

A STUDY TO COMPARE THE CRITICAL THINKING DISPOSITIONS BETWEEN
CHINESE AND AMERICAN COLLEGE STUDENTS

by

Susan K. Dennett

A Dissertation Submitted to the Faculty of
The College of Education
in Partial Fulfillment of the Requirements for the Degree of
Doctor of Philosophy

Florida Atlantic University

Boca Raton, Florida

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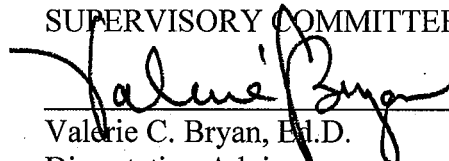
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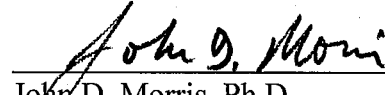
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This dissertation proposal was prepared under the direction of the candidate's dissertation advisor, Dr. Valerie Bryan, Department of Educational Leadership and Research Methodology, and has been approved by the members of her supervisory committee. It was submitted to the faculty of the College of Education and was accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

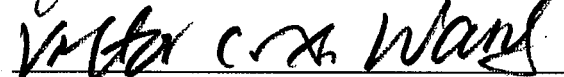
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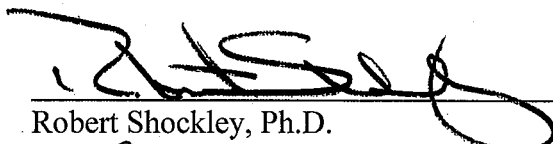
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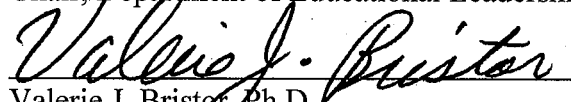
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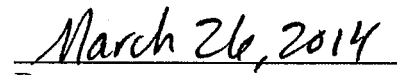
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ABSTRACT

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Title: A Study to Compare the Critical Thinking Dispositions between Chinese and American College Students
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The purpose of this quantitative research study was to compare Chinese and American students' inclined level of critical thinking using the California Critical Thinking Disposition Inventory (CCTDI) (Insight Assessment, 2013). The literature of Paul and Elder (1996, 2000, 2005, 2010), Facione and Facione (1992, 1996) and Brookfield (2005, 2010, 2013) and the conceptual framework in this study provided the foundation for the main research question of whether there are differences between Chinese and American students' scores on the seven individual scales and their total score on the CCTDI.

The Sample included 41 Chinese and 50 American undergraduate and graduate students at Florida Atlantic University, a regional research university located in southeast Florida. Independent t-tests concluded that there were no differences between the 41 Chinese students and the 50 American students regarding their critical thinking dispositions on each of seven scales on the CCTDI.

A factorial analysis of variance measured moderator questions to determine whether there was a difference between Chinese and American students' CCTDI scores based on student gender, discipline of study, undergraduate or graduate status, or enrollment as an undergraduate within the United States. There were significant differences between the critical thinking dispositions of Chinese and American undergraduate and graduate students when comparing the scale of open mindedness and gender. There were also significant differences for the scale of confidence in reasoning and discipline. For the remaining questions, there were no significant differences. A Pearson's correlation determined that there was no relationship between the length of time students had been in the United States and their scores on the CCTDI.

Educational implications include that when problem-solving skills are developed in the college setting, critical thinking can be cultivated to help prepare students for work in future employment settings. Social implications include the use of critical thinking when faced with decision making in adults' lives, as well as in their daily work. This study may be the foundation for future studies. Finally, educators may find the CCTDI helpful in positioning students' critical thinking dispositions prior to learning or training activities.

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CHAPTER 1. INTRODUCTION

“The important thing is never to stop questioning” (Albert Einstein as cited in *Insight Assessment*, 2013, p. 74)

Critical thinking is valuable to all. Skills in critical thinking are required for problem-solving and in decision-making. Both students in learning institutions and adult learners in organizations need critical thinking skills in order to aid learning (Insight Assessment, 2013). Organizations have requirements that include demonstrating that their training programs improve critical thinking dispositions and mindsets. There is an increasing movement toward the need for adult learners to not only demonstrate strong problem-solving skills, but also to demonstrate the disposition to use those problem-solving and critical thinking skills (Insight Assessment, 2013).

The consequences of having weak critical thinking skills are many; costly mistakes that are repeated due to an inadequate analysis of a problem, poor decision-making due to repeating a prior decision without adequately reflecting on the action, wrong assumptions, incorrect creation of training programs, weak assessment of educational curriculum, and even death (Insight Assessment, 2013). In a study of 141 nurses working within four hospitals, the results indicated that there was a positive correlation between their score on the critical thinking disposition inventory and their use of critical thinking within their jobs (Profetto-McGrath, Hesketh, Lang, & Estabrooks, 2003).

Both adult learners and students should be equipped with as many tools for success as possible when approaching learning. Learners with weak dispositions to critical thinking skills are not armed with enough tools to help them succeed to their full potential at college, the workplace, and life in general. According to Paul and Elder (2005), followers may follow leaders unwittingly without understanding the reason why and without understanding the meaning of their leader's actions. Furthermore, learners should be in control of their own minds and understand the meaning of their values. Paul and Elder (2005) stated that learners need to be in charge of their own lifelong learning. If the learners do not understand how to think critically, they may be rigid in their thinking and may run the risk of being trapped in their own concepts and assumptions. Therefore it is important to begin early in providing the tools and resources for students to develop their dispositions to critical thinking. These dispositions will become the foundation to their continuous learning journey in life.

In the past, students have not been encouraged to look for deeper meaning in classroom content. Instead they may only show interest if they ask the instructor if there will be questions on the test. Paul and Elder (2000) define these types of questions as *dead* questions rather than *thought provoking* questions. Instructors who think they are inviting critical thinking from students must encourage further questions from the students in order to develop an inquiring mind. The types of questions students ask of their instructors influence the type of thinking the students conduct. Students should make sure that what they are reading or hearing makes logical sense. If something does not make sense, students should question in order to find meaning.

Paul and Elder (2000) stated that thinking skills need to be developed. A developed thought process can raise the quality of what people build or produce and how they live. College students are the future of society. College students may lead and mentor others. It is important they have high levels of critical thinking skills in order to delve deeper into the meaning of the data; to question the information and not simply accept information at face value. As adults and leaders, decisions are based on the information and the types of questions asked. In a world where globalization is an everyday word, students need to leave college equipped with the tools and skills to help them succeed in organizations that may be filled with different people from different cultures. As cited by Bryan (2013), universities are preparing students for jobs that currently do not even exist yet. Therefore students need to have the ability to think creatively, be adaptive, and have the dispositions to think critically. Organizations need to be proactive and hire employees with the propensity to develop these skills. Bryan (2013) quotes the words from Alvin Toffler, “The illiterate from the 21st century will not be those who cannot read and write but those who cannot learn, unlearn and relearn” (Toffler, 1969, p. 8). It is clear to see that the Institute for the Future for the University of Phoenix Research Institute’s Future Work Skills 2020 agrees with Toffler’s comments because the institute recommended that educational institutions develop student skills; in particular critical thinking skills (Davies, Fidler, & Gorbis, 2011).

There may be barriers that inhibit critical thinking from occurring in students and their abilities to use their dispositions to think critically. Instructors need to be aware of the barriers so that they can effectively remove them in order to develop and encourage students to delve deeper into the material content. In a society where different students

from different cultures attend colleges in the United States, one may raise the question as to whether a student's culture may inhibit the development of a critical mind. This same question was raised by researchers Tiwari, Avery, and Lai (2003) when they embarked on their cross-sectional design to compare the critical thinking dispositions between Hong Kong Chinese students and Australian students.

Fan (2000) defines culture as traits that identify individuals of a group from individuals from other groups (e.g., beliefs, values, attitudes, and customs). Rokeach (1973) adds to the definition to include the way in which individual's behaviors are guided through their beliefs and attitudes. If culture indeed is a barrier to developing a critical thinking mind, one may ask another question; whether global leaders and adult learners will be potentially handicapped due to their culture. It is indeed a significant question because it may impact the leadership skills of potential global leaders. In situations where this may be the case, organizations can encourage the practice, and provide training to encourage the development of, open-mindedness and seeking alternatives when faced with decision-making (Tiwari et al., 2003).

Educators have observed differences in the way students appear to absorb content and think. Some differences may be attributed to students who have been raised in different cultures. In some cases, educators have modified their teaching technique to try to accommodate what they perceive may be differences. At times these educators may change their teaching without sufficient data to support the different technique they use. However, it may be useful to identify whether there are varying levels of critical thinking dispositions among students from different cultures. It may lead to further research on whether culture plays a part in the development of critical thinking dispositions.

In the United States, students more freely take initiative in the classroom whereas some students from different cultures may wait for direction from the instructor before beginning various learning activities. During classroom activities, the researcher observed the Chinese students waiting for the instructor's guidelines before beginning a task. When educators work with international college students, it is important to understand how learning style differences impact teaching techniques. This is significant because if faculty does not recognize the differences in learning styles of students, students may miss out on valuable learning opportunities and not be successful at school. In other words, there may be a connection between cultural values, learning styles, and critical thinking that ultimately may be reflected in a person's ability to perform in leadership roles in a global organization.

To be effective, educators need to recognize these differences and adapt their teaching styles accordingly. Rather than stereotyping certain cultures, attention should be drawn to the fact that there will be differences in learning behavior among learners from different countries. By increasing educators' sensitivity to cultural differences, we can improve learning in the classroom. In addition, if instructors are teaching critical thinking skills, does the students' culture impact the development of these skills? Are there certain skills that are impacted; for example, the disposition to think critically? It is important for students to develop their critical thinking skills; especially in the constantly changing world. It is crucial that instructors help to develop our future leaders' skills to analyze and methodically take things apart to understand each dimension. It is important to develop critical questioning and not always take things at face value. Students need to

leave their higher education institution equipped with a high level of critical thinking in order to make a difference in the ever-changing global world and workforce.

If instructors understand the barriers that may prevent developing these skills, then they may be apt to introduce a variety of teaching methods to help to develop an inquiring mind. Once students leave the higher educational institution, one may assume they are equipped with critical thinking dispositions. A question arises, however. Are these students ready and armed with these dispositions and skills? Once in the workplace as adults, it is important these adults are able to use their higher level thinking skills, so that judgments can be made about the credibility and usefulness of information (Whitson & Amstutz, 1997).

There are limited prior studies regarding the measurement of critical thinking skills of students. Ku and Ho (2010) conducted a study to examine the critical thinking skills of 137 Chinese students at a Hong Kong university. The undergraduate students completed the Need for Cognition Scale, Openness to Experience, and Conscientiousness Subscales of the NEO Five Factor Inventory. In this research study, the researcher was interested in understanding whether there were differences between the critical thinking skill dispositions between American and Chinese college students and if there were differences, what factors might have contributed to the differences.

Biber, Tuna, and Incikabi (2013) conducted a study to measure the critical thinking skills of 99 mathematics teacher candidates at a university in Turkey and used the following variables: grade level in college; high school; gender; and the teacher's reading practice. The California Critical Thinking Disposition Inventory (CCTDI) was used (Insight Assessment, 2013). There were six dimensions of critical thinking skills

measured: analyticity, open-mindedness, inquisitiveness, self-confidence, truth-seeking, and systematicity. The results identified that the mathematics teacher candidates were low in critical thinking skills. The results also indicated that the critical thinking skills did not change significantly the longer the participants were in school. In addition, there was no difference between genders regarding their critical thinking skills.

Setting of the Study

Florida Atlantic University (FAU) is a regional research university with over 30,000 students situated in Southeast Florida with campuses in the cities of Boca Raton, Dania Beach, Davie, Fort Lauderdale, Fort Pierce, and Jupiter. FAU offers over 150 undergraduate and graduate degree programs (Florida Atlantic University, 2013c). As of 2012, students from 48 states and the District of Columbia (Florida Atlantic University, 2013b), and 135 countries around the world, were enrolled (Florida Atlantic University, 2013a). FAU is classified by the Carnegie Foundation for the Advancement of Teaching as a high research activity research university (Carnegie Foundation for the Advancement of Teaching, 2013).

Problem Statement

Educators may not be aware of how culture influences classroom behavior. By not recognizing the cultural differences of students, educators may not use a variety of teaching methods in the classroom to help critical thinking. Sensitizing educators to cultural differences among students may result in increased student engagement, reduced student and teacher frustration, and increased learning. By understanding how to develop critical thinking skills may help to form a strong foundation to develop critical thinking as students continue through their lives to adulthood and become potential leaders. As

Merriam, Caffarella, and Baumgartner (2007) point out, adults working in this global economy need to develop their problem-solving skills in order to grow to the new jobs that will be created in the future. Schied, Mulenga, and Baptiste (2005) agree that the adults who possess lower level skills will find it more difficult than those with the higher-level skills to find sustainable employment. Eastern Chinese culture is uniquely different from Western American culture due in part to the significance of Confucianism to the Chinese culture. When educators recognize that Chinese culture may create barriers to having an inquiring mind, they can incorporate activities in the classroom to remove the barriers. In this study, the researcher attempted to learn whether there were differences in critical thinking skills dispositions between Chinese and American students for the reasons discussed earlier.

