是有用的。
C: 但是你所说的学术修养其实并不仅仅是论文，记得咱们有做了一个毕业生的调查。学生说在公司做完了报告，领导马上就问你受过训练吗。即使你写的是公司的这种报告，你的 critical thinking 和学术思维也能体现。

The integrating project provided a space for students to develop critical thinking skills through academic literacy. The course tasks were not fixed but decided by both instructors and students through communication and dialogue. Students were able to choose their writing topics and could bring papers from their projects to use as learning materials for different academic genres. Students can continue to use materials from their one-year projects. EAP instructors believed that the continuity encouraged students’ self-discovery as researchers. The realization of themselves as researchers gave students confidence in learning, which may convert into competence in the later learning process. However, EAP is still a language class, and instructors expressed the necessity of explicit language components through lecturing.

Similar to the challenges that instructors met in the pedagogy reform, EAP instructors viewed the traditional teacher-centered, knowledge-based teaching method and the examinations to be the major barriers in teaching.
C: A teacher-centered, knowledge-centred approach still exists to a large extent. For example, some students said they did not like the presentation by other students because what students said were often wrong and teachers were often right.
B: I have an example of teachers. Some teachers said, “I have to tell the students what I know.” First, what we know are not necessarily right. Second, we do not necessarily know more than students.
D: Or, because there are still exams. Students still want the teachers to give a higher score.

A: Actually, I feel that teachers need to change their authority consciously. For example, my students call my name, and then they do not have to stand up to answer questions in my classes. They can express in Chinese and interrupt my words.

C: 教学中以老师为中心的，以知识为中心的，还是在很大程度上存在的。比如，学生就说我不喜欢让其他同学讲。学生讲的都不对，老师讲的是对的。

B: 我举一个老师的例子，有老师说我得把我知道的都告诉学生。我们第一知道不一定对，第二也不一定知道比人家多。

D: 或者说这个因为还是有考试的，学生心中，还是希望考试的时候，老师给的分数稍微高一点。

A: 其实我觉得需要老师有意识地去改，去忽略掉老师的权威性。比如他们叫我名字，然后上课回答问题都不用站起来，可以用汉语表达，可以打断我的话。

Instructors expressed the importance of shifting their attitudes from teaching and monitoring to sharing and supporting. They opened themselves to students and were willing to share their own research experience as the model for academic writing. The power of instructors in the classroom would never disappear since instructors were in charge of assessment and credits. However, it helped to create a safe and comfortable class atmosphere, in which students were willing to engage in critical thinking.

**Software Design Course**

The Software Design course took a flipped approach without any lecturing at all. Unlike the EAP course, the flipped course was not going well and was postponed in the end due to student dissatisfaction. The course was a required two-semester course for undergraduates who major in Software Engineering. Students were required to take this course in their third year. P11 Zoey was the program director of Software Engineering and the chief curriculum designer of the
course. She believed that students should learn how to design software through actually designing one, and the software design course should create a “real context of the market.” Therefore, in this course, instructors shifted their role from teaching in classrooms to investing in the market. They did not give lectures about how to code but uploaded learning material online, including textbooks, PPTs, videos. Students learned the knowledge by themselves. Every student needed to design software which was worth investing. In the preparing stage, students were required to come up with a creative idea, conduct market research and submit a feasibility report, trying to convince the instructor. Instructors in this stage did not only give instructions of software designing but also provided feedback and sometimes added requirements from the perspective of investors. The instructor gave suggestions about how to improve students’ design, as well. Once the students’ proposal was approved, they started coding. Because everyone was working on different designs and functions, instructors could not give the same lecture. Instead, all the classes moved to the computer lab. Instructors answered students’ specific questions related to their work.

Zoey mentioned that the reformed course had a higher requirement of instructors’ expertise and brought extra workload for redesigning the curriculum and the pedagogy. Traditional lecturing usually contained clear teaching objectives, and instructors focused on how to make knowledge understandable. While in software designing course, Zoey and her colleagues needed to consider and prepare for potential questions. However, according to Zoey, the extra work was often invisible and not recognized by the department.
The teachers worked harder in this kind of courses. In traditional curriculum design, the teachers only need to check the code line and give a score. Work is much simpler. (In this course) Students chose a variety of topics of software designs. Teachers should be able to communicate with them and to think more clearly. (P11 Zoey, Computer Science) 这样的课程就是老师付出比较多。如果以传统课程设计，老师查代码行给个成绩。可能老师比较简单。学生软件开发是各种各样的题目，你要能跟他能沟通起来，比他想得更清。

Zoey mentioned plagiarism as another barrier of developing critical and creative thinking in the project-based learning. The Internet has made information acquisition too convenient. Students can easily find the source code on the Internet through simple clicks. Instructors had little access to software that can detect plagiarized coding. Even in classroom discussions, some students relied on the internet and were reluctant to think actively.

Students’ feedback of this course was polarized. Students who had taken or were taking this course started an online discussion. They questioned where is teaching. Many current students could not see the value of project-based learning, compared with traditional lecturing. They questioned the way that the teachers did not teach how to code in class but asked students to present their understanding. They argued that if students did all the learning and teaching, why did they still need a teacher. Students could have more opportunities to experience what was a project when they graduated. However, classes were their limited chances to learn knowledge. Some students argued that majoring in software engineering, they had to complete a software designing for graduation in their fourth year. Therefore, they hoped that the course should focus more on teaching them specific knowledge and skills. Moreover, many students did not consider answering questions and lab tutoring as serious teaching.
On the other hand, some former students recognized the value of the project-based learning approach. They argued that among the three traditional roles of teacher, (preaching, teaching, misdoubting 传道授业解惑), “preaching” and “misdoubting” could be more helpful for students to develop skills of innovating, collaborating and competitiveness than “teaching.” One student who graduated in 2017 wrote,

Computer Science is more like computer archeology. Teachers teach what they know rather than what the times need. What you learned in Zoey’s course seem to be out of line but will not be outdated. 计算机科学专业更像计算机考古专业，教的都是老师会的而不是时代需要的，但 Zoey 教的看起来跑题的那一套真的不会过时。

Another concern of students was about the assessment, for exams play a crucial role in Chinese students’ life. Many students studied to pass exams and getting credits. The GPA can decide whether they get scholarships, postgraduate recommendations or a promising career. They believed it is more efficient to get the right answer from the class lecturing than project-based learning. They argued that standardized exams had correct answers, which made the results more objective. However, in Zoey’s project-based learning class, the rubric of assessing the software designing was too subjective, in that teachers gave marks according to their focus. Some former students even posted tips on different teachers’ focus and guidelines on how to draw certain teacher’s attention and get good marks. They also doubted whether the assessment could reflect students’ progress in innovative skills.

Zoey’s pioneer course had been completed two waves by the time of the interview. Unfortunately, three months after our interview, her course received too much negative feedback because of the mismatch between students’ desired learning style and the “flipped” teaching
style. Later, it was called off and changed back to a traditional lecture-based way.

4.3 Influential factors of instructors’ perceptions and teaching practices

In this section, I report findings to the third research question: How do instructors’ educational backgrounds and experience influence their perceptions and teaching practices of critical thinking? In this study, nine out of 24 instructors (P3, P6, P10, P11, P17, P18, P20, P23) expressed their confidence in critical/creative thinking competencies in teaching. However, considering the Chinese characteristics of modesty, some instructors might try to be polite when expressing the lack of their critical/creative competencies.

Three themes, “individual factors, educational and academic research experience, and gender,” were found to influence instructors’ perceptions and teaching practice.

4.3.1 Individual factors

Some instructors attributed their competencies to individual factors. They indicated that their personal traits were the foundation driving them to become a critical or creative thinker. Furthermore, these traits played an important role in the development of their teaching expertise.

Instructors viewed open-mindedness and curiosity as most the influential personalities for critical/creative thinking. For example, P6 Ruby and P8 Daisy related to interest and willingness to think from different perspectives in daily life.

I feel good (about my in critical thinking competencies). I am also such a person in my life. Most of the time, I like to think about different aspects. So many I will not be extreme or take something for granted. For example, after going to the United States once, I felt that I had more thoughts and understandings about the relationship between the United States and China through observation and thinking. “Why is Trump like this?
Why do we say this in China?” I feel that thinking is fascinating. (P6 Ruby)自我评价的话我觉得还不错。我在生活之中就是一个这样的人。绝大部分事情，我会想到很多角度，所以我没那么极端，或者是说不会想当然。比如说去过美国之后，我喜欢观察思考，然后我感觉我对于美国和中国的有好多新的理解。川普为什么这样？我们中国为什么这么说？我把思考当成好玩的事。

I like to think. I am willing to think about problems. (P8 Daisy)我喜欢思考，愿意去想问题。

Moreover, instructors related the open-mindedness to challenge the traditional role of teacher as an authority figure in class. They argued that open-mindedness leads to the belief that teachers should give up their authority and encourage students to question. For instance, P17 Olivia shared

teachers should be open-minded and allow students to question. If the teacher continues to value the hierarchical system from the past, it is not conducive to the cultivation of students’ creative ability. If the student is afraid of the teacher, they may not ask the teacher about problems or communicate with the teacher. This is unfavourable for their further understanding of the problem, including innovation. (P17 Olivia) 首先老师要宽容，允许学生质疑。如果是像过去那种比较严格的师生的等级那种制度的话，其实不利于学生的创新能力的培养。如果学生怕老师的话，有些问题他不会跟老师提出来，不会跟老师沟通。这样的话对于他对问题进一步的理解，包括创新的都是不利的。

Similarly, Thurlings, Evers and Vermeulen’s (2015) study also identified that in personality, curiosity and openness were identified as two features related to innovative behaviours.