Purpose Statement

The purpose of this quantitative research study was to compare the critical thinking dispositions between undergraduate and graduate Chinese and American college students. The research study compared the scores on the CCTDI between Chinese college students and American college students to determine if there were differences and to determine whether there were any factors that may impact the development of critical thinking dispositions.

Significance of Study

There have been limited studies conducted to examine the levels of critical thinking between Chinese and American students. This research study is significant because it contributed to the literature by providing an insight into both the American college students and the Chinese college students' critical thinking dispositions. This

study may contribute to the impact on future teaching methods because armed with this knowledge, instructors of adults and students can develop learning activities to encourage and develop critical thinking skills. Paul and Elder (2010) stated that students can develop their critical thinking styles by developing a habit to see connections between theory and application. They constantly can practice thinking purpose, question, information, inferences, assumptions, concepts, point of view, and implications (Paul & Elder, 2010).

Marshall and Tucker (1992) stressed that critical thinking is necessary for the nation to survive economically. They reiterated that people need to have the ability to think and to problem solve and colleges should be instrumental in developing students' disposition to think critically. Specifically, they stated:

The future now belongs to societies that organize themselves for thinking.

Nations that want high incomes and full employment must develop policies that emphasize the acquisition of knowledge and skills by everyone, not just a select few. (p. xiii)

In today's global competitive world, it is crucial for countries to maximize their resources by developing their leaders early in life, to develop their dispositions, and to develop their problem-solving skills and their thinking and reasoning skills. If countries do not develop these skills in their leaders, they risk lagging behind their competition. This study identified areas in which dispositions to critical thinking skills are lacking and by understanding the results may help to transform instructional approaches within the educational institutions. The 2020 Blueprint is China's vision to improve China's higher education by moving away from simply memorizing material to more of a critical

thinking approach (Zhao, 2011). Therefore studies that identified whether critical thinking skills are evident within students coming from China build on the importance of developing these skills earlier. By being aware of these results may increase more international exchange between countries.

This type of study will also be helpful to FAU in particular, to compare the critical thinking dispositions of its own students, and after reviewing the results, suggest changes to the way in which critical thinking skills can be developed. The results will also be useful in developing training programs for adult learners both in and out of the workplace. Instructors of adult learners can provide activities to encourage the development and use of learners' critical thinking skills. The results of the study should serve to strengthen FAU's marketing tool for the university's international program. The study will serve as a foundation for future studies that may be conducted across larger samples and across other universities.

Conceptual Framework of Critical Thinking

The conceptual framework of critical thinking is useful to assist the researcher understand the different divisions of what skills are considered to be critical thinking. Paul and Elder (1996) discuss that there are certain factors that are used when attempting to measure students' critical thinking skills: elements of reasoning and standards of reasoning. Within the elements of reasoning there provides a logical explanation of what is being considered. Paul and Elder (1996) continue to say that when attempting to evaluate the skills of students, the following elements are considered, "purpose, question at issue, assumptions, inferences, implications, point of view, concept and evidence" (p. 1). Students need to think about the purpose of the question at issue. In order to answer

the question, students may use inferences which may be based on the students' own assumptions. The foundation of these assumptions may be formulated through the students' concepts and evidence which in turn is from the student's own point of view. Within the elements of standards of reasoning Paul and Elder (1996) state that there are standards to see how well the students' are reasoning; not just whether they are reasoning, but the level of reasoning that is being used. The CCTDI measures the level of a person's ability to think critically and measures seven scales together with the total score. Table 1 provides an outline of the CCTDI seven scales together with the related descriptions. This is the conceptual framework the researcher used to define critical thinking dispositions.

Table 1

California Critical Thinking Dispositions Inventory Scale Descriptions

| Scale | Description |
|----------------------|---|
| Inquisitiveness | Curiosity and a desire to learn |
| Open Mindedness | Being aware of own views and biases and being open to others' views |
| Systematicity | Being organized, focused, and having an inquiring mind |
| Analyticity | Use of reasoning and the use of evidence in problem-solving |
| Truth-seeking | Asking questions, seeking knowledge, and being objective and honest |
| Self-confidence | Trusting one's own reasoning abilities |
| Maturity of judgment | Using judgment when making decisions or problem-solving |

(Insight Assessment, 2013).

Research Questions

The literature and conceptual framework guided the researcher into asking the following question: Are there differences between Chinese and American students score on the seven individual scales and their total score on the CCTDI?

It is important to note that there may be some redundancy in using the scales as well as the total scores. If scale correlations are high, then the total score is more likely to have meaning, decreasing the uniqueness of the meaning of the scale subscores. If scale correlations are low, then they present more evidence for uniqueness, making a total score far less useful. Therefore the researcher decided to measure the scales of the CCTDI rather than the total score. The study helped to answer this question along with the following subquestions that were posed. These questions regard the same seven scales as the main research question.

1. Are the differences between Chinese and American students' scores on the CCTDI consistent between male and female students?
2. Are the differences consistent between Chinese and American students who did their undergraduate studies in the United States and those who did not do their undergraduate studies in the United States?
3. Are the differences between Chinese and American students' scores consistent across areas (disciplines)?
4. Are the differences between Chinese and American students' scores consistent between undergraduate and graduate students?
5. Is there a relationship between the number of years that Chinese students have resided in the United States and their scores on the CCTDI?

Contextual Variables

The following contextual variables served as moderators in this research study in order to determine whether they moderated any level of differences of critical thinking dispositions between the American students and Chinese students: gender, undergraduate or graduate student, choice of college (arts, business, engineering, education and science), participation in a social group, and the number of years the Chinese students have resided in the United States.

Definition of Terms

American undergraduate or graduate student: Students born, raised and educated in the United States who are registered at FAU in an undergraduate or graduate degree program.

Andragogy: “The art and science of helping adults learn” (Knowles, 1980, p. 43).

Chinese undergraduate or graduate student: International students, who were born, raised, and educated in China and who are registered at FAU in an undergraduate or graduate degree program.

Critical thinking: According to Brookfield (2005), recognizing and exploring our underlying assumptions and actions are considered to constitute critical thinking.

Paul and Elder (2005) define critical thinking as follows:

Critical thinking is the process of analyzing and assessing thinking with a view to improving it. Critical thinking presupposes knowledge of the most basic structures in thinking (the elements of thought) and the most basic intellectual standards for thinking (universal intellectual standards). The key to the creative

side of critical thinking (the actual improving of thought) is in restructuring thinking as a result of analyzing and effectively assessing it. (p. 7)

According to Ennis (1991) critical thinking is “reasonable reflective thinking that is focused on deciding what to believe and do” (p. 8). For the purpose of this study, the researcher agreed with Paul and Elder’s definition of critical thinking.

Critical thinking disposition: “The consistent internal motivation to engage problems and make decisions by using thinking” (Giancarlo & Facione, 2001, p. 31).

Culture: Fan (2000) defines culture as traits that identify individuals of a group from individuals from other groups (e.g., beliefs, values, attitudes, and customs), and this was the definition of culture used in this study.

Learning style: For the purpose of this research study, Toye’s (1989) definition was used.

Toye (1989) defines learning style as “preferences for certain conditions or ways of learning” (pp. 226-227).

Pedagogy: The education of children.

Power-Distance: Power-distance relates to the way differences within cultures can be measured within a set of dimensions (Hofstede, 1991; Hofstede & Hofstede, 2005).

Also, for the purpose of this study, the researcher agreed with Insight

Assessment’s (2013) operational definitions for the following terms:

Analyticity: Use of reasoning and the use of evidence in problem-solving.

Inquisitiveness: Curiosity and a desire to learn.

Maturity: Using judgment when making decisions or problem-solving.

Open mindedness: Being aware of own views and biases and being open to others’ views.

Self-confidence: Trusting one's own reasoning abilities.

Systematicity: Being organized, focused, and having an inquiring mind.

Truth-seeking: Asking questions, seeking knowledge, and being objective and honest.

Role of the Researcher

The researcher has worked for over four years with students from both the United States and China. The researcher has observed differences in students' when they have been asked to answer a question that requires critical thinking. She has also observed them looking scared when given a critical reflection learning question on an exam. The researcher was interested in this subject of measuring critical thinking skills dispositions because leaders require critical thinking in order to be successful, as well as being a significant reason to focus on teaching critical thinking skills in high school and higher education.

In addition, the researcher recognized that if students are not equipped with the dispositions to think critically, they may continue without these dispositions when attempting to learn as adults. The literature states that China has been (and still is) attempting to find if the more Western approach to teaching and learning enhances workforce productivity (Jackson & Bak, 1998), so if critical thinking differences emerge in this study, the Chinese may wish to explore our approach to teaching and learning and open the doors for future student exchanges.

After having conducted this study, there may be further studies across more universities in different locations. The researcher identified her biases and assumptions and understood these were brought to the study. However, during the data collection and

analysis she made every effort to remove these assumptions as she conducted her research.

Delimitations

Only undergraduate and graduate American students and undergraduate and graduate Chinese students registered at the same university in southeast Florida, FAU, during 2013 were included in the sample. The researcher decided to use only one university because she had easier access to volunteers. It may not be possible to generalize the results to all universities from the results of this study. Therefore the study is only generalizable to institutions similar to this particular institution with similar characteristics. The researcher chose to utilize a paper version of the CCTDI rather than an online version. The researcher thought the face-to-face contact might encourage students to volunteer for the study. The time of the year the study was conducted and whether the students are in the first part of the semester or the second part of the semester was also a delimitation of the study because students may have had the opportunity to learn from instructors who have incorporated ways to develop critical thinking during class learning activities if they are tested at the end of a semester.

Limitations

One of the limitations of this study is that students volunteered to participate and since there are only 63 Chinese students at this institution, it was difficult to obtain a sample of 50 students. Only 41 Chinese students participated in the study. The use of volunteers might have affected the results of this study because the students that elected to participate might be more critically minded than those that did not elect to participate. In addition, the researcher had experience teaching both Chinese and American students

and may have had her own biases that may have influenced the study. Another limitation is that the critical thinking skills were measured using one instrument; it was a forced-choice questionnaire. The researcher made a conscious decision to choose this instrument because it had been used in many studies prior to her study and it was reliable and valid. Certain factors were considered during this study; for example the students' gender, discipline, length of time in the United States, nationality, and any membership to social groups. There may be other factors that contribute to the students' critical thinking dispositions; for example, their reading ability and other prior academic or employment experiences the students' may have had prior to completing the questionnaire. In addition, it is possible that students from China, who have an interest in studying abroad, may be more inclined to think critically than students who do not have an interest in studying abroad.

Chapter Summary

Chapter One introduced the concept that there may be differences between American and Chinese undergraduate and graduate students' scores on the CCTDI. The chapter also included an explanation of the need for and the purpose of the study, the significance of the study, the setting of the study, and the research questions. In addition, the role of the researcher, definition of terms, and the delimitations and limitations of the study were identified.

The remaining chapters answer the research questions. Chapter Two identifies the literature that relates to the study; in particular with regard to the purpose and significance of the study, instruction and learning styles, critical thinking, Chinese learning styles, and Chinese critical thinking styles. Chapter Three focuses on the

research design and methods and includes the sampling, data collection, and data analysis plans. Chapter Four includes the results and analyses of the study. Chapter Five offers the conclusions that can be drawn from the study, a summary of the findings, and recommendations for future research.

CHAPTER 2. LITERATURE REVIEW

“Critical thinking is skeptical without being cynical. It is open-minded without being wishy-washy. It is analytical without being nitpicky. Critical thinking can be decisive without being stubborn, evaluative without being judgmental and forceful without being opinionated” (Facione, 2013, p. 74).

The literature in this section is divided into the following sections; contextual variables as related to the scales of the CCTDI, instruction and learning styles, teaching methods in China, culture, Chinese leadership styles, and critical thinking skills. Contextual variables as related to scales of the CCTDI include gender, whether the students are undergraduate or graduate students, belonging to a social group, area of study, and the length of time students from China have lived in the United States. The literature on instruction emphasizes the importance of understanding how different methods may be used when instructing students from different cultures. The literature selected supports the need for faculty to understand the preferences of students and that not all students learn the same way, nor do they prefer the same style of assessments. The literature supports that there are differences between cultures related to learning preferences, cultures, and critical thinking. Select literature of Paul and Elder (1996, 2000, 2005, 2010), Facione and Facione (1992, 1996), and Brookfield (2005, 2010, 2013) discusses critical thinking skills.

Contextual Variables as Related to Scores on the CCTDI

The literature in this chapter outlines the various studies conducted regarding contextual variables and as they relate to scores on the CCTDI. The various studies served as a foundation to support the contextual variables that served as moderators in this study to examine whether they moderated the level of difference in the scores on the instrument.

Gender. Gender may be a moderating contextual variable when analyzing the level of critical thinking dispositions students have. The CCTDI was used to measure the critical thinking dispositions among 224 college students at two universities (Bers, McGowan, & Rubin, 1996). Researchers were interested in measuring the college students' disposition toward critical thinking and looked at whether gender made a difference with the total scores and the scale scores. Out of the 224 students, 124 were measured at the beginning of the semester and again at the end of the semester to see if there was a difference in scores. Overall, females scored higher on the total scores of the CCTDI than males.

Length of time of education. A question arises as to whether critical thinking may be developed and improved over time. When the college student is considered, does critical thinking improve from one academic year to another? In their study, Shin, Lee, Ha, & Kim (2006) concluded that critical thinking dispositions of students did improve by academic year. A longitudinal study of 60 nursing students in a university in Korea was conducted using the CCTDI. The study compared the critical thinking dispositions of students in the nursing program in their first to fourth years between 1999 and 2002. During March each year the data were gathered. These results are consistent with earlier

studies. In 2002, Bartlett and Cox examined the critical thinking dispositions of physical therapy students and found an improvement over one year. In an even earlier study in 1997, Colucciello noted statistically significant higher scores of fourth year students between second year students.

Walsh and Hardy (1999) compared critical thinking dispositions using the CCTDI between male and female undergraduate students and across academic majors in a mid-Atlantic public university. The students were third year students. The sample consisted of 121 males and 213 females and they were enrolled in practice disciplines and non-practice disciplines. Practice disciplines were nursing, education, and business while English, history, and psychology were considered non-practice disciplines. Students in the non-practice disciplines scored higher on the CCTDI than students in the practice disciplines. Female students in both of the disciplines scored higher in critical thinking dispositions than males on two of the CCTDI scales, open-mindedness and maturity of judgment.

Instruction and Learning Styles

Different cultures respond differently to the instructor's classroom, and even other students in the learning environment. Some authors have identified unique differences between Eastern and Western cultures. Students demonstrate understanding of the subject matter in various ways. Wolfgang (1977) suggested that although students were quiet in class or were reluctant to speak voluntarily, they feared that teachers thought the students did not know the material. Wolfgang also reported that students from West Africa would avoid eye contact, resulting in teachers in the United States thinking these students do not know the material. Avoiding eye contact can also be perceived as a sign

of disrespect. Eckstein et al. (2006) also agreed that Chinese students avoid eye contact with the instructor during lectures; instead they focus their attention on their notebook or textbook on their desk. Wolfgang (1977) mentioned that Korean students are taught to listen in class and only speak when asked.

Wang (2007) also states that Chinese students do not challenge teachers the way that Western students do. Teacher's authority is respected. However, if students do not ask clarifying questions or challenge information that does not make sense to them, the result may be students not understanding or misinterpreting the material. It may also lend itself to the instructor thinking the students do not have any opinions and these students believe any information fed to them. This leads to a question: Does the Chinese culture prevent students to think critically? By not developing critical thinking skills, are students who may become leaders in China lacking in these skills?

According to Wang and Kreysa (2006), Chinese culture encourages a teacher-centered learning environment. In order to appear competent, in China teachers should be totally in control of instruction (Wang & Kreysa, 2006). This method of teaching is quite the opposite in Western education where the instructor is a facilitator and encourages student learning. Paine's 1992 research reveals that teaching in China is viewed as text-driven and teacher-dominated. Teacher-student interaction in Chinese classrooms does not occur as it would in the Western classroom. Teachers are viewed as performers rather than facilitators.

Students are rewarded when demonstrating good memorization skills in China. Wang, Dennett, and Bryan (2013) assert that teaching in China is focused exclusively on the transmission of orthodox subject knowledge, while concepts such as flexibility,

problem-solving, critical thinking, and independent learning are not recognized.

Hofstede (2006), a seminal researcher in cultural differences, studied over 100,000 participants from over 50 different countries. Based on the research answers, Hofstede was able to determine five areas of how the cultures differ; power distance, uncertainty avoidance, individualism-collectivism, masculinity-femininity, and long-term-short term orientation (Northouse, 2010). Hofstede's (2006) work suggests that culture has an impact on education.

Hofstede's (2006) *Power Distance Dimension* describes two types of power distance: small power distance (SPD) and large power distance (LPD). There are notable differences between Eastern and Western countries in terms of the distance dimension. For example, the United Kingdom, in the Western world, has a small power distance and this has a bearing on education in terms of student behavior. Students are expected by their teachers to be vocal in the classroom and to challenge the teacher. Students also are encouraged by their teachers to take initiative and think independently (Hofstede, 1986, 1991). Several studies (Jarrah, 2004; Ladd & Ruby, 1999; Pun, 1989) support many of Hofstede's notions. Their work also suggests that students from LPD settings in the Eastern world have a passive learning style and prefer to be led and that teachers advise the students on what to learn and how to learn. Other cultures in the Western world prefer to be in control of their own learning and therefore students participate in the learning process (Dejoy & Dejoy, 1987). This supports the need for the faculty to be aware of the students' preferences. This literature provides the foundation to support faculty asking students how they interpret participation.

China is a country where there is a large power difference and there is a hierarchical relationship between the student and teacher. Students are not expected to challenge the teacher. The teacher is responsible for guiding the class and for providing educational content. Within China's Confucianism system, there are the following underlying values and principles; benevolence, righteousness, propriety, wisdom, fidelity, class system, obedience, doctrine of the mean, and *renqing*, which basically means being kind and respecting others' feelings. Confucianism is the foundation of schools and traditions.

It was not the intention of this research study to imply that faculty should completely change their methods of teaching and assessment; simply they should be aware that there are different student expectations of classroom teaching styles or behavior based on the students' culture, influences learning styles, and preferences. Instructors should incorporate a variety of styles in their own classrooms so that they can maximize learning. By being informed by Hofstede's (2006) work and other related studies, an institution's faculty may note how culture can influence how students behave in the classroom. If faculty assess students on the behavior they exhibit in the classroom – for example, discussions with the instructor, levels of engagement, or how the students perform on multiple choice tests – the faculty may not be giving all students equal opportunity to reach their full learning potential. If faculty members do not recognize students' dispositions to develop their critical thinking skills, are these skills therefore ignored? By not developing critical thinking skills, are leaders lacking in these skills? By not developing these critical thinking dispositions, are adults equipped to learn effectively and make decisions effectively? Pisapia (2009) discusses that leaders today in

the global world are faced with challenges and demands that this global world brings. These constant changes require leaders to create new maps to determine the right decisions to make and the correct paths to follow.

In today's diverse world and the need for organizations to compete effectively, as well as the encouragement of adult continuous learning, it is crucial that leaders possess the ability to problem solve, to reason, to be aware of their own biases – to think critically. If future leaders require an inquiring mind and critical thinking skills, the understanding of the role of culture on learning, may help the instructor to focus on building critical thinking skills. According to Gay (1979), teachers may indirectly influence students' resistance to learning by not listening to their students and appreciating their cultural differences.

There are researchers who do not support a cultural based model. Wong (2004), after conducting a qualitative study on 87 students using a grounded theory approach, found that rather than being culturally based, learning styles are contextual based. He conducted surveys and interviews. His findings demonstrated that the students would rather follow a teaching and learning style that was centered on students. Therefore Wong recommends rather than adapting the teaching style, educators should simply be aware that the Asian students may experience some learning difficulties and the educators should provide any assistance required. During his interviews, Wong learned that the Asian students experienced difficulties in three areas; barriers regarding culture, barriers with language, and variations in learning styles. Thornhill (1993) added another variation. Thornhill suggests that there will be different expectations among students

regarding participation in classroom activities and educators should be aware of such variances when designing the coursework.

Teaching Methods in China

It might be useful to review the teaching methods in China that form the foundation of Chinese methods of learning. Many teachers in China have been inspired by Confucianism. One of its beliefs is allowing teachers to be teachers and allowing students to be students (Wang & Farmer, 2008). As long ago as 25 centuries, reflection occurred as a way of learning. Reflection was first defined by Confucius. Silent reflection in China is a way of understanding the quality of a person's life. This is the way Confucius recommended learning. It is a way of acquiring knowledge. The silent reflection involves delving deep into reflective thought to be aware (Wang & King, 2006). Wang and King go on to say that memorization is also a way of Confucian learning.

In China, the teacher simply transmits the subject information to the students – a pedagogical approach (Wang, 2007). Critical thinking and the encouragement to approach problem-solving and independent thinking do not usually occur (Wang, 2007). More often than not, students in China listen without challenging. In China, when teachers are trained how to teach, the main focus is on the text and teachers are taught how to teach the text. Teachers do not challenge the types of text approved by The Ministry of Education (Wang et al., 2013). Teachers concentrate on teaching subject knowledge rather than problem-solving, critical thinking and independent learning; clearly a pedagogical approach to teaching. Pedagogy is defined as education of children. When we review the way teachers teach in China, it is confirmed that teachers

approach teaching in an identical way, both teacher and subject-centered. Again a pedagogical approach is preferred in China (Wang et al., 2013). This is very different to Western educators who prefer a more of an andragogical approach, especially when teaching adults. Even when teaching adults in China a pedagogical approach is used.

According to Wang (2007) and Cheng (1999), China expects students to memorize text more than any other cultural setting. Memorizing has been a normal routine in the Chinese classroom. Even children in elementary school were taught to memorize and recite poetry (Eckstein et al., 2006). However, Cheng (1999) argued that although Chinese students were taught to memorize through repetition, they only did this once they understood the material. Cheng claimed that it was this understanding that helped students to excel in tests rather than simple memorization or rote learning; students learn without understanding the meaning of the terminology or without giving much thought to the topic (Biggs, 1994). By attaching meaning to the content of the questions, students were able to answer test questions.

Building upon the foundation of Confucian learning, Mezirow (1991) agrees that reflection is crucial for learning. However Mezirow takes reflection a couple of steps further. Mezirow (1991) defines reflection as “the process of critically assessing the content, process, or premise(s) of our efforts to interpret and give meaning to an experience” (p. 104). Pisapia, Pang, Hee, Lin, and Morris (2009) state that, “by reflecting on both successes and failures, leaders begin to unpack the assumptions and values that lie beneath rules, regulations, and skills in work and everyday life” (p. 13). According to Paul and Elder (2005), if a student does not learn to think critically that student will resort to rote learning and, as a result, the student will not internalize the

concept; the student will simply memorize the definition of a term. Mezirow (1990) described critical self-reflection as being crucial in adulthood to help how problems are solved and how adults assess how they perceive certain situations. He stressed that this critical self-reflection plays an important part in moving to adulthood. As educators of adults, educators must assist learners to develop their critical thinking skills so that they can examine their own assumptions and the foundation of how they find meaning of something. This is quite the opposite in Chinese classrooms. Classrooms in China tend to be teacher-centered rather than student-centered (Paine, 1992) which is a pure pedagogical approach. Chinese teachers stress the importance of exam results, and according to Boyle (2000), they focus exclusively on the textbook.

No one else can emphasize the importance of exams more in the Chinese educational system than teachers, which may be why Chinese students often prefer the exam-oriented approach of their Chinese teachers and are enthusiastic about courses that, by American standards, would be dull and geared simply towards achieving high scores on exams. (Wang & Farmer, 2008, p. 7)

In essence, to be effective, educators need to recognize such differences and adapt their teaching styles accordingly. If critical thinking is a skill needed to make decisions and good choices, then educators should incorporate learning activities in the classroom to develop critical thinking. In order to develop critical thinking, teachers can incorporate Bloom's Taxonomy into their lesson plan (Bloom, 1971). When using Bloom's hierarchical classification categories, teachers need to understand the level of their students' skills before moving to the next level. Bloom's Taxonomy created two dimensions of learning: the knowledge dimension and the cognitive process dimension

for learning. The knowledge dimension involves the type of knowledge that needs to be learned and the cognitive process dimension includes the process the student uses to learn (Bloom, 1971).

A study in China was conducted to examine whether adult learners were being taught lower-order thinking skills or higher-order thinking skills. A survey was sent to 389 adult participants who taught in higher education institutions in China. A total of 359 surveys were returned. Using Bloom and associates' Cognitive Learning taxonomy, the six learning factors were; knowledge, comprehension, application, analysis, synthesis, and evaluation. The lower-order thinking skills consisted of knowledge, comprehension, and application and the higher-order thinking skills consisted of analysis, synthesis, and evaluation (Wang & Farmer, 2008). The results identified that lower-order thinking skills drove the teaching methods. Analysis, synthesis, and evaluation were not encouraged in the classroom. Biggs (1996) described these lower-order thinking skills (knowledge, comprehension, and application) as being the foundation of Confucianism.