In addition, some instructors mentioned that personal traits of magnanimity and persistence were the basis of competencies. Magnanimity here means that one does not concentrate on personal interests. Reforms and innovation usually took more effort and time. P13 William specified
I think it (creative thinking competencies) may be related to personalities. The first is not too concerned for personal gains or losses, and the second is perseverance. The process of innovation will encounter a variety of problems, such as lack of money, difficulties related to collaboration. Besides, the process of innovation is very long, and there may be no achievements in the initial stage. It takes time to develop. (P13 William)

我觉得可能跟人的性格有关系。第一个别太计较，第二要有毅力。因为这个创新的过程里面一定会遇到各种各样的问题，比如说没有钱，团队协作困难。另外创新的过程很漫长，初期可能没有什么成绩，要慢慢的发展积累。

These findings acknowledge Thurlings, Evers and Vermeulen’s (2015) finding that personality disposition, such as “attitudes and beliefs, motivation, learning goal orientation, self-efficacy, persistence” also positively predicated teachers’ innovative behaviours (p. 447). However, the term “magnanimity” did not appear in their findings. Instead, previous findings in this study of instructors’ conceptualization of critical/creative thinking, “thinking for the interests of communities”, might explain the value of magnanimity.

4.3.2 Educational and academic research experience

Beside the personality orientations above, instructors mentioned their educational and academic research experience shaped and sometimes transformed their teaching practices.

**Overseas experience**

The finding suggested that overseas educational experience and research experience may profoundly affect instructors’ perception and teaching practice. Participants with overseas experience mentioned changes in their perceptions of learning and teaching.
P9 Mary recently finished her Ph.D. study in Korea. She personally benefited from the peer-support learning group and flipped classes in her overseas study and was trying to facilitate collaborative learning in her students.

Teachers do not teach much. For example, the first chapter was, “what is grammar?” The textbook was not fixed but included many online references. The students were divided into several groups. Each group chose one section to present. The classes were all flipped that teachers did not teach but let students present. Then other students asked questions, and the presenters answered. If there were any shortages, the teacher added some comments. In Korea, students organized their study groups with classmates. Some students with a strong organizational ability spontaneously organized group study. I felt that this experience was beneficial to me for training my ability to collect materials, organize language, and teamwork. So now in my cultural extensive reading class, I used this flipped way to let students organize groups to learn.

Jenny had a short-term visiting experience in the US. Her experience of taking a course made her reflect on the importance of asking questions in fostering critical thinking.

During my previous visit, I took a course in American history. At that time, each of us was responsible for a presentation. My topic was industrial capitalism. At the end of the presentation, I needed to have two questions for discussion. I clearly remembered what I said, “because this unit is full of informative knowledge, I have no questions.” Then there was a Harvard graduate teaching assistant, he immediately said, “How can this be without problems? In fact, there are all kinds of problems. I think you have not thought
deeply.” I felt that he meant that I lacked critical thinking. Later, this incident had a significant impact on me because I lost face at that time. After that, I always think deeply, ask questions, and reflect on whatever problems I encountered. P4 Jenny 我以前访学期间，去上美国历史。当时我们每一个人会负责做一个 presentation，关于一个 topic，我记得我当时做的是那种工业化资本主义那种的，然后做完之后，你要提两个问题，然后让大家讨论一下。 但是我当时清楚的记得，我说的是 because this unit is full of informative knowledge, I have no question. 然后当时有一个哈佛毕业的助教，他马上就说，”这怎么可能没有问题，其实有各种各样的问题，我觉得你这没有深入的思考。”我感觉他的意思就是我缺乏思辨的能力。后来这件事对我还影响挺大的，因为当时丢了脸了，然后我就以后遇到什么问题我都会仔细的去思考，提问，反思。

P18 Grace had a one-year visiting scholar experience in the US. Her visiting experience deepened her understanding of inquiry-based learning from the form of creative classroom activities allowing students to experience the knowledge acquisition process.

When I was abroad, I also listened to this course. After I came back, I made some reforms to my teaching method. I chose six articles published in famous magazines at the beginning of the term, and then let students choose one topic they liked. Then, students who chose the same topic became a group. Each student independently searched the literature and then wrote a term paper about the topic. Then in the group discussion, they shared the information and the process of searching for information. Finally, each group gave a PPT presentation in the classroom. After the presentation, each student modified their term papers and handed them in for the teacher to mark. (P18 Grace)我当时出国的时候也听了就这门课，回来以后对授课方式做了一点改革。我是开学的时候选择六篇在著名杂志上发表的文章，然后学生去里面去选喜欢哪个题目。选完之后，就相当于有个小组了。每个学生先自己独立地查资料，然后写成一篇小文章。然后组内讨论，每个人都把自己查的资料分享一下，也分享查资料的过程。最后做一个 PPT 到课堂上去展示。讲完之后在回去修改小论文，才交上来。然后老师会根据最后交的论文再给他一个分数。
P20 Eric got all of his postsecondary education in the US. He reported that the overseas experience enabled him to compare the differences in education between east and West and further developed his critical and unique way of teaching concepts. For example, he viewed complete demonstration of the research process as more important than providing a concrete conclusion. Therefore, he intended to introduce different views in his class and lead students to form their views through logical thinking.

Our teachers in history class like to give conclusions. Actually, some people had done research, read some historical materials, and concluded through thinking. But the problem was that we only bring a combination of things. Students do not know how this conclusion came, what were the basis and the logic. There is no such thing as the West did that students learn the method and make their conclusions. In my class, I often told the students that the important part is not the conclusion but how this idea comes from. We can accept these views or not. But to accept means to understand how it came and feel that it was logical and consistent with the facts. If you did not accept this conclusion, it was because your analysis showed something going wrong, or not matching the fact. You came to establish your conclusions. Yet, no matter what, I do not ask the students to accept the conclusions in the textbook, or what opinions I have.
out of problem, or somewhere is in conflict with this fact, I will build my own conclusion again.

But no matter how, I don’t require students to accept the conclusion in the book, or my view.

In other cases, some instructors reported the lack of critical/creative thinking development in their own educational experience led to their lack of confidence and expertise in teaching critical/creative skills.

For the relatively older teachers, including me, our educational experience did not particularly emphasize critical thinking. Therefore, if we were not consciously cultivating our critical thinking abilities, we were kind of lacking critical thinking. (P5 Daniel) For the relatively older teachers, including me, our educational experience did not particularly emphasize critical thinking. Therefore, if we were not consciously cultivating our critical thinking abilities, we were kind of lacking critical thinking. (P5 Daniel)

At that time, I remembered that the teachers tell me everything and I did not need to think but only to recite. Teachers rarely asked us to think about why. Usually, each question had a fixed answer. After the discussion, the teacher would give you a standard answer. I think this is what limits my critical thinking abilities. (P12 Freya)

However, for some instructors, although previous education experience negatively influenced their expertise in teaching critical/creative thinking, it also allowed them to reflect on their experience and learned from the lessons critically. Therefore, they were conscious of the adverse effects and tried to avoid them in their teaching practices. For example, P12 Freya intentionally told her students there were differences answers to questions; P5 Daniel purposefully encouraged students to express their voices in discussion and writing tasks.
Altogether, in this study participants reported the positive influence of overseas experience. The UN(WH) started its own funding program to support faculty to study or do research abroad for a year in 2014. However, the opportunities are very limited for the funding only supports five people per year. Therefore, the majority did not have the chance to go abroad. In the interviews, most instructors suggested the university needs to provide and support more overseas exchange opportunities. In addition, instructors also suggested that university should encourage those who have overseas experience to offer workshops to share their overseas experiences.

**Academic research experience**

In this study, instructors also reported that academic research experience promoted instructors’ critical/creative skills and benefited their teaching experience as well. Instructors spoke about how their research experience trained their thinking skills to be scientific formative, encouraged positive self-efficacy and willingness to take challenges. Moreover, instructors with advanced research experience, especially those with doctoral degrees, felt more confident about their critical/creative skills. Also, they were more willing to add advanced academic content into the curriculum.

If teachers have no engineering experience, teaching may be limited to theoretical knowledge and key content. But in turn, if they have, they can guide theoretical knowledge understanding with practical examples, which may promote students’ motivations in learning. P10 John 老师没有工程经验，教学也仅限于理论知识，重点内容。但反过来，如果要是有工程经验的老师，他能在讲课过程当中把一些纯理论课加实践引导，能促进学生学习的兴趣，调动学生的学习积极性。
Teachers with the abilities of research and innovation could transit their abilities to students in a certain way. (P19 Mike)老师有科研的能力，有创新能力，才能够把你会的东西通过一定的方式教给学生。

Students in this study also supported that this kind of instructors played a vital role in their critical/creative thinking development.

These courses were all related to the teachers’ research fields. Some teachers had translated their experience of research into classes. I think this is better. It is to let students have more exposure to more extra-curricular and advanced content. (S8 Harry)这些课程都是老师与领域相关的。有些老师把自己做研究的经验，搬到课程上来给学生讲，我觉得这样比较好。就是让学生多接触一些课外的内容，多接触一些比较先进内容。

More importantly, instructors viewed their expertise as an ongoing learning process. They needed continuous study in their fields and consciously translated their own experience and expertise into teaching. They required more professional development opportunities from the university.

For teachers, academic ability could have an impact on the quality of teaching. Still, teachers should be given more opportunities for professional development, to study, and to get in touch with the progress of the latest research. (P15 Ella)对于老师来说，学术能力如果一直得不到提高的话，对你的教学的质量实际上是有影响。还是应该给老师更多的机会可以去读书，进修，接触科学的进展的。

Instructors also suggested that the university could have routine professional development activities and funding for everyone. Currently, opportunities are competitive.

4.3.3 Demographics

Through Matrix coding analysis in Nvivo 12, I examined the influences of three demographic factors: age, teaching years and gender, on themes of instructors’ perceptions and
teaching practices of critical/creative thinking. The data did not indicate significant differences in the ranges of age and teaching years, but gender did. Female instructors in this study were more willing to participate in pedagogy reform. In the UN(WH)’s recent pedagogy reform of applying project-based learning and blended learning, nine instructors, six females (P1, P2, P8, P11, P12, P17) and three males (P3, P20, P23), engaged in project-based learning, and four instructors tried blended learning approach, with three females (P4, P11, P12) and one male (P24).

Many female instructors talked about the gender differences of critical/creative thinking. They indicated that the differences were often perceived as biases or even discrimination. Two female instructors (P6, P7) from HSS both mentioned that there was a stereotype that boys were considered to be more critical or creative than girls. They explained from the social expectations. Girls were expected to be shy and less willing to express novel views.

Some would think that boys and girls have different thinking styles. Generally speaking, regardless of whether the boys are good at academic or not, they often think more critically and deeper than girls. But in my opinion, it may be due to the fact that there are fewer boys than girls in HSS. Boys and girls do have different perspectives on some issues. Because the number of boys is small, their views sound novel. In addition, everyone feels that girls are shy and do not want to show their enthusiasm. And girls do not want to express themselves like boys. (P7 Chloe) 有的人会觉得男生女生的思维不一样。总体上说，男生不管成绩好还是不好，他想问题的角度和深度，很多时候优于女生。我感觉可能是由于文科女生多男生少。男女同学看问题的角度不同。因为男生人数少就显得他们的观点很新颖。另外大家都觉得女生要更害羞，不想出风头，没有男生勇于表达自己。
Female participants in this study also questioned the gender bias. Although females often had fewer opportunities, they were more engaged in creative activities of academic teaching and researching.

Later, I found that in this field (software design), women need to be more outstanding than men, in order to stand firm in the industry. Therefore, girls can only work harder and do better than others to prove that they are stronger than others. Society is ruthless. When a girl succeeds, she can do well, and show her tenacity. (P11 Zoey) 后来发现在这个行业（软件设计）中，女生只有比男生优秀的特别特别多，才能在行业中站稳脚。所以女生只能自己狠一点，做的优于别人，证明自己比别人强。这社会就这样，挺残酷的。当女生一旦成功的话，就会做得很好，她这种坚韧的意义体现出来。

Some female instructors (P11, P17) reported that they would deliberately encourage their female students to believe in themselves and work independently. For example, in project-based learning, instructors often set female role models for students and help girls to take leadership roles in project groups.

Summary

The concepts of critical/creative thinking are not alien to Chinese instructors in this case. However, they have unique and varied conceptualizations of critical/creative thinking based on their educational and cultural contexts. Discipline backgrounds influenced instructors’ understanding. HSS teachers used the term of critical thinking and emphasized the thinking components, while STEM teachers used the term creative thinking and focused on knowledge application. All instructors recognized the importance and significance of critical/creative thinking in higher education in China. The university imposed new curricula to emphasize
critical/creative competencies. Problem-based learning was advocated in the new curricula. While traditional teacher-centred and exam-oriented instructional practices seem to have a bearing on teaching and administration, instructors were exploring suitable approaches in corresponding to university policies. In regular classes, the communicative approach and the inquiry-based approach were widely applied. Synthesis writing was often used in large size classes. Innovative contests created a platform for peer-support learning. Project-based learning was transitioning from extra-curriculum activities to regular integrated curriculum courses. Meanwhile, instructors met many challenges in the process of curricula reform, such as exam-oriented educational experience, instructors’ expertise, students’ sense of pragmatism for learning these skills and an over-use of technology. Instructors attributed their competencies of critical/creative thinking to personalities and educational and research experience. Overseas experience and academic research experience profoundly affected their teaching practices. The study showed that female instructors were more willing to engage in creative pedagogy reform than male instructors. Moreover, female participants met gender bias, especially in STEM.
Chapter 5 Discussion

This chapter discusses the findings in relation to the theoretical framework, Thomas’ (1997, 2002) culturally appropriate pedagogy, which was presented in Chapter One. The discussion intends to provide an in-depth understanding of the perception and teaching practices of NU(WH). The data analysis found some overlapping themes that did not only respond to the research questions but were also closely related to the theoretical framework. This study has synthesized the findings according to the four components of the theoretical framework: contextual, epistemological, personalistic, and process components.

5.1 Contextual components

According to Thomas (2002), political factors are the most powerful contextual component. Instructors’ teaching practices in NU(WH) are influenced by the national and institutional policies. Instructors not only conformed to the policies but also resisted the policies in practice. Therefore, the following section further explores the policy influences regarding quality education reform, decentralization and educational inequality.

5.1.1. Quality education reform and decentralization in higher education

Some instructors in the study indicated that previous examination-oriented experience often had an adverse effect on their and their students’ critical/creative thinking. The antidote of examination-oriented education 应试教育 (Yingshi Jiaoyu) in the Chinese discourse is “quality education”素质教育 (Suzhi Jiaoyu). Since the 1990s, the Chinese central government has embarked on a series of policies to apply “Suzhi” education reform (素质教育改革). The reform
aimed to change from traditional pedagogies, which overemphasized rote memorization and mechanical training, to stressing the development of twenty-first-century skills, such as critical thinking, creative thinking, problem-solving and innovation (Tan, 2019). The “quality education reform” emphasizes creativity and innovation and features decentralization as a prominent strategy (Zhao & Qiu, 2012). For about 30 years, many efforts have been made to improve students’ “Suzhi”素质 in terms of critical/creative competencies. Although most instructors (22 out of 24) in this study were over 35 years old and did not experience the reform in their K-12 experience, they stated their observations of the improvement of students’ critical/critical competencies as a result of the reform.

However, participants also felt that the assessment system and fierce competition of Gaokao高考 (China national college entrance examination) limited the influence of the educational reform. Teachers were making efforts to develop creative teaching methods rather than develop students’ creativity (Pang & Plucker, 2013). Participants argued that no matter how many changes had been made to the pedagogy, exam scores remained the dominant assessment method. What is more, in order to succeed in the highly competitive “Gaokao,” students had to train their examination skills by memorizing knowledge and doing massive test exercises, especially in their middle schools. Participants’ observations echoed findings of the extant literature on the washback effect of “Gaokao”(Dello-Iacovo, 2009; Ross & Wang, 2011; Yan, 2015). For example, Dello-Iacovo (2009) argued that despite some successful policy implementing examples, the dominant pedagogy of Chinese education remains rote learning and
exam-oriented competition, especially at the secondary level of education. Findings also confirmed that the top-down policies of “Suzhi” education reform alone do not necessarily change the exam-oriented and rote nature of the primary and secondary education at the grassroots level (Yan, 2015). Therefore, the school pedagogic practices of overemphasizing rote knowledge and educational testing systems hindered Chinese students’ creativity development (Niu & Sternberg, 2003).

Participants in this study believe that higher education differs from K-12 education. In higher education, students have already passed the Gaokao and were less influenced by the washback effect of Gaokao. At the same time, the purposes of teaching and learning were not just passing exams or gaining a higher level of education. Instructors did not have the pressure of teaching for exams. Students took more initiative to decide whether they want to get further education. Moreover, the next level of education, graduate study admission, required more than scores of the entrance examination. Therefore, they believed that higher education had more chances than K-12 in changing exam-oriented teaching and learning.

Higher education also received more adequate resources than primary and secondary education and became the beneficiary of education reform (Niu & Kaufman, 2013). The decentralized strategies in higher education were under a much better condition than in primary and secondary education (Mok & Han, 2017). In primary and secondary education, curriculum development mainly falls to government responsibilities. The central and provincial education authorities provide guidelines and design textbooks for each subject. Provincial education
departments develop the curriculum and designate textbooks for each subject. Schools and classroom teachers have limited responsibility in developing curriculum to meet the unique needs of their students (Fu & Clarke, 2019). In the context of decentralization policies of higher education, institutions provided more choice and autonomy for instructors and students.

In NU(WH), the “curricula reform” allowed instructors to offer new courses from their expertise. Also, it was the course instructors’ responsibility to design curriculum and to select textbooks and learning materials. Instructors can also adjust their curriculum and syllabus according to students’ distinctive needs. Students have more rights in choosing courses and teachers than in primary and secondary school. Moreover, NU(WH) started to transform its management system to the Credit System (学分制), which allows students to choose courses and instructors. Nevertheless, the “Credit System reform” was still exploring how to offer more choices to students. Some attempts in NU(WH) were to accept an online course as credit courses, to allow students to change majors in their second year, and to extend graduation duration from four years to six years.

Meanwhile, the course evaluation adopted the formative assessment system. Now all the courses require evaluations of daily performance and achievement. For example, in the EAP course, final exam accounts for 50% of the assessment and the other 50% includes items reflecting the daily tasks, such as attendances, monthly quizzes, group tasks, presentations, and term papers. Besides the exam items with standardized answers, some instructors included open-ended questions in their final exams. The formative assessment system on the learning process
decreased the washback effect of exams in daily teaching activities. Moreover, it encouraged knowledge comprehension and application rather than rote memorization.

5.1.2 Paradox of educational inequality

Participants argued about the paradox effects of decentralization on educational inequality. While they observed the improvement of critical/critical competencies, they also noticed that the improvement was unbalanced because of regional and social/economic differences. Instructors in this study reflected on students’ academic performances and reported that students from economically developed areas, such as big cities or coastal provinces, often acted better in critical/creative thinking and problem-solving skills (P1, P7, P14). Some preeminent students often have project-based research experience in middle school, like S6 Ethan from an experimental middle school, and S7 Emma from a middle school in Hangzhou, a well-developed area of China. These experiences helped them to perform better in their university projects, while novice students often faced many challenges at the beginning of project-based learning. Therefore, many of them gave up or even resisted participating in project-based learning, such as what happened in the implementation of the “first-year project.”

Their observations echoed with the extant literature about the paradox (Dello-Iacovo, 2009; Wang, 2011; Tan, 2012; Yan, 2015; Guo & Guo, 2018; Wang & Rong, 2019). On the one hand, educational policies have made remarkable progress in increasing educational attainment and decreasing educational inequality in China. On the other hand, the central government issued the education reform directives but left the finance and implementation to local authorities.
Educational funding varies among different regions (Sherman & Poirier, 2007; Dello-Iacovo, 2009). The research suggested that the intra-provincial disparities accounted for the most significant portion of total inequality in compulsory education, about 70 to 90 percent (Lin, 2009, cited in ParkHouse & Rong, 2016). Compulsory education was fully funded by the local governments and the amount of funding depended on local economies. Moreover, education authorities provided additional resources and assigned more qualified teachers to key schools (Cheng, 2010). Most of these key schools are located in urban areas, which caused rural students to have fewer opportunities to get a quality education (Wang, 2016). For example, Kipnis (2001) found that rural schools spent more time on the compulsory exam subjects, such as Mathematics and Chinese, and less on creativity classes due to a lack of teaching expertise.