In their article, Burba, Petrosko, and Boyle (2001) discussed how learner expectations can vary because of different cultural backgrounds; there will be subsequent differing expectations of a classroom instructor, too. They noted that instructors often use the same teaching style with all students. Unfortunately, the same teaching approach for all students may actually impede some learning efforts. In addition, instructors need to understand the underlying values that shape an individual's learning behavior and styles and modify their instructional methods to match these values.

Walker and Dimmock (2005) state that it is helpful for institutions to recruit instructors from similar cultures to those of the students. The instructors would share

similar experiences and values to those of their students. Again, this literature simply reinforces the need for instructors to be aware of the different classroom expectations from the students. By recruiting a diverse faculty, enriches the awareness of cultural differences within the institution. The diverse faculty would collaborate and share their learning experiences with others. They could improve the institution's learning program by providing ideas of program delivery and assessment to ensure an equal opportunity for learning between all students. According to Walker and Dimmock (2005), when instructors recognize differences in culture and can use a variety of teaching techniques to accommodate different learning styles, they appreciate that there is not only one way of designing a curriculum. This knowledge can enhance the cultural diverse classroom.

Dorner and Gorman (2006) noted that culture laid the foundation for how people learn and communicate. If educators do not recognize such differences, they run the risk of dealing with all cultures in a single way. By teaching the same way to all students, teachers may inadvertently create frustration among students because students feel they do not understand the material because they are not used to a certain type of delivery method. This may also be an unequal treatment of students. They are not being given the same opportunity to learn. This supports the recommendation that educators should recognize individual differences and use a variety of learning activities in the classroom. For example, educators may miss important non-verbal cues indicating that students require different learning or teaching approaches. A student who makes eye contact with the teacher may be viewed as paying attention and listening in class. However a student who does not make eye contact may be viewed as distracted. Another student may actively participate in discussions whereas someone else may sit quietly and not interact.

An educator sensitive to cultural differences will understand these types of non-verbal cues and look for ways to involve students in classroom activities.

Hofstede (2009) also stated that power dimensions have an effect on student-teacher relations. In the Western world, in the United Kingdom in particular; the researcher observed that the relationship between student and teacher is informal. The researcher observed that students are expected to debate with the teachers. On the other hand, in the Eastern world, specifically China, the relationship between the student and teacher is formal. The teacher is considered an expert and is not questioned. The teacher leads the class and students are dependent followers. Students do not expect to make decisions; instead they expect to be directed by the teacher (Eckstein et al., 2006).

According to Eckstein et al. (2006), the teacher's authority in China is respected and all work in the classrooms is tightly structured with very minimum participation from the students. The teachers do not encourage opinions from the students. In fact, it is quite the opposite; teachers may appear insensitive if they ask about students' opinions. After completion of the class, students leave with detailed notes. Students expect the teachers to make students successful by the students being able to pass the tests.

If instructors do not adapt the instructional method, important cues that prevent or obstruct learning may be missed. According to Hofstede (2009), Chinese students do not question the teacher. The faculty member might interpret the lack of questions as non-participation and grade the Chinese student lower than an American student who asks questions. In addition to being sensitive to learning activities in the classroom, teachers need to pay particular attention when grading students and designing curriculum.

Merriam et al. (2007) suggest that learning styles are influenced by culture and

recommend that teachers examine how they grade students. For example, some Western teachers issue grades on participation level. However, some students may be uncomfortable speaking in class due to their cultural traditions and as a result can receive a lower grade than a person from another culture used to speaking in public. Thus, when planning curriculum, designers should prepare learning activities while taking into account students' cultural traditions to maximize student involvement (Caffarella, 2002).

If China wants to produce leaders who are proficient in critical thinking and have the ability to think independently, there needs to be major alterations in the way teachers teach in China. Educational institutions should make changes in early education before adulthood. For years to date, the United States' colleges have admitted Chinese students who purposefully want to learn critical thinking skills and how to think independently (Wang et al., 2013).

The literature selected, emphasized the differences between cultures and student expectations. It emphasized the need to determine what the perceptions of faculty and students related to the cultural differences of students and their learning are. By understanding this important question, should assist in enriching the student's learning experience.

Teaching Methods in the United States

Unlike teaching methods in China, teachers in North America encourage critical thinking skills among students. Students are encouraged to evaluate arguments, interpret and analyze information and come up with conclusions, as well as examining how conclusions were drawn (Wang & Farmer, 2008). In 1968, Knowles introduced the term *andragogy* that states that adults are responsible for their own learning, and as a result,

educators form partnerships with their students (Knowles, 1975). Knowles (1980) specifically defined andragogy as “the art and science of helping adults learn” (p. 43). Andragogy encourages self-direction and encourages building on the students’ former experiences (Wang & Farmer, 2008). Knowles (1975) posits that there are eight factors to consider when designing the learning community: self-direction, experience, motivation, readiness, need to know, timing, practicality and socialization. Different to its counterparts in China, North American teachers use an andragogical approach to teaching, whereas the teachers of adults in China continue to focus on a pedagogical approach (Wang et al., 2013). Wang et al. (2013) also state that in andragogy, students take additional responsibility for their own learning. Life experiences aid learning by encouraging students to inquire and ask questions and have an input into learning activities (Knowles, 1975). By using personal life experiences, students may relate to the topic and take an interest in their own learning plans. This process moves the student from a pedagogical approach of memorization to developing more critical thinking skills and problem-solving skills. These skills help the students as they move into adulthood (Mezirow, 1990).

Mezirow (1990) continues to explain that in Western culture, students have been educated to think for themselves and then in adulthood use this education to examine their own beliefs and critically reflect on their past experiences to aid in decision-making and problem-solving. When students have learned early in the classroom to think for themselves by designing their own learning around what skills they consider are important, they are more apt to buy in to the learning and be motivated to learn. Students are involved in the two-way process of designing the curriculum rather than the

curriculum being imposed on them (Knowles, 1978). This involvement is continued through to adult learners.

As Mezirow (1990) states when describing the educator of adults, “He or she does not simply act as a passive facilitator of learning but as an empathic provocateur, gently creating dilemmas by encouraging learners to face up to contradictions between what they believe and what they do” (p. 366). According to Brookfield (2013), educating adults includes assisting these learners to analyze their experiences and using this analysis to help with finding solutions to problems. Earlier in 1987, Brookfield stated that when teaching students to be critical thinkers, the focus should be on assumptions and helping the learner to understand how they perceive experiences and to facilitate group discussion to look at alternatives. Brookfield (1987) also stated the importance of teaching students the skill of critical questioning. Critical questioning involves questions that invite assumptions rather than information. Tables 2 and 3 outline the assumptions differences between pedagogy and andragogy.

Table 2

A Comparison of Assumptions of Teacher-directed (Pedagogical) and Self-directed (Andragogical) Learning

| Assumptions About: | Pedagogical: Teacher Directed Learning | Andragogical: Self-directed Learning |
|----------------------------------|--|---------------------------------------|
| 1. Concept of learner | Dependent personality | Increasingly self-directed organism |
| 2. Role of learner's experiences | To be built on more than used | A rich resource for learning |
| 3. Readiness to learn | Varies with levels of maturation | Develops from life tasks and problems |
| 4. Orientation to learning | Subject-centered | Task or problem-centered |
| 5. Motivation | External rewards or punishments | Internal, incentives, curiosity |

(Knowles, 1977).

Table 3

A Comparison of Process Elements of Teacher-directed (Pedagogical) and Self-directed (Andragogical) Learning

| Process Elements | Pedagogical: Teacher Directed Learning | Andragogical: Self-directed Learning |
|------------------------------|--|--|
| 1. Climate | Formal authority-oriented competitive judgmental | Informal, mutually respectful, consensual, collaborative, supportive |
| 2. Planning | Primarily by teacher | By participative decision-making |
| 3. Diagnosis of needs | Primarily by teacher | By mutual assessment |
| 4. Setting goals | Primarily by teacher | By mutual negotiation |
| 5. Designing a learning plan | Content units, course syllabus, logical sequence | Learning projects learning content sequenced in terms of readiness |
| 6. Learning activities | Transmittal techniques, assigned readings | Inquiry projects independent study experimental techniques |
| 7. Evaluation | Primarily by teacher | By mutual assessment of self-collected evidence |

(Knowles, 1977).

Chinese Leadership Styles and Critical Thinking Skills

The next part of the literature review examines leadership styles of the Chinese. This is an attempt to determine whether there are any leadership differences between cultures. This will transition to looking specifically at critical thinking. The literature may support that culture plays a major role in impacting critical thinking skills.

The GLOBE researchers (House, Javidan, Dorfman, & Hanges, 2004) used a quantitative design and studied 62 countries in order to find differences and similarities between cultures and how leadership was viewed by the different cultures. Using standardized instruments, the researchers identified behaviors relating to leadership skills:

charismatic/value-based leadership, team-orientated leadership, participative leadership, humane-orientated leadership, autonomous leadership, and self-protective leadership. Specifically the Chinese study reviewed 158 responses from middle managers. The Chinese ranked themselves as seventh out of 61 countries on collectivism. The conclusion from this is that China is extremely collectivistic. The profile created for the Confucian Asia countries included the following leadership behaviors: self-protective, team orientated, and humane orientated. Leaders with these traits do not invite input from others in decision-making (Northouse, 2010).

Huang and Snell (2003) conducted case studies of five Chinese leaders in three organizations within China. One leader exhibited a transformational leadership style. He created a spiritual and high moral type of environment. He ensured fair practices and used his power as a leader to ensure policies and procedures were followed. Another leader also demonstrated a different style of leadership: transactional. He was not able to accomplish any changes or incorporate a high moral type of work environment. A pseudo-transformational leadership style was exhibited in the third case study and three leaders took advantages of weaknesses in order to benefit themselves. The leadership styles of the three case studies were different, but each leader influenced the moral environment of the organization. Throughout the studies, a theme evolved; Chinese leadership is built upon the Chinese culture.

It is important to recognize the limitations of the three case studies. Interested readers need to focus on the discussion information looking through various lenses. The sample was small and it would be beneficial to conduct additional research using different methods of data collection, such as surveys and observations, and instead of just

using qualitative research, quantitative research is needed too. It may be useful to specifically look at organizations that have been influenced by the Western world to see whether Chinese leaders have successfully adopted critical thinking and inquiry skills (House, Brodbeck, & Chhokar, 2007).

Ku and Ho (2010) conducted a study to examine the critical thinking skills of 137 Chinese students at a Hong Kong university. The undergraduate students completed the Need for Cognition Scale, Openness to Experience, and Conscientiousness subscales of the NEO Five Factor Inventory. In addition they completed the Concern for Truth subscale. Students were asked 25 questions based upon a scenario. The students were required to answer each question with both multiple choice and open-ended answers. Students were required to use both judgment and evaluation skills. The findings concluded that there are factors that significantly influence critical thinking skills. The Chinese culture of seeking answers from other people or authority may influence the way the Chinese make judgment decisions, instead of using reasoning and evidence and experience. This was evident in the responses students gave in the Concern for Trust subscale.

Another interesting finding that may be linked to the foundation of Confucianism is the strong need for academic performance. In the Confucianism environment more emphasis was placed on academics, and not reasoning or critical thinking (Lee, 1996; Li, 2002). In their study, Ku and Ho (2010) stress that there is a need to develop critical thinking skills early on in the Chinese culture so that critical thinking is evident later on in life. Facione and Facione (1996) stated that students in training programs demonstrating a disposition toward critical thinking will improve their critical thinking

skills more than students who do not show the disposition. In order to effectively measure critical thinking, Facione and Facione (1992) developed the following attributes: an inquiring mind, open-mindedness, systematicity, analyticity, truth-seeking, critical thinking, self-confidence, and maturity of judgment. These categories that help to form the definition of critical thinking were derived from a study conducted to come to an agreement in the late 1980s. The study is known as the APA Delphi Study of Critical Thinking. The investigator used the Delphi technique in order to form a consensus in an unbiased way. Scholars across disciplines participated in the blind research study. The results provided a consensus of a description of critical thinking skills that were relevant and also an outline of the mental disposition needed in order for a person to think critically. As well as having critical thinking skills, a person needs to have the disposition to think critically.

After 20 years of research, the CCTDI was created by Facione and Facione in the early 1990s to measure a person's disposition to think critically. It is possible for an individual to have the skills to think critically and yet still not be willing to use these skills. When making decisions, critical thinking skills need to be used and in addition, the individual must be willing to use these skills (Insight Assessment, 2013).

The CCTDI was used to measure the critical thinking dispositions among 224 college students at two universities (Bers et al., 1996). Researchers were interested in measuring the college students' disposition toward critical thinking and looked at whether age, gender, and prior education made a difference with the total scores and the scale scores. Out of the 224 students, 124 were measured at the beginning of the semester and again at the end of the semester to see if there was a difference in scores.

Overall, females, older students, and students with more education scored higher on the total scores of the CCTDI. Changes were minimal regarding the students who were measured at the beginning of the semester and at the end of the semester.

Glaser (1942) stated that in order to think critically people need to be able to use experiences as a foundation of consideration when faced with a question or problem. They also need to have the knowledge of how to think logically and conduct reasoning. In addition, people need to demonstrate logical thought and reasoning. Without the potential to think through problems and view alternatives and decide on the most appropriate route to take in a decision, leaders run the risk of making poor decisions (Brookfield, 2010).

The literature is significant because students lacking these critical thinking skills or dispositions to think critically might require additional instruction or assignments in order to strengthen their critical thinking skills than other students. Instructors can look for ways to develop students' critical thinking skills in the classroom. The literature reiterates that the tendency of the Chinese culture is to encourage students to memorize their studies rather than reflect on information and use problem-solving techniques to come up with solutions (Ku & Ho, 2010). Therefore it is prudent to ask whether the pedagogical approach to education in China is inhibiting the production of adults who may become leaders with critical thinking skills, or at the very least, is producing leaders who struggle to act on their disposition toward critical thinking. Wang et al. (2013) discuss the absence of an andragogical approach to teaching in China and how apparently leaders in China have not yet recognized how moving from a pedagogical approach to an

andragogical approach could indeed be the catalyst to the development of Chinese leaders.

A study raised questions regarding the role of how institutional, educational, and culture may impact individuals' dispositions to think critically (Tiwari et al., 2003). In their cross-sectional design, they examined the critical thinking dispositions of 384 nursing students from two cultural backgrounds: Hong Kong and Australia. There was a significant difference found between the Hong Kong students and the Australian students. The Australian students overall score suggested a positive disposition while the Hong Kong students did not suggest a positive disposition toward critical thinking. The CCTDI was used as the measurement instrument. However, when reviewing the scales, both groups scored high in the scale for intellectual curiosity. On the other hand, both the Australian students and the Hong Kong students scored lowest on the truth-seeking scale. Both groups were similar when measured on analyticity, Systematicity, and critical thinking confidence. They had a positive disposition toward analyticity but when their score was calculated for systematicity they were both ambivalent, meaning that when faced with a problem, they would not have the disposition to seek a solution in an orderly and focused approach (Tiwari et al., 2003). Regarding the scale of open-mindedness, the Australian students were more inclined to be open to diverse viewpoints than the Hong Kong students. In addition, there was a difference on the scores for maturity of judgment. The Australian students had a positive disposition while the Hong Kong students were ambivalent toward maturity of judgment. Both groups failed to show a negative disposition toward any scale and in addition, there were no strong positive tendencies to any of the scales. In this study, the researchers question whether culture is

a factor in contributing to the fact that Hong Kong students resist conflicting and alternative views when compared to the Australian students (Tiwari et al., 2003).

Literature Identifying the Need for Critical Thinking in Adult Learning

In 2000, the China Enterprise Confederation received information regarding organizations' opinions of the quality of various training and education courses. The analysis was provided by the International Labor office, the University of Leicester in England, and the Centre of Labor Market Studies. The studies were conducted in China among 465 different organizations. The following skills were identified as being required from prospective employees: critical thinking, organizational, problem-solving, teamwork, and communication (Dahlman, Zeng, & Wang, 2007; Brookfield, 1987, 2005, 2010, 2013). Additionally, the Definition and Selection of Competencies (DeSeCo) Project of the Organization for Economic Cooperation and Development researched the major competencies that were required for a functioning society (Rychen & Salganik, 2003). Results defined critical thinking and creativity as being crucial for employees working in organizations in Asian countries. Employers believed that in order for the organizations to continuously improve; these skills were necessary (Dahlman et al., 2007).

Chapter Summary

This chapter was organized in the following order; contextual variables as they relate to the CCTDI, literature that discusses research that compares scores on the CCTDI between cultures including Chinese culture, gender, length of time in the United States, and across disciplines. The chapter moved on to include instruction and learning styles, teaching methods in China, teaching methods in North America (including pedagogy and

andragogy), Chinese leadership critical thinking styles, and literature identifying the need for critical thinking in adult learners.

The literature on instruction and learning styles focused on understanding how instructors might use different instructional methods when students are from different cultures. The literature discussed how faculty should try to understand the learning preferences of students and acknowledge that students do not learn the same way. There is evidence within the literature that supports there are differences between cultures related to learning preferences and cultures and critical thinking. Within the teaching methods section, the literature identified the teaching methods in China. These methods serve as the foundation of Chinese methods of learning. Furthermore, the literature discussed that there are differences between student expectations and cultures. The literature supports the importance of understanding perceptions of faculty regarding cultural differences and learning to help maximize the students' potential for learning. Finally the last section of the literature review included the leadership styles and critical thinking. This was an effort to learn whether there were differences among cultures and leaders. The literature moved to critical thinking and provided a strong argument that culture plays a strong part in developing critical thinking skills.

CHAPTER 3. METHODOLOGY

This chapter provides an outline of the methodology of the study. This includes the research design, the research questions, the hypotheses, the sampling plan, the access plan, the instrumentation, the procedure, and the data analysis. In addition, the location of the study will be identified in this section.

The purpose of this quantitative research study was to compare Chinese and American students' disposition level of critical thinking using the CCTDI. The sample selected included Chinese (born, raised, and educated in China) and American (born, raised, and educated in the United States) undergraduate and graduate students at a large institute of higher learning located in southeast Florida. The Chinese students consisted of students from China enrolled in undergraduate or graduate degree programs. They were English speaking Chinese students. The American students were selected from existing students enrolled in undergraduate or graduate degree programs at the selected site. The students volunteered to participate in the study. The sample size was 41 Chinese students and 50 American students. The students were comprised of 37 males and 54 females and the researcher thought their ages ranged from 20 to 40 years of age by observing their appearance (exact ages were not requested).

The study took place at FAU on the Boca Raton, Florida campus and was approved by the FAU Institutional Review Board (IRB).

Research Questions

The primary research question was: Are there differences between Chinese and American students' scores on the individual seven scales of the CCTDI? The study helped to answer this question along with the following subquestions that were posed:

1. Are the differences between Chinese and American students' scores on the CCTDI consistent between male and female students?
2. Are the differences consistent between Chinese and American students who did their undergraduate studies in the United States and those who did not do their undergraduate studies in the United States?
3. Are the differences between Chinese and American students' scores consistent across areas (disciplines)?
4. Are the differences between Chinese and American students' scores consistent between undergraduate and graduate students?
5. Is there a relationship between the number of years that Chinese students have resided in the United States and their scores on the CCTDI?

The null hypotheses to be examined include:

H₀1: There is no difference between Chinese and American students' scores on the CCTDI.

H₀2: There is no consistency in the differences in the Chinese and American students' scores on the CCTDI between male and female students.

H₀3: There is no consistency in the differences between Chinese and American students' scores on the CCTDI between students who did their undergraduate studies in the

United States and those who did not do their undergraduate studies in the United States.

H₀4: There is no consistency in the differences between Chinese and American students' scores on the CCTDI across areas (disciplines).

H₀5: There is no consistency in the differences between students' scores on the CCTDI between undergraduate and graduate students.

H₀6: There is no relationship between the number of years Chinese students have been in the United States and their scores on the CCTDI.

Sample and Procedure

The sample selected included Chinese students who were in an undergraduate or graduate degree program at FAU. The university was selected due to its location. The researcher was a student with the university and therefore had access to the participants. The sample also included American students located at the same university located in southeast Florida.

At the time data was collected, the university had a total population of 63 Chinese students (including undergraduate and graduate students), therefore recruiting 50 Chinese students was difficult. A representative from the Office of International Student and Scholar Services sent an email on the researcher's behalf (see Appendix D) to all Chinese students who were in the undergraduate and graduate college at FAU to determine if they would like to volunteer to participate in the study. The students were informed that the researcher would be available to collect data by handing out the CCTDI instruments at the international student welcome meeting. Volunteers were also solicited through flyers and a presentation held by the researcher for both Chinese and American students at the

meeting of the United Association of Chinese Students and Scholars where the researcher asked for volunteers. At that same meeting, students were assured of confidentiality and that they would receive a McDonald's coupon for their time. The students had a choice whether they wanted to participate or not. The researcher made a similar presentation at a classroom of students and again asked for volunteers (see Appendix C).

Flyers were displayed in the student common areas to ask for American student volunteers. The researcher staffed an information table located on the Boca Raton campus to solicit volunteers. The researcher also staffed a table at the Office of International Student and Scholar Services welcome table to encourage international students to participate. The event was a welcome event for all international students in various programs at FAU; this included undergraduate and graduate students. Once participants volunteered, the researcher asked the participants to sign the consent form (see Appendix B) and to complete the demographic questionnaire (see Appendix A). The demographic questionnaire included gender, nationality (location in China), and length of time in the United States if from China. The participants were also asked on the demographic questionnaire whether they were an undergraduate student or graduate student, and if they were a graduate student they were asked if they did their undergraduate studies in the United States, their academic discipline, and whether they belonged to a college social group.

The sample size was 41 Chinese students and 50 American students. The participants completed the CCTDI. They were given 25 minutes to complete the CCTDI. The researcher chose a paper version of the instrument rather than an online version for three reasons:

1. The researcher wanted to be consistent with one of the appeals for volunteers as being a face-to-face activity and more personal;
2. The researcher elected to use the paper version of the test to avoid the possibility of different response rates based on test format; and
3. The researcher sought to assure treatment process was the same for all students.

If they chose to receive an emailed copy of their results, they provided an email address.

Setting of the Study

Florida Atlantic University (FAU) is a regional, high research activity research university (Carnegie Foundation for the Advancement of Teaching, 2013) with over 30,000 students enrolled in over 150 undergraduate and graduate degree programs (Florida Atlantic University, 2013c) situated in Southeast Florida with campuses in the cities of Boca Raton, Dania Beach, Davie, Fort Lauderdale, Fort Pierce, and Jupiter. As of 2012, students from 48 states and the District of Columbia (Florida Atlantic University, 2013b), and 135 countries around the world, were enrolled (Florida Atlantic University, 2013a).

Instrumentation

The CCTDI was used to measure the level of critical thinking of the participants. In 1990, the CCTDI was created by Drs. Peter and Noreen Facione. As described earlier, the American Philosophical Association's (1990) consensus definition of critical thinking is the foundation of the CCTDI. There were 75 questions that took approximately 15 minutes to complete (although students were given a total of 25 minutes to complete the questionnaire). The questions were arranged on a 6-point Likert-type scale and there were seven sub-scores. The sub-scores were not labeled, rather the questions were listed

in order with no subheadings, therefore it was not evident how many items were included in each sub-score. Students completing the instrument responded on whether they agreed or disagreed with each statement. The range was “strongly agree” to “strongly disagree.” There was no option to select neutral; therefore it was a forced-choice questionnaire. Seven attribute scales were derived from the summation of sub-scores of the 75 items using item and factor analysis techniques. The scales included: open-mindedness (being aware of self-bias and being tolerant of others’ life styles and beliefs), analyticity (use of reasoning and the use of evidence in problem-solving), cognitive maturity (using judgment when making decisions or problem-solving), truth-seeking (asking questions, knowledge seeking, and objective and honest), systematicity (focused and organized), inquisitiveness (intellectual curiosity and the motivation of the person wanting to learn) and self-confidence (trusting one’s own reasoning abilities) (Facione, Sanchez, Facione, & Gainen, 1995). The scores on each scale ranged between 10 and 60. Table 4 outlines the scores and the descriptions on the CCTDI.

Table 4

Scores and their Descriptions on the CCTDI

| Score | Description on the CCTDI |
|-------|--|
| 50-60 | Strong positive tendency toward critical thinking disposition |
| 40-50 | A positive tendency toward critical thinking disposition |
| 30-40 | Inconsistency/Ambivalence |
| 20-29 | A negative tendency against critical thinking disposition |
| 10-19 | Strong negative tendency against critical thinking disposition |

(Facione et al., 1995)

In the past, the total score of all the scales was the number taken into consideration to determine a person's standing. It is important to note, however, that each independent score was important. All the scales were agreed upon by researchers, employers, and educators across cultures that these were important habits of the mind (Insight Assessment, 2013). If a person had a low score in one scale; the total score may have indicated a higher level of critical thinking disposition. Therefore by understanding the independent score for each individual scale, or attribute, it can be noted where scales are low or high (Insight Assessment, 2013). However the overall score is calculated and reported. In addition, each scale is weighted equally.