Central, provincial and local governments also selected pilot regions and schools to experiment with education reforms first and later implemented the policies to other schools and regions by building on the experience of the pilot schools, and later extended the experience of the pilot regions or schools to a wider range (Dello-Iacovo, 2009). For example, Shanghai, the frontier of “Suzhi” curriculum reform, made massive achievements. Shanghai started earlier and gained more productive achievements than many other regions in China (Cheng, 2010). However, the economic disparity between rural and urban living standards widens the urban-rural educational inequality (Wang, 2016). Due to the social-economic disadvantages, rural students struggle to meet the necessary performance requirements of the national curriculum. Rural teachers are unwilling to adopt student-centred teaching methods because they think the...
new methods are time-consuming and may result in unpredictable learning achievements (Wang, 2011). Moreover, rural students received less access to private after-school tutoring (Kipnis, 2001). The only way for rural students to gain upward social mobility is to work hard to gain high scores in the university entrance examination (Dello-Iacovo, 2009).

Therefore, on one side, university students were recruited according to the scores of Gaokao and showed great homogeneity in students’ academic performance. On the other side, instructors still need to deal with students with different backgrounds and learning experiences. The diversity, to some extent, was caused by the educational inequality and enhanced the challenges in fostering students’ critical/creative thinking abilities. However, the current diversity also provides opportunities for advanced students to expand their experience to other students through peer-supported activities.

5.2 Epistemological component

The epistemological component discussed the instructors’ knowledge of critical/creative thinking and the relationship between perceptions and teaching practices. In this study, instructors’ perceptions of critical/creative thinking were situated by the social-cultural context. This situated perception and their disciplinary backgrounds, in return, brought the instructors to different focuses on pedagogical practice.

5.2.1 Disciplinary backgrounds, HSS vs. STEM

The finding of disciplinary differences in conceptualizing critical thinking gave evidence to the coexist of general and domain-specific critical thinking (Ennis, 1989, 2016; Paul, 1992;
Bailin et al., 1999). Knowledge structures in different disciplines influence cognitive purposes and further result in different teaching practices (Jones, 2007; Marquis & Henderson, 2015). For most participants, their understandings of critical/creative thinking directly link to their academic backgrounds.

In terminology, participants from HSS were more familiar with critical thinking. HSS instructors expressed that knowledge in their disciplines was more qualitative and interpretive. Their conceptualizations of critical thinking were more in a general approach, which shared much in common with the two-demotion model, dispositions and skills (Ennis, 1991; Facione, 1990). In their view, critical thinking meant cognitive skills, such as logical thinking, and being open-minded. Thus, they often used teaching methods such as discussions, arguments, and synthesis writings. They also perceived the benefits of developing critical thinking from both academic and personal developments. Hence, in their teaching practices their priority was to set a safe environment to engage students. They encouraged students to present alternative interpretations supported by logical thinking. They were more willing to adopt communicative activities such as group discussions in class.

Consistent with the literature review in chapter 2 (e.g., Wen, 2009; Liu, 2013), participants from Foreign Language pay particular attention to critical thinking. In the curriculum, the department used a series of textbooks concentrating on critical thinking development. In their teaching practice, teaching critical skills was explicit. Participants designed specific activities to develop subskills of critical thinking, such as argument, reasoning, and providing evidence in
academic writing. Moreover, foreign language instructors in this study were more involved in pedagogy reform of projected-based learning and blended learning. According to the department administrators (P3 Bryan, P5 Daniel), teaching foreign languages was not content-based, but rather more skill-based. Teaching skills, for example, writing skills, were not as structured or concrete as teaching content, such as a scientific principle. Besides, many foreign language instructors took curriculum and instructions as their research interests and were willing to spend more efforts on the pedagogy reforms.

Although the terminology of critical thinking frequently appeared in program descriptions and requirements, participants from the STEM disciplines did not directly relate critical thinking to their teaching practice. Instead, they equated it to creative thinking in which knowledge and application were considered fundamental. They viewed knowledge as systematically constructed and valued the discipline-specific content more than generic skills. Without learning to acquire the specific knowledge content, applying critical/creative skills was limited and somehow meaningless. Similar findings appeared in the Ahern et al (2012) study about engineering academics. Therefore, STEM instructors did not explicitly teach critical/creative thinking but reflected on knowledge application or problem-solving process. They preferred to use lecturing to explain knowledge, principles, and theories. Based on students’ understanding, they taught the application by modelling the problem-solving process. For instance, some instructors (P10 John, P17 Olivia, and P23 Steven) would like to encourage students to find innovative and alternative solutions. They also preferred to use leading academic findings and real-world problems as
scenarios to practice knowledge application and problem-solving skills. Through modelling, students accumulated knowledge and the experience of problem-solving. Then they also learnt to utilize these skills to solve new problems or use more creative methods in the prior setting. Students (e.g. S1 Conor, S3 Roy) in this study particularly pointed out these teaching methods as helpful in critical/creative thinking development.

The disciplinary boundaries had a structural influence on academic identity and teaching practice of the instructors (Brew 2008). The “curricula reform” in NU(WH) also valued the interdisciplinary skills and viewed them as the source of innovation. In innovative teams and competitions, the university administrators intended to advocate for interdisciplinary projects. The perception of interdisciplinary background enhancing critical/creative thinking competences critiqued the linear hierarchical approach of teaching critical/creative thinking. Interdisciplinary background may encourage the fluidity of knowledge and comprehensive and holistic thinking. Therefore, these students have more opportunity to develop reflective awareness, which may bring critical/creative abilities. Similar, many researchers (e.g., Brew, 2008; Huang, Pan & Yu, 2016) also suggested that contemporary universities should challenge the fixed view of disciplinary affiliation and provide a more multi-disciplinary undergraduate education.

5.2.2 Constructivism vs. Chinese social-cultural inheritances

The “Western”-styled, student-centred, inquiry-based instruction was promoted by the Chinese educational authorities at different levels (Tan, 2017b). Findings in this study suggested that instructors mainly applied pedagogies based from constructivist, e.g., inquiry-based
learning, project-based learning and communicative approach to develop students’
critical/creative competencies. Although participants’ perceptions and teaching practices about
critical/creative thinking shared many similarities with Western norms, they also contained
particular culture factors. Instructors valued learners’ autonomy as the most significant character
of critical/creative skills, which closely related to the constructivism educational approach of
student-centred and self-directed learning and emphasized students’ responsibility rather than
knowledge transmitted by teachers (Tan, 2017b).

Thomas (1997) discussed that teachers, especially those from developing countries, might
sacrifice their culture-specific knowledge, the process of gaining knowledge and their ways of
thinking to “more universalistic prerogatives” (p. 20). Similarly, instructors in this study
recognized the importance of personal autonomy, active engagement, pluralism and
collaboration in developing critical/creative thinking skills. However, the “curricula reform”
could not bring a total shift of didactic instruction. Instructors recognized their role as an
exemplar of problem-solving. Meanwhile, they did not discard the role of a transmitter of
knowledge. In other words, instructors in this study did not unconditionally embrace “Western”
conceptions or learning theories, such as the constructivist views in education. Instead, they “re-
interpreted and adapted these foreign ideas and assimilated them into the indigenous contexts in
accordance with their Chinese logics, values and ways of life” (Tan, 2015, p. 205).

Respect, discipline and practice

Tan (2015) elucidated three “dominant” cultural inheritances, existing in the recent China
education reforms, including “students’ respect for the teacher, student attention and discipline in class, and the importance of practice” (p. 196). In this study, instructors actively negotiated their traditional beliefs and engaged in different corresponding epistemology to suit the local context and educational reform agenda. In other words, instructors experienced a process of epistemological justification in which cultural factors mediated the “Westernize” policy transfer.

According to Tan (2015), “students’ respect for the teacher” derived from the notion that a teacher in China was not only an expert in knowledge but also a moral guide. Therefore, reflected in daily rituals, students should respect and obey their teachers’ words. Then, “student attention and discipline in class” were trained through reinforcement and social contracts in a daily classroom, such as putting up one’s hand before answering questions or standing up when called by teachers. However, in this study, instructors’ perceptions toward these two cultural inheritances, “respect” and “discipline,” had changed in many ways. All the participants in this study, including instructors and students, mentioned that they did not consider teachers as the “authority figure.” Teachers did not gain respect because of their role as a teacher, but because of their experience and achievement in academia and teaching. Instructors also regarded “discipline” as students’ own responsibility. Moreover, other research (Guo, Wu, & Liu, 2019) found that social-economic conditions in recent China have shaken the Chinese teachers’ high social status and “authority figure” status that they enjoyed in the past. Therefore, Chinese teachers were often passive in dealing with discipline problems with a student to avoid conflicts.

Additionally, instructors believed that the willingness to ask questions and even challenging
teachers in learning process represents critical/creative competencies. Setting up a balanced relationship between teachers and students could help students to speak up for themselves. Some instructors stated the importance of the shifted role of teachers. In the more traditional role, a good teacher should have the correct answers all the times and should be able to choose and explain knowledge in a way which ensures easy understanding and learning (Hu, 2002).

However, to foster high order thinking like critical or creative thinking, instructors in this study emphasized encouraging different answers, focusing on the process of gaining knowledge rather than knowledge itself in lecturing. As for the “discipline,” instructors in this study believed that their students were all adults and were able to be responsible for their behaviours. The development of critical/creative thinking required self-regulation, autonomy and hard work. This was supported by Chinese scholar, Wen’s (2009) hierarchical model, which placed meta-thinking skills, such as autonomy as the most important critical thinking skills which may determine the development of other skills. Moreover, instructors tried to remove classroom discipline to create a safer classroom atmosphere to encourage students’ agency of independent thinking. For instance, in EAP class, instructors allowed students to call their names, not to put a hand up when they want to speak in class, to remain seated when talking in class, and to use Chinese to express themselves when they felt their English was not enough.

Although instructors intended to decrease their “authority,” their power did not disappear. Students still perceived that they were afraid of asking questions or challenging teachers. Even though the teachers were amiable and welcomed questions, they still have the power of
evaluation. Moreover, students felt that it was impolite and useless to challenge teachers. It could only make teachers feel awkward. They would like to ask their peers or resort to the internet for help and answers. The differences between instructors and students may explain why Chinese students appear to be “silent” in classrooms.

The third inheritance, “the importance of practice,” noted that learning in Chinese tradition was expected through repetitive practices and reviews to achieve proficiency (Tan, 2015, p. 196). Similarly, Hu (2002) summarized four Rs, “reception, repetition, review and reproduction” as the ways of learning rooted in Chinese culture, which may cause tension with the student-centred and critically transformed educational approach (pp. 100-101). In this study, the same traditional epistemology of learning still deeply influenced participants. In teaching and pedagogy, participants placed emphasis on knowledge accumulation and practice. They put forward that critical/creative thinking requires higher order thinking skills, which cannot be achieved without knowledge accumulation.

In this study, participants, both instructors and students, perceived that most classes in NU(WH) remained traditional teacher-centred, in which teachers were the knowledge transmitters and students passively accepted instructions. Although not many, two instructors (P10 John and P22 Luke) argued that knowledge learning should take place prior to ability practice. They separated knowledge learning and skill practice into the tasks in lecturing and in labs or research projects. Therefore, in classroom teaching, they insisted on using lecturing and believed it was more useful for first-year students and suggest that inquiry-based or
communicative teaching methods should be applied in the higher levels, such as a senior year or graduate study.

**Holistic thinking and middle way**

For most instructors, they viewed knowledge learning and skill development as a holistic process. They acknowledged the advantages of lecturing in structured knowledge, especially in large-size class. They also recognized its deficiency in knowledge application. They believed that the inquiry-based teaching methods helped to deepen the understanding of knowledge. Therefore, they preferred to combine lecturing with communicative activities in their classrooms, project-based tasks in students’ assignments, and open-ended questions and synthesis writings in their course assessments. This indicated the middle way of Chinese thinking style. Similarly, Jia et al (2017) did an empirical study to test the effectiveness of inquiry-based teaching in developing the creative ability of Chinese undergraduates. Their research found that a mixed-method approach, including both lecture-based and inquiry-based teachings, was better than using them separately for Chinese students.

In addition, adopting only one approach, either the traditional teacher-centred lecture or the new pedagogy, would lead to students’ dissatisfaction. For example, student participants regarded the lecture-only class as the worst way to develop critical/creative thinking. S2 Simon, S3 Roy, and S8 Harry all mentioned their boring experience with lecture-only class, in which teachers ignored the students’ responses. Furthermore, Zoey’s project-based flipped class was an example of adopting a new pedagogy without considering the traditional learning styles of the
students. One reason for the failure could be students’ lack of independent learning experience. Most students had not taken a flipped class before and became overwhelmed in the new learning style. Moreover, some students did not recognize the value of the new pedagogy. They considered it to be less effective than the traditional approach. Students also critiqued the assessment as too subjective without rubrics. Another reason could be that instructors did not provide enough scaffolding to knowledge acquisition. Instructors put resources online and asked students to learn by themselves. Some instructors admitted their lack of expertise in facilitating a flipped class. Hence, students requested to go back to the traditional lecturing style.

The holistic and middle way brought a combination of learning habits and new pedagogies. Furthermore, the combination is not simply one plus one approach. Instead, it is a dynamic negotiation process which retains traditional elements of acceptance and beliefs and accommodates new concepts into a new mind-set. Constructivist educational approaches should not be incompatible with the transmission approach but be congruent with other pedagogies that complement and aid the learner’s construction of knowledge (Tan, 2017b). Instructors’ trials in fostering critical/creative thinking reflected a combination of the “Western” constructivism approaches and the heritage of Chinese culture factors.

**Thinking for the community interests and peer-support learning**

A unique combination of constructivism and the Chinese heritage, “thinking for the community”, was the peer-support learning groups in innovative contests. It fostered an authentic pedagogical approach, combining project-based, inquiry-based and collaborative learning with
collective identity.

First of all, the peer-support learning groups created an atmosphere that contributed to both intrinsic motivation and group identity (Nguyen, 2018). Most STEM innovative contests set up a real-world scenario different from the traditional lecturing classroom. Students needed to work in a group to solve problems while competing with other groups. The new approach was distinct from regular classes and addressed students’ interests to engage them. As for extra-curricular activities, students had the autonomy to decide whether to attend them or not. The choices reinforced a sense of belonging to the group.

Moreover, the conception of “thinking for the community interests” attributed to the collective identity, which values interpersonal relationships and in-group cohesion (Nguyen, Terlouw, & Pilot, 2006). The STEM contests gave students a united goal to work toward. With group identity, students gained a group honour and were willing to devote themselves to the group. Hence, students worked hard on their projects collectively and did not care about their individual scores.

Secondly, the peer-support learning groups found a systematic peer-support learning approach. The HRT team constituted a sophisticated horizontal and vertical structure (see Figure 4.3). The vertical structure brought students of the same technical skills together and created a space for students to learn from the collective wisdom of their peers. The horizontal structure consisted of sub-teams working on different projects. Between-group competitions enhanced in-group cooperation and group identity (Nguyen, Terlouw, & Pilot, 2006). Inside the horizontal
team, leaderships were developed through running the daily routines, such as recruitments, orientation training, and assigning tasks. Among group members, peer evaluations seemed to be competent to enhance students’ critical and creative thinking. Because of the group identity, students viewed each other as an insider and were franker with one another when they provided feedback or critiques on one another’s work. Furthermore, the well-structured task assignments coordinated every individual and also enhanced students’ autonomy and responsibility for achieving their tasks. One team member’s delay may affect others’ work or even the entire project.

Thirdly, the systematic peer-support learning approach was sustainable. The continuity depended on an apprenticeship system which was called 梯队建设 (team construction). The well-organized system assigned different positions. In each position, there were both senior students and apprentices. The apprentices learned from their seniors and follow their lead to practice in a real problem-solving process. They gained knowledge and experience and passed them to new apprentices. In this approach, students took agency in the whole process while instructors entirely gave up their power. Once a mature system was formed, it ran in a healthy ecosystem in which innovations were evoked. This approach reflected the cultural epistemology of learning that innovations derived from the accumulations and the inheritances of former team members. Instructors’ roles shifted from a knowledge transmitter to a platform supporter. In other words, instructors and school administrators provided a supportive platform to extend sustainable talents cultivation.
5.3 Personal component

The personal roles of teachers are particularly important in developing an appropriate pedagogy (Thomas, 1997). The following sections discuss personalities, the positive effects of overseas educational experience and academic research experience, the complicated influence of teaching experience, and the gender differences in motivation.

Personality of magnanimity

Unlike the common terms, open-mindedness and curiosity, the personality of magnanimity was unusual in Western literature in relation to critical/creative thinking. Regarding instructors’ understanding of critical thinking and thinking for the community interests, instructors in this study valued magnanimity, which meant sacrificing personal gains or short-term gains for students’ critical/creative thinking development. When undergoing curricula reform, instructors encountered more challenges than before. In particular, conducting new pedagogies required more effort and brought extra workload, which may not always be recognized. Moreover, institutional supports were often inadequate or insufficient. Both the culture feature and transformative local context added value to the importance of the quality of magnanimity.

Overseas vs. local educated

The findings in this study suggested that overseas educational experience and research experience may profoundly affect instructors’ perception and teaching practice. These findings were consistent with Liu and Jiang’s (2015) study that the overseas experience allowed scholars
to be involved in an international academic community and develop into open-mindedness, and also changed their values and perspectives in teaching and researching. The native-educated instructors reported the lack of critical/creative thinking development in their own educational experience, which resulted in their lack of confidence and expertise in teaching critical/creative skills. Nevertheless, findings indicated that self-reflection and personal development allowed instructors to make up for their shortages.

Academic research

Findings in this study also suggested that academic research experience could promote instructors’ critical/creative skills and benefit their teaching experience as well. Instructors spoke about how research experience trained their thinking skills to be scientific formative, encouraged positive self-efficacy and willingness to take challenges. Moreover, instructors with advanced research experience, especially those with doctoral degrees, felt more confident about their critical/creative skills. Also, they were more willing to add advanced academic content into the curriculum. Students in this study also supported that this kind of instructor played a vital role in their critical/creative thinking development. In another study, Tang and Kaufman (2015) appeared to confirm the finding that improving instructors’ research ability could help to improve students’ creative motivation.

Demographic factors

Matrix coding analysis suggested that demographic factors of age and teaching experience showed a complicated influence on instructors’ perception and teaching practice of
critical/creative thinking. On the one hand, similar to Mullet and colleagues’ (2016) study, participants with more teaching experience tended to be more confident about their expertise in teaching critical/creative skills. On the other hand, young instructors were more willing to accept new pedagogy concepts, such as student-centred, inquiry-based, technology-assisted pedagogies, which were similar finding to Lee and Seo’s (2006) study.

The study showed that female participants were more active in pedagogy reform than male participants. Similarly, Zhu and Engels (2014) stated in their study that female teachers reported a higher level of applying innovative instruction than male teachers in student-centred, collaborative learning and e-learning environments. Female instructors in this study confirmed this finding and gave a possible explanation that female academics received fewer opportunities in academic funding. Additionally, much extant literature reported that females were put in a disadvantaged position in the research grant application and funding outcomes (Ley & Hamilton, 2008; Waisbren et al., 2008; Bedi, Van Dam, & Munafo, 2012; Mutz, Bornmann, & Daniel, 2012). Pedagogy research usually has less requirements in research equipment and funding. Therefore, more female instructors are devoted to the relatively easily-accessed pedagogy research to meet job requirements for research than male. Female participants in this study questioned the gender bias that females were less creative than males in STEM. Although females were often granted with fewer opportunities, they were more engaged in creative activities of academic teaching and researching.
5.4 Process component

Some researchers argued that the top-down policy implementation in China limited decentralization. The central government only transfers “fiscal responsibilities, management authority, curriculum content, or examination and admissions” to the lower level but holds the right to withdraw the authority at any time (Zhao & Qiu, 2012, p. 316). In this way, the central education authority continues to play an essential role in policymaking, from providing guideline or orientation of the direction of curricula reform and providing financial and policy supports.