There have been a number of published reports regarding the predictive value of the CCTDI. Appendix E provides a list of studies in which the CCTDI has been used to measure critical thinking disposition. Criterion validity of this instrument has been well documented in dissertation studies, reports, and published research (Insight Assessment, 2013). In one study, Kwon, Onwuegbuzie, and Alexander (2007) demonstrated that systematicity and confidence were significant predictors of library anxiety. The instrument has also been tested for reliability. Cronbach's alpha was overall .90 and .71-.80 for the seven scales was consistent when 1,019 additional college students participated in the measurement (Facione & Facione, 1996). The CCTDI was used to measure the critical thinking skills of 587 freshmen at a private college; 13% of the sample had a high level of critical thinking skills on all seven scales. Eighty seven percent of the sample was high only on one of the seven scales (Facione et al., 1995). This instrument was also used in another study by Biber et al. (2013) to measure the critical thinking disposition of mathematics teachers in Turkey.

Since the items in the CCTDI originated from the APA Delphi data, based on the agreed description of the critical thinker (citation), and subsequently the items have been reviewed by educators who have administered the instrument, the CCTDI had content validity (Insight Assessment, 2013). In addition, the use of technical or critical thinking language was avoided when designing the survey statements. Rather, there was much use of expressions and terms used in everyday language. Although the CCTDI has been translated into other languages, it was determined to not use a translated version of this instrument, since the participants used in this study were able to speak and read English well.

In order to measure construct validity of the CCTDI, Insight Assessment (2013) conducted a study of 200 students to compare the critical thinking disposition of participants with various personality traits. There were significant correlations between truth-seeking, open-mindedness and inquisitiveness and openness to new experiences. Truth-seeking ($r = .27, p < .001$), open-mindedness ($r = .33, p < .001$); and inquisitiveness ($r = .37, p < .001$). There was also significant correlation between openness to experience and confidence in reasoning ($r = .25, p < .004$).

According to Insight Assessment (2013), all assessment instruments used by Insight Assessment have strong internal consistency reliability; “A minimum Alpha of 0.80 for attributes measures and a minimum KR-20 of .72 for skills measures” (Insight Assessment, 2013, p. 50). The seven scales in the CCTDI pilot sample ranged from .71 to .80 with the alpha for the overall instrument reaching .91. Consistent values ranging from .60 to .78 on the individual scales and .90 and above for the total measure have been measured in data collected in the last 15 years (Insight Assessment, 2013).

There are various instruments available to measure critical thinking skills. The Watson-Glaser Critical Thinking Appraisal was considered. This instrument focuses on three main areas; recognizing assumptions, evaluating arguments, and drawing conclusions. Paul and Elder (1996) developed an instrument as well that had three parts and students were required to answer 100 questions. The instrument concentrated on various areas of thought; analysis, assessment, dispositions, skills and abilities, and the barriers that prevent thinking critically.

The researcher chose the CCTDI because it was valid and reliable. Furthermore, Insight Assessment stated that the internal consistency (reliability) statistic for the CCTDI was the Cronbach's Alpha statistic with a reliability coefficients for the CCTDI range between .80 -.98. Scale score statistics demonstrated similar strength. Test retest reliability for the reported scores averaged 86. The instrument has been used in prior studies and the company representing the instrument had a good reputation with other measurement instruments (Insight Assessment, 2013). Further, the CCTDI has roots in the APA Delphi Report (The American Philosophical Association, 1990). The report discussed a project that took two years to complete regarding defining critical thinking among experts. It focused on college teaching and how to measure the skills. Dr. Peter Facione headed up the team. Included in the findings of the report was the idea that there were certain dispositions that encouraged the use of critical thinking. There was a strong agreement (61%) that the following dispositions were included in the foundation of good critical thinking: inquisitiveness, self-confidence, open-mindedness, recognizing one's own biases, and flexibility. Furthermore, it was concluded that these dispositions needed to be developed in order to develop strong critical thinking.

Data Analysis

The analysis comprised of descriptive statistics and inferential statistics. The differences in means using independent t-tests between the 50 American students and the 41 Chinese students were compared using the CCTDI. A factorial analysis of variance was used to measure the moderator questions. The independent t-test, factorial analysis of variance, and correlation were generated using the statistical software, SPSS (Statistical Package for the Social Sciences version 20.0). The researcher chose SPSS to analyze the data because it is fairly simple to use and it was able to do all the analyses the researcher needed. According to Stevens (2009), SPSS has been well documented due to the fact it has been used and updated for more than 20 years. The level of significance was set at 0.05. Table 5 outlines the ways each hypothesis was analyzed. The analyses were completed for each of the seven scales.

Table 5

Analysis of Hypotheses

| Hypotheses | Analysis |
|---|--------------------------------|
| H ₀ 1: There is no difference between Chinese and t-test American students' scores on the CCTDI | T-test |
| H ₀ 2: The differences between Chinese and American students on the CCTDI are consistent between genders | Factorial analysis of variance |
| H ₀ 3: The differences between Chinese and American students on the CCTDI are consistent between students who did their undergraduate studies in the United States and those who did not do their undergraduate studies in the United States | Factorial analysis of variance |
| H ₀ 4: The differences between Chinese and American students on the CCTDI are consistent across disciplines | Factorial analysis of variance |
| H ₀ 5: The differences between Chinese and American students on the CCTDI are consistent between undergraduate and graduate students | Factorial analysis of variance |
| H ₀ 6: There is no relationship between the number of years Chinese students have been in the United States and their scores on the CCTDI | Pearson's correlation |

Anticipated Outcomes

Prior to conducting this study, the researcher anticipated there were learning differences between the critical thinking dispositions of Chinese and American college students based on real-life observations. By realizing there is or is not a difference, it may be possible to posit that culture may or may not play a part in the development of

such skills. The literature states that China is attempting to find if the more Western approach to teaching and learning enhances workforce productivity, so the researcher believed if critical thinking differences emerge in this study, the Chinese may wish to explore the university's approach to teaching and learning and open the doors for future student exchanges. Furthermore the study may invite instructors to incorporate more opportunities within the classroom to strengthen these skills.

Chapter Summary

This chapter reviewed the methodology of the study including the research design, research questions, hypotheses, sampling plan, access plan, instrumentation, procedure, and plan for data analysis. The study was quantitative and the scores on the CCTDI were analyzed using independent t-test, factorial analysis of variance, and Pearson's correlation. The study took place at FAU and the sampling plan consisted of 50 American and 41 Chinese students attending FAU. The chapter also included the researcher's anticipated outcomes of the study.

CHAPTER 4. DATA ANALYSIS AND FINDINGS

The data analysis and findings are presented in this chapter. The purpose of this study was to compare the critical thinking dispositions between undergraduate and graduate Chinese and American college students across disciplines. SPSS version 20.0 was used to analyze the data in order to answer the research questions.

Research Questions and Null Hypotheses

The research question was: Are there differences between Chinese and American students' scores on the individual seven scales of the CCTDI? The study helped to answer this question along with the following subquestions that were posed:

1. Are the differences between Chinese and American students' scores on the CCTDI consistent between male and female students?
2. Are the differences consistent between Chinese and American students who did their undergraduate studies in the United States and those who did not do their undergraduate studies in the United States?
3. Are the differences between Chinese and American students' scores consistent across areas (disciplines)?
4. Are the differences between Chinese and American students' scores consistent between undergraduate and graduate students?
5. Is there a relationship between the number of years that Chinese students have resided in the United States and their scores on the CCTDI?

The null hypotheses examined included:

H₀1: There is no difference between Chinese and American students' scores on the CCTDI.

H₀2: There is no consistency in the differences in the Chinese and American students' scores on the CCTDI between male and female students.

H₀3: There is no consistency in the differences between Chinese and American students' scores on the CCTDI between students who did their undergraduate studies in the United States and those who did not do their undergraduate studies in the United States.

H₀4: There is no consistency in the differences between Chinese and American students' scores on the CCTDI across areas (disciplines).

H₀5: There is no consistency in the differences between students' scores on the CCTDI between undergraduate and graduate students.

H₀6: There is no relationship between the number of years Chinese students have been in the United States and their scores on the CCTDI.

The sample consisted of both undergraduate and graduate students from FAU in Boca Raton, Florida. A total of 91 students voluntarily participated in the research study. The total population included 41 Chinese students and 50 students from the United States. Table 6 identifies the breakdown of student demographics.

Table 6

Participant Demographics (N = 91)

| Demographic Information | Count |
|---|-------|
| Total female | 54 |
| Total male | 37 |
| Participants from the United States | 50 |
| Females from the United States | 33 |
| Males from the United States | 17 |
| Undergraduates from the United States | 46 |
| Graduates from the United States | 4 |
| Science students | 9 |
| Other disciplines | 41 |
| Member of a social group | 15 |
| Not a member of a social group | 35 |
| Total who completed their undergraduate degree in the United States | 49 |
| Total who completed their undergraduate degree in another country | 1 |
| Participants from China | 41 |
| Females from China | 21 |
| Males from China | 20 |
| Undergraduates from China | 16 |
| Graduates from China | 25 |
| Total who completed their undergraduate degree in the United States | 12 |
| Total who completed their undergraduate degree in another country | 29 |
| Science students | 25 |
| Other disciplines | 16 |
| Member of a social group | 14 |
| Not a member of a social group | 27 |

Demographic information was collected on a questionnaire. Out of a total of 91 students, 41 were Chinese, 50 were from the United States. There were 54 female students; 21 were from China and 33 were from the United States. There were 37 male students; 20 males were from China and 17 males were from the United States. A question asked students to disclose their nationality. Chinese students were asked whether they were from Mainland China, Korea, Taiwan or other. Only eight students disclosed where they were from and they indicated that they were from Mainland China.

Participants identified what discipline they had selected. Disciplines were then divided into two categories: science (math, science, nursing, chemistry), and other (art, education, and non-declared).

Participants specified whether they belonged to a social group and indicated what type of group it was. For the purpose of the analysis, the researcher categorized the groups into two categories: belonging to a social group, and non-belonging to a social group. There were 15 American students and 14 Chinese students who indicated that they belonged to a social group. There were 35 American students and 27 Chinese students who indicated that they did not belong to a social group. There were 46 American undergraduate students and four American graduate students, and 16 Chinese undergraduate students and 25 graduate Chinese students.

Analysis of Research Questions and Null Hypotheses

The researcher used SPSS version 20.0 to analyze the data for this study. To answer the main research question, the researcher used an independent sample t-test. Since the scores on the scales were a summation of the total score of the CCTDI, the researcher conducted analyses on the seven scales: truth-seeking, open mindedness,

inquisitiveness, analyticity, systematicity, confidence in reasoning, and maturity of judgment. A factorial analysis of variance was used to answer the moderator questions and a Pearson's correlation was used to measure the relationship question.

Primary Research Question. Are there differences between Chinese and American students' scores on the individual seven scales of the CCTDI?

H₀1: There is no difference between Chinese and American students' scores on the CCTDI.

An independent t-test was conducted on the total score of the CCTDI and on each of the seven scales: truth-seeking, open mindedness, inquisitiveness, analyticity, systematicity, confidence in reasoning, and maturing of judgment (see Tables 7 - 14-). Using SPSS, the analysis was computed and it was found that Levene's test $p = .961$ was not-significant. The equal variance t-test was then run. This led to a failure to reject the null, $t(89) = .54, p > .05$. The conclusion is that there were no differences between Chinese and American students' total score on the CCTDI.

For each of the seven sub-scales of the CCTDI: Truth-seeking, open mindedness, inquisitiveness, analyticity, systematicity, confidence in reasoning and maturity of judgment there were no differences between Chinese and American students' scores. There was a failure to reject the null on all seven scales $p > .05$. Tables 7 through 14, outline the results of the Levene's test and the equal variance t-test results.