5.4.1 Top-down policy implementation

The case of NU(WH) provided an example of how key universities play mutual roles in policymaking. On the one hand, the “curricula reform” in NU(WH) were guided by the requirements of central policies. Responding to the three stages of policies promoting creativity, from the nascent stage (1998-2001), developing stage (2002-2009), to transformative stage (2010-), NU(WH) also experienced three stages of promoting creativity development. Before 2010, the university did not pay special attention to critical/creative thinking education. At the grassroots level, students joining professors’ research groups were considered a means of cultivating creative abilities. Many participants recalled that they thought that to develop critical/creative thinking ability was the responsibility of the graduate program at that time. The first innovation club in the university, HIT Racing Team, was founded in 2009. From 2010 to 2015, the university started to respond to the Outline (MOE, 2010) and added the educational goal of developing creative talents into its undergraduate program requirement in 2012. Extra-
curricular activities were the primary cultivating method. In this period, departments supported students to set up innovation clubs or teams for attending national and international competitions. Since 2015, the university focus has transformed from elites to general, and from add-on extra-curriculum to integrated curriculum. Departments started to build supporting all first-year students to prepare for “innovation” competitions. Therefore, the university conducted the “first-year project” to involve every first-year undergraduate in research projects. Moreover, since 2015, the university has continued to encourage instructors to reform curriculum and pedagogy, adding new innovative courses into the curriculum and applying project-based learning and blended learning in classroom teachings.

On the other hand, as a key university (985), NU(WH) received special national funding from the central government. Hence, it responded quickly to the central policies and had a high implementation level. This echoed with Zhu and Engels’ quantitative research (2014), which found that key universities responded quickly and in a timely manner to the central policy of instructional innovations. Moreover, they took more responsibility for extending policies implementation and follow-up policymaking.

In 2011, NU(WH) became one of the 33 pilot universities in reforming creativity and entrepreneurship education. The newly released *Opinions on Accelerating the Construction of High-level Undergraduate Education and Comprehensively Improving Talent Cultivation Ability* requires attention to adopting inquiry-based, project-based pedagogy reform, developing blended learning, extending Credit System reform, and increasing the proportion of formative assessment
(MOE, 2018). All of these contents could be found in the “curricula reform” of NU(WH). The Ministry of Education also organized five *Online Open Course Construction and Application Management Workshop* by 2018. The principle of NU(WH) was one of the host speakers in the workshop to share the experience of blended learning in NU(WH). NU(WH)’s reform provided practical experience for other universities and future policymaking. In this way, key universities like NU(WH) influence a broad range of policy implementation. Moreover, experiences gained from the “pilot study” may affect the next stage policymaking. Therefore, recentralization of top-down policy implementation has paradoxically balanced the decentralization of Chinese higher education (Tan, 2019).

5.4.2 Discrepancies between policy and the teaching and learning experiences

This top-down policy implementation held an advantage in raising the institutional awareness and facilitating decision making of local executive plans. For instance, the first-year projects,” promoting project-based learning and blended learning are a direct and timely response to central policies (MOE, 2012; State Council of PRC, 2015b; MOE, 2018). Despite such positive effects, the study also revealed discrepancies between policy and the teaching experience of instructors in NU(WH).

Firstly, contradictions existed among the promoting policies and “pragmatic” motivation. Historically, education in China has been promoted with a “pragmatic” purpose such as upwards social mobility. Findings suggested that many students held extrinsic learning motivation, “learning for scores (GPA).” “Scores” in this study mainly consisted of basic scores like exam
results and add-on scores such as attending contests, research projects, and so forth. The “scores” was recognized as the prime standard to value a student’s achievements. For instance, “scores” were the decisive rubric and condition of winning scholarships and entering graduate study without an examination. Moreover, enterprises were more willing to accept graduates with a high GPA. In practice, participation in projects and blended learning usually required extra effort. Conversely, those activities such as innovative competitions and “first-year project” were categorized as the add-on in GPA, which counted less. S1 Conor and S6 Ethan reported that students would assign efforts to learn tasks according to the value of the scores accounted in GPA. Many students only participated in the activities to gain “innovative credits” for graduation. Hence, they lack the agency of putting effort into these add-on activities. Instructors also sensed students’ unwillingness to take tasks in optional courses and even general required courses, which counted less in GPA calculation. In addition, students’ excessive concern about their GPA brought challenges to the assessment of critical/creative thinking. Instructors reported that some students question the fairness of qualitative assessment, such as synthesis writing. As the GPA system is 100 points, it was difficult for instructors to judge the minor differences. Moreover, when one course was taught by different instructors, they may have different rubrics. Nevertheless, the minor difference in score may profoundly affect students in the future, such as the opportunity of postgraduate recommendation. In this study, the university policies neglected the “pragmatic” motivation. To some extent, the neglect leads to an invisible resistance to teaching and learning reform. When the “curricula reform” aimed to develop autonomy and
independent learner, a practical situation in NU(WH) was that it enhanced passive learning and wasted students’ time. Participants in this research raised the concerns of social and economic pressure restraining students’ choices. For example, the new regulation of extending the graduation duration from four to six years could not meet the “pragmatic” purpose and only remain in the paper. Parents and society may consider the extending of graduation as a failure. The lack of recognition then may affect students’ competitiveness in the future career market. Hence, few students can afford to extend graduation due to these pressures.

Secondly, the institutional policy implementation brought more requirements and pressures to instructors and students without enough support. In this study, the university strategies paid more attention to the management and evaluation rubrics. For example, to impose the “first-year project,” the university assigned it as required credits, which meant that students have to take it for graduation, but supporting resources were limited, and only one-fifth of the students may get the funding which was issued after the project was done. There was a lack of qualified supervisors to implement the project-based learning to all first-year students. In the execution plan, student counsellors, the department administrators, and professors were all allotted specific responsibilities. However, the extra-workload was not recognized by the university with payment. Instructors reported that it was the interests in academic research and moral sense that supported their endeavours in the “First-year Project.” In promoting the pedagogy reform of blended learning, the university mainly applied three kinds of strategies: setting requirements, providing pedagogy research funding and holding teaching skills competitions. The university
set standards about how many blended courses there will be by next year and then announced curriculum development funding, particularly for blended learning. However, instructors still reported insufficient funding for blended learning required inputs of technology tools and training of using the technology. The university funding was too limited to support the technology and training input. Moreover, there were limited resources to support instructors’ professional development. Besides a few online courses about how to make up instructional video clips, instructors got no resources about pedagogy reform. All the instructors in this study reported that they never received any training about how to teach blended learning courses. Instructors were critical to using teaching skills competitions as professional development. Although the administrators intended to showcase the exemplary high-level teaching practices through these competitions, the instructors did not feel it helpful in their teaching. They explained that the competition was more like a show which could not be applied in the daily classroom. It seemed that instructors in this study were forced to reform pedagogy to project-based or blended without adequate support.

The last gap lay in the lack of communication between instructors and the university administrators. It was ubiquitous that educational reforms confront obstacles and holdbacks. Challenges identified in this study share similarities with previous studies of inquiry-based or project-based learning (Beckett, 2002; Guo, 2006; Beckett & Zhao, 2016). Findings in the study provided evidence for Zhu and Engels’ (2014) discussion that the top-down policy structure in China may cause barriers in communication and idea-sharing and respond slowly in changing
situations. Instructors in this study felt that they were under a different situation of communicating with university administrators for students. The university provided many opportunities for students to express their ideas and had regulations to ensure a timely response. However, when it came to teachers, there were few communicative opportunities. Especially when students and teachers took different positions, instructors felt they were a vulnerable group. For example, when P11 Zoey’s course reforming was questioned and reported to the university, she had to change back to the traditional lecturing according to the students’ request. Moreover, Zoey did not get opportunities to adjust her teaching plans. Instructors argued that the university should be a place for education, but now it was just a service provider for students and a manager for teachers. The current communication opportunities mainly served students rather than instructors in this case.

**Summary**

Higher education in China, especially key universities, received policy and financial preference in cultivating critical/creative competencies. However, the economic disparity and pilot-sweep way of policy implementation enhanced the diversity of students and hence brought many challenges for instructors in pedagogy reforms. Because of the differences in knowledge structures and cognitive processes, disciplinary backgrounds directly influenced instructors’ perceptions and choices of pedagogy approaches. Instructors mainly applied constructivism teaching approaches, which were promoted in educational policies. However, their perspectives and teaching practices on cultivating critical/creative abilities were not fixed but were
experiencing a dynamic negotiation between local social-cultural beliefs and constructivism approaches. Also, instructors’ overseas educational experience and academic research experience showed a positive effect on their teaching behaviours. In addition, there were gender differences in the agency of pedagogy reforms. Female instructors in this study were more willing to engage in creative pedagogies than male. However, the top-down implementation left many discrepancies between policies and the teaching practice, including overlooking students’ “pragmatic” purpose of learning, bringing more requirements rather than supports, and lacking communication between administrators and instructors.
Chapter 6 Conclusion

As stated before, the intent of this qualitative case study was to understand Chinese instructors’ perceptions of critical/creative thinking and their teaching practices. Literature addressed a significant gap regarding culturally specific critical/creative thinking. Specifically, there was a need to investigate university instructors rather than students and to pay attention to their daily teachings. Moreover, understanding the influential factors of instructors’ perceptions and teaching practices was a response to the transitional higher education in China. The limited voices of Chinese university instructors in research related to teaching critical/creative thinking particularly interested me. My object was to answer the call for more research about how critical/creative thinking was perceived and taught in China higher education and to contribute to a culturally appropriate pedagogy of critical/creative thinking effectively.

In the final chapter, I include conclusions drawn from this study, followed by significant contributions of my research. I also present the implications emerging from the findings for policymakers, university administrators and instructors. Then I discuss my limitations in the study and provide my recommendations for future research.

6.1 Summary of findings

Findings of the study revealed that instructors’ disciplinary affiliations were more likely to influence their perceptions of critical thinking. HSS instructors used the term of critical thinking to emphasize the thinking components. Instructors from STEM used the term creative thinking to focus on the knowledge application (see Figure 14). Findings showed that instructors’
interpretations of critical thinking demonstrated Chinese characteristics, such as holistic thinking, thinking for the interests of community, and knowledge accumulation as a foundation for critical thinking. Both the Western and local social-cultural beliefs of teaching and learning impacted instructors’ perceptions and teaching practices. Findings also showed that Chinese instructors adopted a combination of lecture-based teaching with the communicative approach, synthesis writing, inquiry-based approach, and project-based learning approach to foster students’ critical thinking.

![Diagram: Chinese instructors’ critical/creative thinking perceptions model]

Figure 14 Chinese instructors’ critical/creative thinking perceptions model

_Educational transformation._ Instructors in this study were under a transitional education era. Developing critical/creative skills has become an educational goal in China for about 30 years. The central government and higher education institutions have made numerous efforts to change the traditional exam-oriented pedagogy. Thus, higher education in China is different from a few decades ago. Findings of my study challenged the deficit discourse that Chinese students were
incapable of critical/creative thinking. However, in practice, more efforts had been made in diversifying teaching methods than developing critical/creative abilities. Exams remain the dominant assessment system. Due to the economic disparity and pilot-sweep way of policy implementation, the national pedagogy reform developed quite unequally. Education of critical/creative abilities developed in more advanced progress in higher education than in K-12. Institutions of higher education, especially key universities like NU(WH), received more policy supports and resources. In return, as one of the top universities, NU(WH) shared a leading responsibility of the central polices implementation of cultivating innovations and pedagogy reforms in higher education. The local institutional policies were experiencing transformations, from elite education to general education, and from extra-curriculum activities to inclusive curriculum and pedagogy reforms.

**Epistemological negotiation.** Firstly, this study depicted that Chinese instructors’ perceptions and teaching methods of critical/creative thinking were not homogenous or fixed. They varied from disciplinary backgrounds, personalities, educational and research experiences. Specifically, living in the transformative era, instructors in this study all hold a developing perspective on critical/creative abilities and instructions. They recognized the challenges but still actively participated in the transforming period. Most participants were undergoing an ongoing, dynamic negotiation of knowledge-centred, lecture-based pedagogy vs. student-centred, inquiry-based pedagogy in this case.
On the one hand, their previous exam-oriented education experience and cultural educational belief in learning through practice seem to have a bearing on teaching and learning. Some participants considered the new pedagogies as less efficient and more time-consuming than lecturing. Many instructors expressed their unfamiliarity with inquiry-based learning pedagogy. In addition, some students do not recognize new teaching methods, such as the flipped class, as teaching. On the other hand, instructors had a clear understanding of the term critical/creative thinking. They believed the premise of critical/creative thinking development was to provide choices and safe environments for students.

Meanwhile, instructors were giving up their roles as figures of authority and learning to become facilitators in knowledge acquisition. In this study, the student-teacher relationship from instructors’ view was equal and mutually communicated. Students did not consider teachers as the authority figures in class anymore and were willing to ask questions and challenge teachers when needed.

*Developing pedagogy.* In this study, instructors mainly applied constructivist educational approaches to cultivate critical/creative competencies according to the central and institutional policies. However, the findings of this study demonstrated that it might be misleading to dichotomize Chinese and Western teaching and learning. Instructions only address one extreme approach, either exam-orientated or inquiry-based, and both received negative feedback from participants in this study. Instructors negotiate new pedagogies with their original beliefs and social-cultural context and come up with a middle way to address both in their teaching. The
middle way was not merely one plus one but a dynamic approach. Data from the study demonstrated instructors’ agency, trials, failures, changes, achievements and innovations in developing culturally appropriate pedagogy.

6.2 Contributions

Previous studies have examined the importance and benefits of cultivating critical thinking in higher education (Manalo et al., 2015). Years of research on critical thinking instruction in higher education identified consistent benefits in student achievement in the workplace and lifelong learning (Davies & Barnett, 2015). Internationalization provided more opportunities for Chinese students to study abroad and increases the diverse demography of countries of immigration like Canada. Meanwhile, it brought more challenges for education to offer culturally appropriate pedagogy.

Unlike many studies, this study sought to address instructors’ voice and examine instructors’ perceptions of critical thinking and how to teach critical thinking in China higher education institutions. Findings of this study may contribute to the literature of understanding the Chinese cultural-specific critical/creative thinking. The Chinese characteristics of critical thinking may extend the current Chinese critical thinking models, such as Wen’s hierarchical model (2009), by adding the culture components. Furthermore, the results may add to educators’ knowledge of attitude and beliefs toward culturally appropriate instruction on critical/creative thinking. The research may provide university educators and administrators practical information in educational decision-making about what cultural factors should be considered and how to
incorporate those cultural factors into critical thinking instruction. The findings may contribute to curriculum development of designing courses for teaching or incorporating the teaching of critical thinking and may also reveal ways to help international educators to understand and engage students from China. Further, the results may offer educators knowledge and experience to better prepare students for the competition in the internationalized workplace.

6.3 Implications for policies

According to the findings of the study, it was evident that even though central and institutional policies imposed new educational concepts, they did not naturally change instructors’ epistemologies. Evidence drawn from data of this study underlined the need for understanding instructors’ epistemological justification for cultural factors which mediate policy implementations. As indicated in this study, a traditional belief such as “knowledge accumulation and learning through practice” continue to live in the higher education context. Furthermore, “pragmatic” motivation in teaching and learning is also grounded in Chinese society. Therefore, the implication for policymakers is to consider the social-culture beliefs in teaching and learning when recommending new pedagogies. Moreover, current policies on teachers’ professional development emphasized technical tools and practical strategies of implementing new pedagogies. Hence, professional development can add teachers’ epistemology and motivation discussions when implementing educational policies.

At the university level, this study indicated three gaps between institutional policies and practices, including neglect of students’ “pragmatic” motivation in learning, lack of supporting
resources for curricula reform, and lack of communication between instructors and administrators. This study suggested that the new form of project-based learning in curricula could be offered for more credits, which could motivate students to participate in the new way of learning. Notably, the credits may be added to the innovative competition experiences rather than only to the winners in competitions. Findings suggested changes in the teacher evaluation system. One change could be to recognize instructors’ extra efforts in pedagogy reforms. Another suggestion could be to grant more freedom to instructors when applying new pedagogies. Especially when there were conflicts among instructors and students, the university administrators could provide more chances for instructors to make corrections rather than calling off the reform. More importantly, this indicated a demand for instructors’ professional development. It was also recommended that experiential workshops would be more helpful than teaching competitions. University leaders should allow time for the educational transformation. Instructors need time to develop their expertise and students also need time to get used to new pedagogies. This study found a deep cultural root of what is knowledge and how to gain knowledge. It also indicated the changing situation of “respect” and “discipline” in the higher education context in China.

6.4 Implications for practices

Evidence from this study revealed a list of recommendations for teaching practices:

1. Instructors should consider the students’ knowledge foundation, forms and credits of course in curriculum development. Critical/creative thinking is higher-order thinking, requiring
disciplinary knowledge to support competency development. Therefore, special efforts should be made to prepare novice students for a new way of learning in pedagogy reform.

2. This study indicated that collaboration between senior and junior students seems to be more productive than regular peer groups. Also, a sustainable peer-support system worked better than instructors’ teaching in the project-based learning context.

3. When applying new pedagogy such as inquiry-based learning and project-based learning, there is a demand for explicit knowledge instruction. Moreover, modelling knowledge acquisition was more effective than letting students experience the acquisition process in large classes.

4. Clear and consistent evaluation rubrics were found particularly important to engage “pragmatic” Chinese students. These rubrics may help to guide students in daily learning activities.

5. In lecture-based classes, provoking questions show more advantage in developing students’ critical and creative thinking. The provoking questions do not test the memory of knowledge but elicit answers for further inquiry. We suggest the instructors experiment with asking probing questions and encourage students to ask thought-provoking questions, too.

6.5 Limitations and future study

This is a small-scale study with only one institution with few participants. It should be noted that instructors’ perceptions and teaching practices in NU(WH) do not represent those in other universities in China. When NU(WH) enjoys the substantial resources and plays a pioneering role in educational reforms, other universities, notably the non-985/211, or “double first-class”
institutions still struggle with challenges like low reform motivation of instructors, inadequate educational resources and supports. Educational priorities in those institutions may not be applying pedagogy reform policies in order to develop critical/creative thinking. The case of NU(WH), therefore, is an example of key universities rather than a broader picture of higher education in China. Without further examination, the findings cannot be generalized.

The research findings suggested that instructors’ understandings and pedagogy in terms of critical/creative thinking education have been shaped through their disciplinary backgrounds and their previous experiences of learning, teaching and research. More and varied data might have provided different results. Future studies can examine diverse higher education institutions in China and compare with findings from this study. Comparative studies between Chinese and Western universities may provide a broader picture of how to provide culturally appropriate pedagogy in terms of critical/creative thinking.