Table 7

Independent Samples Test: Total CCTDI Score

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | | |
|-------------------|-----------------------------|---|------|------------------------------|--------|--------------|------------|------------------|---|----------|-------|
| | | F | p | t | df | p (2-tailed) | Mean Diff. | Std. Error Diff. | 95% Confidence Interval of the Difference | | |
| | | | | | | | | | | Lower | Upper |
| CCTDI Total Score | Equal variances assumed | .002 | .961 | .539 | 89 | .591 | 4.05854 | 7.52613 | -10.89571 | 19.01279 | |
| | Equal variances not assumed | | | .542 | 86.926 | .589 | 4.05854 | 7.49112 | -10.83106 | 18.94813 | |

Table 8

Independent Samples Test: Truth-seeking

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | | |
|-------------------|-----------------------------|---|------|------------------------------|--------|--------------|------------|------------------|---|---------|-------|
| | | F | p | t | df | p (2-tailed) | Mean Diff. | Std. Error Diff. | 95% Confidence Interval of the Difference | | |
| | | | | | | | | | | Lower | Upper |
| CCTDI Total Score | Equal variances assumed | .266 | .607 | .984 | 89 | .328 | 1.53561 | 1.56033 | -1.56473 | 4.63595 | |
| | Equal variances not assumed | | | .999 | 88.819 | .320 | 1.53561 | 1.53645 | -1.51736 | 4.58858 | |

Table 9

Independent Samples Test: Open Mindedness

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | | |
|-------------------|-----------------------------|---|------|------------------------------|--------|--------------|------------|------------------|---|---------|-------|
| | | F | p | t | df | p (2-tailed) | Mean Diff. | Std. Error Diff. | 95% Confidence Interval of the Difference | | |
| | | | | | | | | | | Lower | Upper |
| CCTDI Total Score | Equal variances assumed | 6.489 | .013 | 1.419 | 89 | .159 | 1.91610 | 1.35042 | -0.76716 | 4.59935 | |
| | Equal variances not assumed | | | 1.462 | 88.034 | .147 | 1.91610 | 1.31075 | -0.68872 | 4.52092 | |

Table 10

Independent Samples Test: Inquisitiveness

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | | |
|-------------------|-----------------------------|---|------|------------------------------|--------|--------------|------------|------------------|---|--------|-------|
| | | F | p | t | df | p (2-tailed) | Mean Diff. | Std. Error Diff. | 95% Confidence Interval of the Difference | | |
| | | | | | | | | | | Lower | Upper |
| CCTDI Total Score | Equal variances assumed | .119 | .730 | -1.930 | 89 | .057 | -3.22634 | 1.67197 | -6.54851 | .09583 | |
| | Equal variances not assumed | | | -1.942 | 87.392 | .055 | -3.22634 | 1.66109 | -6.52773 | .07505 | |

Table 11

Independent Samples Test: Analyticity

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | | |
|-------------------|-----------------------------|---|------|------------------------------|--------|--------------|------------|------------------|---|---------|-------|
| | | F | p | t | df | p (2-tailed) | Mean Diff. | Std. Error Diff. | 95% Confidence Interval of the Difference | | |
| | | | | | | | | | | Lower | Upper |
| CCTDI Total Score | Equal variances assumed | .180 | .672 | 1.182 | 89 | .240 | 1.58537 | 1.34146 | -1.08009 | 4.25083 | |
| | Equal variances not assumed | | | 1.190 | 87.389 | .237 | 1.58537 | 1.33275 | -1.06345 | 4.23418 | |

Table 12

Independent Samples Test: Systematicity

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | | |
|-------------------|-----------------------------|---|------|------------------------------|--------|--------------|------------|------------------|---|---------|-------|
| | | F | p | t | df | p (2-tailed) | Mean Diff. | Std. Error Diff. | 95% Confidence Interval of the Difference | | |
| | | | | | | | | | | Lower | Upper |
| CCTDI Total Score | Equal variances assumed | .916 | .341 | -.854 | 89 | .396 | -1.28634 | 1.50664 | -4.28000 | 1.70732 | |
| | Equal variances not assumed | | | -.851 | 84.271 | .397 | -1.28634 | 1.51209 | -4.29316 | 1.72048 | |

Table 13

Independent Samples Test: Confidence in Reasoning

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | | |
|-------------------|-----------------------------|---|------|------------------------------|--------|--------------|------------|------------------|---|---------|-------|
| | | F | p | t | df | p (2-tailed) | Mean Diff. | Std. Error Diff. | 95% Confidence Interval of the Difference | | |
| | | | | | | | | | | Lower | Upper |
| CCTDI Total Score | Equal variances assumed | .115 | .735 | -.173 | 89 | .863 | -.27756 | 1.60036 | -3.45745 | 2.90233 | |
| | Equal variances not assumed | | | -.174 | 87.013 | .862 | -.27756 | 1.59239 | -3.44261 | 2.88748 | |

Table 14

Independent Samples Test: Maturity of Judgment

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | | |
|-------------------|-----------------------------|---|------|------------------------------|--------|--------------|------------|------------------|---|---------|-------|
| | | F | p | t | df | p (2-tailed) | Mean Diff. | Std. Error Diff. | 95% Confidence Interval of the Difference | | |
| | | | | | | | | | | Lower | Upper |
| CCTDI Total Score | Equal variances assumed | .553 | .459 | 2.094 | 89 | .039 | 3.65707 | 1.74628 | .18724 | 7.12690 | |
| | Equal variances not assumed | | | 2.066 | 80.102 | .042 | 3.65707 | 1.76996 | .13481 | 7.17934 | |

Subquestions. This study also asked: Are the differences between Chinese and American students' scores on the CCTDI consistent between male and female students?

H₀2: There is no consistency in the differences in the Chinese and American students' scores on the CCTDI between male and female students.

A factorial analysis of variance was conducted on the seven scales of the CCTDI and data concluded there were no significant differences between gender and Chinese and American students' scores on all the seven scales of the CCTDI. For the scale of truth-seeking, Levene's test p-value of .425 (see Table 15) was such that the null hypothesis was not rejected. The main effect for nationality and gender were not significant ($p = .383$ and $.192$ respectively) (see Table 16). Therefore, there was no evidence that Chinese and American (nationality) means were different (combining across gender) when comparing their scores on the CCTDI scale of truth-seeking, or that the gender was different (combining across nationality) in the population. The p value of $.096$ (see Table 16) failed to allow the researcher to reject the interaction null hypothesis at the $.05$ level.

Table 15

Levene's Test of Equality of Error Variances for Truth-seeking Scale

| F | df1 | df2 | p |
|------|-----|-----|------|
| .940 | 3 | 87 | .425 |

Table 16

Tests of Between-participants Effects for Truth-seeking Scale

| Source | Type III Sum of Squares | df | Mean Square | F | p | Partial Eta Squared | Noncent. Parameter | Observed Power ^b |
|----------------------|-------------------------|----|-------------|----------|------|---------------------|--------------------|-----------------------------|
| Corrected Model | 286.651 ^a | 3 | 95.550 | 1.789 | .155 | .058 | 5.366 | .451 |
| Intercept | 103608.038 | 1 | 103608.038 | 1939.404 | .000 | .957 | 1939.404 | 1.000 |
| Nationality | 41.080 | 1 | 41.080 | .769 | .383 | .009 | .769 | .140 |
| Gender | 92.429 | 1 | 92.429 | 1.730 | .192 | .019 | 1.730 | .255 |
| Nationality & Gender | 151.375 | 1 | 151.375 | 2.834 | .096 | .032 | 2.834 | .384 |
| Error | 4647.767 | 87 | 53.423 | | | | | |
| Total | 115571.000 | 91 | | | | | | |
| Corrected Total | 4934.418 | 90 | | | | | | |

Note. a. R Squared = .058 (Adjusted R Squared = .026); b. Computed using alpha = .05.

For the scale of open mindedness, Levene's test p-value of .018 (see Table 17) was such that the equality of error variances was significant. The assumptions were violated. The researcher went ahead with the factorial analysis of variance. The effect for nationality and gender were .340 and .944 respectively (see Table 18); neither were significant. However, when the researcher tested the interaction: Is the difference between Chinese and American students different for males and females? The interaction was significant ($p = .007$) (see Table 18). From the examination of the means (see Table 19), the researcher found the interaction was disordinal. The reason for the significance was that the Chinese males scored higher than the Chinese females and the American females scored higher than the American males on the CCTDI sub scale of open mindedness. The Chinese males were in the positive range of the CCTDI scale of open-

mindedness and the Chinese females were in the ambivalent range. The American females were in the positive range of the CCTDI scale and the American males were in the ambivalent range. The partial eta squared of .081 indicates a weak relationship between nationality and gender (see Table 18).

Table 17

Levene's Test of Equality of Error Variances for Open Mindedness Scale

| F | df1 | df2 | p |
|-------|-----|-----|------|
| 3.522 | 3 | 87 | .018 |

Table 18

Tests of Between-participants Effects for Open Mindedness Scale

| Source | Type III Sum of Squares | df | Mean Square | F | p | Partial Eta Squared | Noncent. Parameter | Observed Power ^b |
|----------------------|-------------------------|----|-------------|----------|------|---------------------|--------------------|-----------------------------|
| Corrected Model | 379.899 ^a | 3 | 126.633 | 3.280 | .025 | .102 | 9.839 | .732 |
| Intercept | 143567.799 | 1 | 143567.799 | 3718.388 | .000 | .977 | 3718.388 | 1.000 |
| Nationality | 35.580 | 1 | 35.580 | .922 | .340 | .010 | .922 | .158 |
| Gender | .193 | 1 | .193 | .005 | .944 | .000 | .005 | .051 |
| Nationality & Gender | 297.072 | 1 | 297.072 | 7.694 | .007 | .081 | 7.694 | .783 |
| Error | 3359.090 | 87 | 38.610 | | | | | |
| Total | 158932.000 | 91 | | | | | | |
| Corrected Total | 3738.989 | 90 | | | | | | |

Note. a. R Squared = .102 (Adjusted R Squared = .071); b. Computed using alpha = .05.

Table 19

Means and Standard Deviations by Gender and Nationality for Open Mindedness Scale

| Nationality | Gender | Mean | Std. Deviation | N |
|-------------|--------|---------|----------------|----|
| American | Female | 43.3939 | 7.38215 | 33 |
| | Male | 39.7647 | 6.34950 | 17 |
| | Total | 42.1600 | 7.19512 | 50 |
| Chinese | Female | 38.3810 | 4.15303 | 21 |
| | Male | 42.2000 | 5.73631 | 20 |
| | Total | 40.2439 | 5.29047 | 41 |
| Total | Female | 41.4444 | 6.74514 | 54 |
| | Male | 41.0811 | 6.06620 | 37 |

For the scale of inquisitiveness, Levene's test p-value of .686 (see Table 20) was such that the null hypothesis was rejected. The main effect for nationality and gender were significant and not significant ($p = .035$ and $.694$ respectively) (see Table 21). The p value of .236 failed to allow the researcher to reject the interaction null hypothesis at the .05 level (see Table 21). The researcher examined the means (see Table 23) and found the Chinese males scored higher than American males on the inquisitiveness scale of the CCTDI; however, both scores fell into the positive range. Therefore, there was no evidence that Chinese and American (nationality) means were different (combining across gender) when comparing their scores on the CCTDI scale of inquisitiveness, or that the gender was different (combining across nationality) in the population.

Table 20

Levene's Test of Equality of Error Variances for Inquisitiveness Scale

| F | df1 | df2 | p. |
|------|-----|-----|------|
| .496 | 3 | 87 | .686 |

Table 21

Tests of Between-participants Effects for Inquisitiveness Scale

| Source | Type III Sum of Squares | df | Mean Square | F | p | Partial Eta Squared | Noncent. Parameter | Observed Power ^b |
|----------------------|-------------------------|----|-------------|----------|------|---------------------|--------------------|-----------------------------|
| Corrected Model | 337.501 ^a | 3 | 112.500 | 1.779 | .157 | .058 | 5.337 | .449 |
| Intercept | 183850.347 | 1 | 183850.347 | 2907.229 | .000 | .971 | 2907.229 | 1.000 |
| Nationality | 290.076 | 1 | 290.076 | 4.587 | .035 | .050 | 4.587 | .563 |
| Gender | 9.861 | 1 | 9.861 | .156 | .694 | .002 | .156 | .068 |
| Nationality & Gender | 90.220 | 1 | 90.220 | 1.427 | .236 | .016 | 1.427 | .219 |
| Error | 5501.795 | 87 | 63.239 | | | | | |
| Total | 201536.000 | 91 | | | | | | |
| Corrected Total | 5839.297 | 90 | | | | | | |

Note. a. R Squared = .058 (Adjusted R Squared = .025), b. Computed using alpha = .05.

Table 22

Means and Standard Deviations by Gender and Nationality for Inquisitiveness Scale

| Nationality | Gender | Mean | Std. Deviation | N |
|-------------|--------|---------|----------------|----|
| American | Female | 45.8485 | 8.63178 | 33 |
| | Male | 43.1176 | 7.06118 | 17 |
| | Total | 44.9200 | 8.16373 | 50 |
| Chinese | Female | 47.4762 | 8.26813 | 21 |
| | Male | 48.8500 | 7.08055 | 20 |
| | Total | 48.1463 | 7.64709 | 41 |

For the scale of analyticity, Levene's test p-value of .847 (see Table 23) was such that the null hypothesis was rejected. The main effect for nationality and gender were not significant and significant ($p = .182$ and $.043$ respectively) (see Table 24). The p value of .464 (see Table 24) failed to allow the researcher to reject the interaction null hypothesis at the .05 level. Therefore there was no evidence that Chinese and American (nationality) means were different (combining across gender) when comparing their scores on the CCTDI scale of analyticity, or that the gender was different (combining across nationality) in the population.