Also, this study was a short-term study and data was only collected over about two months. As indicated in this study, instructors were experiencing an educational transformation, in which they were negotiating their epistemology and developing their pedagogy. Therefore, a longitudinal study, tracking the transformation, especially the process of particular pedagogy reform, may generate more explanatory findings. Such studies may also help to provide an understanding of how instructors aligned the demands of cultivating critical/creative thinking with their teaching practices and how they responded to local challenges in teaching.
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Appendix I Demographic Information

1. What is your gender?
   □ Female  □ Male  □ Other

2. What is your age?
   □ 34 or younger  □ 35 to 44  □ 45 to 54  □ 55 to 64  □ 65 or older

3. Which department do you come from?

4. What is the highest level of education you have completed?
   □ Bachelor  □ Master  □ Doctor  □ Other (please specify)

5. Which level do you teach now?
   □ Pre-undergraduate  □ Undergraduate  □ Graduate  □ Other (please specify)

6. How many years have you been teaching at the university level?

7. What language do you use in your teaching?

8. How many courses do you teach this year?

9. Which course/ courses have you taught in your current university? Please list.

10. How many students do you teach in one class?
    □ under 10  □ 10-29  □ 30-59  □ 60-99  □ 100-200
        □ above 200
个人背景信息 (Chinese vision)

1. 性别
   □ 女 □ 男 □ 其他
2. 年龄
   □ 34 以下 □ 35 to 44 □ 45 to 54 □ 55 to 64 □ 65 以上
3. 学院
   ________________________________
4. 学历
   □ 本科 □ 硕士 □ 博士 □ 其他请列出) ________________
5. 授课学生层次
   □ 预科 □ 本科 □ 研究生 □ 其他请列出 ________________
6. 您在高校任职年限
   ________________________________
7. 您的授课语言
   ________________________________
8. 您一年教授课程的门数
   ________________________________
9. 请您列出在该校任职以来教授过的课程名称

10. 您现在教的课程班额多大？
    □ 小于 10 □ 10-29 □ 30-59 □ 60-99 □ 100-200
        □ 200 以上
Appendix II Guided Interview Questions English version

1. Critical thinking is translated into “批判性思维” and “思辨”. Which one do you prefer? Why? What is your understanding of critical thinking? (critical thinking will be replaced by the translation participants chosen in the interviews.)

2. Do you think higher education should equip students with critical thinking? Why or Why not?

3. Do you think critical thinking is teachable? Why or why not?

4. Do you think critical thinking is more domain specific or more general sense or both? Why?

5. Do you think a university should provide a general critical thinking course for students? Why?

6. How is critical thinking reflected in the course curricula you are teaching?

7. How do you prepare yourself for teaching critical thinking?

8. What kinds of activities did you do when teaching critical thinking?

9. Is it easy for you to teach critical thinking? Why or why not?

10. What are the challenges of teaching critical thinking according to your experience?

11. Some people say that it is hard to teach Chinese students critical thinking. Do you agree? Why?

12. How do you say about student-instructor relationship? Do your students feel the same way?

13. Do you think traditional and contemporary Chinese culture prohibit the teaching of critical thinking? Why?

14. What are the benefits of teaching critical thinking for instructors?

15. What are the benefits of learning critical thinking for students?

16. What do you think the university instructors need to do help students develop critical thinking?

17. If you would like to see some changes in the current curricula and pedagogy regarding critical thinking, what would that be?
Guided Interview Questions Chinese Version

1. Critical thinking 在汉语里有过两种翻译方法，“批判性思维”和“思辨”，您更倾向于哪种翻译？为什么？您是如何理解 CT 的？(CT 将被受访者选择的翻译方式所取代)
2. 您认为高等教育应该培养学生的 CT 吗？为什么？
3. 您认为 CT 是可以教出来的吗？为什么？
4. 您认为 CT 更具有专业特殊性，还是更具有普遍性，或者两者兼有？
5. 您认为大学应该为学生开设专门的 CT 课程吗？为什么？
6. critical thinking 在您所教授的课程中是怎样体现的？
7. 您认为教师需要为教授 CT 做什么样的准备？
8. 您具体是怎样教授 CT 的？
9. 对您来说教授 CT 容易吗？为什么？
10. 根据你的经历，教授 CT 面临的困难是什么？
11. 有人说很难教中国学生 CT。您同意吗？为什么？
12. 您是如何看待师生关系的？您的学生也这样认为吗？
13. 你认为中国的传统文化和现代文化给教授 CT 造成障碍吗？
14. 教授 CT 对教师有什么受益？
15. 学习 CT 对学生有什么受益？
16. 您认为教师应该怎样帮助学生培养 CT？
17. 在 CT 方面，您认为现在的课程设计和教学法需要做出什么改变？
Appendix III Guided Discussion topics for Focus groups

1. Critical thinking and Culture
   - What role does culture play considering critical thinking?
   - How does your cultural background influence your understanding of critical thinking?
   - According to your teaching experience, do you agree with the following statements Why or why not? “Chinese students are lack of critical thinking.” “Chinese can’t learn how to think critically.” “It is impossible to teach Chinese students to think critically.”
   - How do you say about student-instructor relationship? Do your students feel the same way?
   - How do you understand students’ “silence”?

2. The position of critical thinking in English for Academic Purpose course
   - Do you think critical thinking is important for EAP? Why or why not?
   - How is critical thinking reflected in your EAP course design?

3. Critical thinking and pedagogy
   - How do you teach critical thinking in your class? Would you please share an example?
   - How do you prepare yourself to teach critical thinking to students from multiple culture background?
   - How do students reflect your way of teaching critical thinking?
   - If you would like to see some changes in the current curricula and pedagogy regarding critical thinking, what would that be?
Guided discussion topics for focus groups (Chinese version)

1. Critical thinking and Culture
   文化在 CT 中起到什么作用？
   你的文化背景是如何影响你对 CT 的理解的？
   根据你的教学经验你同意下说法吗？为什么？“中国学生缺少 CT。”“中国学生没办法进行批判性思考。”“不可能教会中国学生批判性思考。”
   你如何看待师生关系？你认为对待师生关系的态度存在文化差异吗？
   你是如何理解学生的“安静”的？

2. The position of critical thinking in English for Academic Purpose course
   你认为 CT 对学术英语课程重要吗？为什么？
   CT 在学术英语课程的设计中是怎样体现的？

3. Critical thinking and pedagogy
   你在课堂上是怎样教授 CT? 能用举例具体解释一下吗？
   当你面向中国学生教授 CT 是你都要准备些什么？
   学生对你教授 CT 的方式反应如何？
   在 CT 方面，您认为现在的课程设计和教学法需要做出什么改变？
Appendix IV Checklist of Classroom Observation Field Notes

1. Classroom setting
   - What does the classroom look like?
   - What resources, technologies are in the setting?
   - How are the table and chairs placed?

2. Students
   - Students’ number, sitting position, movements, and attitudes to instructors

3. Instructor
   - The instructor’s voice, gesture, communication patterns, movements and attitudes to students.

4. What is going on?
   - How do instructors start the intro of the class theme?
   - How do instructors ask questions to trigger students to think critically? How and what do the students respond to them?
   - In what activities are critical thinking reflected?
   - How long do these activities last? What is the sequence and process of these activities?
   - How do students interact with the activity and interact with one another during these activities?
   - How are students engaged in the critical thinking activities?
   - How do instructors respond to students’ critical thinking?
   - What is the content of discussions between the instructor and students?
Appendix V Sample of First-year Project Progress Report

2018.4.2 -- 4.7 research progress arrangement of the ride-hailing company: deepening the research on problems and countermeasures.

According to the winter vacation survey conducted by each of our excellent online car-hailing researchers, I have concluded 12 problems. In order to deepen the problem research, we will carry out the most critical in-depth study. The following is a list of tasks, referring to the sorting I sent last time:

<table>
<thead>
<tr>
<th>Member</th>
<th>The research object</th>
</tr>
</thead>
<tbody>
<tr>
<td>Xinmeng Zhang</td>
<td>2. The ride-hailing car has become a cover for taxis.</td>
</tr>
<tr>
<td>Chen Yan</td>
<td>1. The owner’s online and offline information is inconsistent.</td>
</tr>
<tr>
<td></td>
<td>8. During rush hour, passengers do not pay extra price.</td>
</tr>
<tr>
<td>Yuhaizhang</td>
<td>3. The platform is not equal to the owner and the passenger in the order.</td>
</tr>
<tr>
<td></td>
<td>6. Subsidies for passengers and owners on the platform.</td>
</tr>
<tr>
<td>Yehan Liu</td>
<td>4. The management of ride-hailing platforms is not strict.</td>
</tr>
<tr>
<td>Ruimin Zheng</td>
<td>12. Penalty contradiction</td>
</tr>
<tr>
<td>Xiaoyu Zhao</td>
<td>11. The number of cardholders is at a low level.</td>
</tr>
<tr>
<td>Xiaoyin Zhang</td>
<td>6. The driver service attitude is not good. 7. Passengers are uncivilized.</td>
</tr>
<tr>
<td>Weixi Zhu</td>
<td>10. Difficulty in settling claims. 5. Lack of government management.</td>
</tr>
</tbody>
</table>

Deadline: please send it to me in the form of investigation report before 22:00 on Saturday (4.7).

Framework and contents of the survey report:
1. The title is the research object (the black body of the title is bold and the body is small, and the body is all of the song body)
2. According to reality, for example (mainly from interviews and news, indicating news sources and authors)
3. According to the literature and journalism, to analyze the causes of the problem, which requires strong theoretical (indicate the sources of news and literature, literature source format: 1. Deng-hua hou. "square deal" the operation mode of the net around the car and its regulatory path. Journal of law, 2016, 27 (12) : 68-77.)
4. According to the literature and the news, make a list of the solutions, avoid the jargon, and be realistic and innovative (with reference to the same source)
5. The difficulties and reflections encountered in the investigation and research, as well as the harvest.
6. Add attachments: pack your screenshots of literature and news, as the true basis of the investigation report.

**The need to uphold the idea:** 1. The poor polarity (net is a new product about car, will inevitably encounter in the process of survey data is not enough, but that is no reason for failure, we need to end can check data)

2. Innovation (the project of the first year is a research project of real autonomy, which represents the youth of The Times. If we do it carefully, it will contribute to the construction of the city).

**Note:** this week’s in-depth research task is the key to the entire project of our network, which is the basis of the final questionnaire.

Reply about in mid May, we each network about car researcher will, in the form of individual results show and display to their object of study, I hope you seriously, because this is not just your representative works, also involves your personal achievement as well as the final credits.

From S7 Emma

2018.4.1