Table 23

Levene's Test of Equality of Error Variances for Analyticity Scale

| F | df1 | df2 | p |
|------|-----|-----|------|
| .269 | 3 | 87 | .847 |

Table 24

Tests of Between-participants Effects for Analyticity Scale

| Source | Type III Sum of Squares | df | Mean Square | F | p | Partial Eta Squared | Noncent. Parameter | Observed Power ^b |
|----------------------|-------------------------|----|-------------|----------|------|---------------------|--------------------|-----------------------------|
| Corrected Model | 238.529 ^a | 3 | 79.510 | 2.019 | .117 | .065 | 6.057 | .502 |
| Intercept | 161178.720 | 1 | 161178.720 | 4092.929 | .000 | .979 | 4092.929 | 1.000 |
| Nationality | 71.301 | 1 | 71.301 | 1.811 | .182 | .020 | 1.811 | .265 |
| Gender | 165.604 | 1 | 165.604 | 4.205 | .043 | .046 | 4.205 | .527 |
| Nationality & Gender | 21.335 | 1 | 21.335 | .542 | .464 | .006 | .542 | .113 |
| Error | 3426.042 | 87 | 39.380 | | | | | |
| Total | 174167.000 | 91 | | | | | | |
| Corrected Total | 3664.571 | 90 | | | | | | |

Note. a. R Squared = .065 (Adjusted R Squared = .033); b. Computed using alpha = .05.

For the scale of systematicity, Levene's test p-value of .535 (see Table 25) was such that the null hypothesis was rejected. The main effects for nationality and gender were not significant ($p = .401$ and $.445$ respectively) (see Table 26). The p value of .458 (see Table 26) failed to allow the researcher to reject the interaction null hypothesis at the .05 level. Therefore, there was no evidence that Chinese and American (nationality) means were different (combining across gender) when comparing their scores on the CCTDI scale of systematicity, or that the gender was different (combining across nationality) in the population.

Table 25

Levene's Test of Equality of Error Variances for Systematicity Scale

| F | df1 | df2 | p |
|------|-----|-----|------|
| .732 | 3 | 87 | .535 |

Table 26

Tests of Between-participants Effects for Systematicity Scale

| Source | Type III Sum of Squares | df | Mean Square | F | p | Partial Eta Squared | Noncent. Parameter | Observed Power ^b |
|----------------------|-------------------------|----|-------------|----------|------|---------------------|--------------------|-----------------------------|
| Corrected Model | 93.860 ^a | 3 | 31.287 | .606 | .613 | .020 | 1.817 | .171 |
| Intercept | 140673.713 | 1 | 140673.713 | 2722.985 | .000 | .969 | 2722.985 | 1.000 |
| Nationality | 36.735 | 1 | 36.735 | .711 | .401 | .008 | .711 | .133 |
| Gender | 30.431 | 1 | 30.431 | .589 | .445 | .007 | .589 | .118 |
| Nationality & Gender | 28.726 | 1 | 28.726 | .556 | .458 | .006 | .556 | .114 |
| Error | 4494.557 | 87 | 51.662 | | | | | |
| Total | 153406.000 | 91 | | | | | | |
| Corrected Total | 4588.418 | 90 | | | | | | |

Note. a. R Squared = .020 (Adjusted R Squared = -.013); b. Computed using alpha = .05.

For the scale of confidence in reasoning, Levene's test p-value of .841 (see Table 27) was such that the null hypothesis was rejected. The main effect for nationality and gender were not significant ($p = .705$ and $.593$ respectively) (see Table 28). The p value of .097 (see Table 28) failed to allow the researcher to reject the interaction null hypothesis at the .05 level. Therefore, there was no evidence that Chinese and American (nationality) means were different (combining across gender) when comparing their

scores on the CCTDI scale of confidence of reasoning, or that the gender was different (combining across nationality) in the population.

Table 27

Levene's Test of Equality of Error Variances for Confidence in Reasoning Scale

| F | df1 | df2 | p |
|------|-----|-----|------|
| .278 | 3 | 87 | .841 |

Table 28

Tests of Between-participants Effects for Confidence in Reasoning Scale

| Source | Type III Sum of Squares | df | Mean Square | F | p | Partial Eta Squared | Noncent. Parameter | Observed Power ^b |
|----------------------|-------------------------|----|-------------|----------|------|---------------------|--------------------|-----------------------------|
| Corrected Model | 174.809 ^a | 3 | 58.270 | 1.022 | .387 | .034 | 3.065 | .269 |
| Intercept | 172201.401 | 1 | 172201.401 | 3019.302 | .000 | .972 | 3019.302 | 1.000 |
| Nationality | 8.241 | 1 | 8.241 | .144 | .705 | .002 | .144 | .066 |
| Gender | 16.406 | 1 | 16.406 | .288 | .593 | .003 | .288 | .083 |
| Nationality & Gender | 160.984 | 1 | 160.984 | 2.823 | .097 | .031 | 2.823 | .383 |
| Error | 4961.916 | 87 | 57.034 | | | | | |
| Total | 188962.000 | 91 | | | | | | |
| Corrected Total | 5136.725 | 90 | | | | | | |

Note. a. R Squared = .034 (Adjusted R Squared = .001); b. Computed using alpha = .05.

For the scale of maturity of judgment, Levene's test p-value of .506 (see Table 29) was such that the null hypothesis was rejected. The main effect for nationality and gender were not significant ($p = .076$ and $.999$ respectively) (see Table 30). The p value of .155 (see Table 30) failed to allow the researcher to reject the interaction null

hypothesis at the .05 level. Therefore there was no evidence that Chinese and American (nationality) means were different (combining across gender) when comparing their scores on the CCTDI scale of maturity of judgment, or that the gender was different (combining across nationality) in the population.

Table 29

Levene's Test of Equality of Error Variances for Maturity of Judgment Scale

| F | df1 | df2 | p |
|------|-----|-----|------|
| .783 | 3 | 87 | .506 |

Table 30

Tests of Between-participants Effects for Maturity of Judgment Scale

| Source | Type III Sum of Squares | df | Mean Square | F | p | Partial Eta Squared | Noncent. Parameter | Observed Power ^b |
|----------------------|-------------------------|----|-------------|----------|------|---------------------|--------------------|-----------------------------|
| Corrected Model | 442.844 ^a | 3 | 147.615 | 2.150 | .100 | .069 | 6.451 | .531 |
| Intercept | 146295.494 | 1 | 146295.494 | 2131.038 | .000 | .961 | 2131.038 | 1.000 |
| Nationality | 221.439 | 1 | 221.439 | 3.226 | .076 | .036 | 3.226 | .427 |
| Gender | .000 | 1 | .000 | .000 | .999 | .000 | .000 | .050 |
| Nationality & Gender | 141.281 | 1 | 141.281 | 2.058 | .155 | .023 | 2.058 | .295 |
| Error | 5972.540 | 87 | 68.650 | | | | | |
| Total | 164596.000 | 91 | | | | | | |
| Corrected Total | 6415.385 | 90 | | | | | | |

Note. a. R Squared = .069 (Adjusted R Squared = .037); b. Computed using alpha = .05.

This study also asked: Are the differences between scores consistent between Chinese and American students who did their undergraduate studies in the United States and those who did not do their undergraduate studies in the United States?

H₀₃: There is no consistency in the differences between Chinese and American students' scores on each of the seven scales of the CCTDI between students who did their undergraduate studies in the United States and those who did not do their undergraduate studies in the United States.

A factorial analysis of variance was computed on each of the seven scales of the CCTDI. Using SPSS, Levene's test was used to compute the homogeneity of variance. The determination to retain or to reject the null hypothesis was based on the p value computed. When the p value was less than 0.05, the null hypothesis was rejected and findings were considered not significant.

The results identified there was no significant difference, therefore the researcher failed to reject the null hypothesis. It was concluded that it did not make a difference whether students did their undergraduate studies in the United States or whether they did their undergraduate studies in another country, to their scores on the CCTDI.

For the scale of truth-seeking, Levene's test p-value of .348 (see Table 31) was such that the null hypothesis was rejected. The main effect for completing their undergraduate studies in the United States and nationality were not significant ($p = .565$ and $.567$ respectively) (see Table 32). The p value of .960 failed to allow the researcher to reject the interaction null hypothesis at the .05 level (see Table 32). Therefore, there was no evidence that Chinese and American (nationality) means were different (combining across whether students did their undergraduate studies in the United States

or not) when comparing their scores on the CCTDI scale of truth-seeking, nor that there were differences between students who did their undergraduate studies in the United States or elsewhere (combining across nationality) in the population.

Table 31

Levene's Test of Equality of Error Variances for Truth-seeking Scale

| F | df1 | df2 | p |
|-------|-----|-----|------|
| 1.113 | 3 | 87 | .348 |

Table 32

Tests of Between-participants Effects for Truth-seeking Scale

| Source | Type III Sum of Squares | df | Mean Square | F | p | Partial Eta Squared | Noncent. Parameter | Observed Power ^b |
|---|-------------------------|----|-------------|---------|------|---------------------|--------------------|-----------------------------|
| Corrected Model | 96.138 ^a | 3 | 32.046 | .576 | .632 | .019 | 1.729 | .165 |
| Intercept | 17821.264 | 1 | 17821.264 | 320.455 | .000 | .786 | 320.455 | 1.000 |
| Nationality | 18.561 | 1 | 18.561 | .334 | .565 | .004 | .334 | .088 |
| Undergraduate_US_or_other | 18.397 | 1 | 18.397 | .331 | .567 | .004 | .331 | .088 |
| Nationality & Undergraduate_US_or_other | .143 | 1 | .143 | .003 | .960 | .000 | .003 | .050 |
| Error | 4838.279 | 87 | 55.612 | | | | | |
| Total | 115571.000 | 91 | | | | | | |
| Corrected Total | 4934.418 | 90 | | | | | | |

Note. a. R Squared = .019 (Adjusted R Squared = -.014); b. Computed using alpha = .05.

For the scale of open mindedness, Levene's test p-value of .025 (see Table 33) was significant and the null hypothesis was not rejected. However, the main effect for

completing their undergraduate studies in the United States and nationality were not significant ($p = .392$ and $.510$ respectively) (see Table 34). The p value of $.858$ failed to allow the researcher to reject the interaction null hypothesis at the $.05$ level (see Table 34). Therefore, there was no evidence that Chinese and American (nationality) means were different (combining across whether students did their undergraduate studies in the United States or not), when comparing their scores on the CCTDI scale of open mindedness, nor that there were differences between students who did their undergraduate studies in the United States or elsewhere (combining across nationality) in the population.

Table 33

Levene's Test of Equality of Error Variances for Open Mindedness Scale

| F | df1 | df2 | p |
|-------|-----|-----|------|
| 3.269 | 3 | 87 | .025 |

Table 34

Tests of Between-participants Effects for Open Mindedness Scale

| Source | Type III Sum of Squares | Estimated Marginal Means df | Mean Square | F | p | Partial Eta Squared | Noncent. Parameter | Observed Power ^b |
|--|-------------------------------|--------------------------------------|----------------|---------|------|---------------------------|-----------------------|--------------------------------|
| Corrected Model | 114.272 ^a | 3 | 38.091 | .914 | .438 | .031 | 2.743 | .243 |
| Intercept | 24878.453 | 1 | 24878.453 | 597.130 | .000 | .873 | 597.130 | 1.000 |
| Nationality | 30.861 | 1 | 30.861 | .741 | .392 | .008 | .741 | .136 |
| Undergraduate_US_ or_other | 18.236 | 1 | 18.236 | .438 | .510 | .005 | .438 | .100 |
| Nationality & Undergraduate_US_ or_other | 1.351 | 1 | 1.351 | .032 | .858 | .000 | .032 | .054 |
| Error | 3624.717 | 87 | 41.663 | | | | | |
| Total | 158932.000 | 91 | | | | | | |
| Corrected Total | 3738.989 | 90 | | | | | | |

For the scale of inquisitiveness, Levene's test p-value of .536 (see Table 35) was such that the null hypothesis was rejected. The main effect for completing their undergraduate studies in the United States and nationality were not significant and significant ($p = .686$ and $.041$ respectively) (see Table 36). There was no evidence that Chinese and American (nationality) means were different (combining across whether students did their undergraduate studies in the United States or not) when comparing their scores on the CCTDI scale of inquisitiveness, nor that there were differences between students who did their undergraduate studies in the United States or elsewhere (combining across nationality) in the population. The p value of .370 (see Table 36) failed to allow the researcher to reject the interaction null hypothesis at the .05 level;

however, when the means were examined (see Table 37), there was a significant difference between Chinese students who did their undergraduate studies in the United States and those who did not. There was a significant difference between means between the American students who did their undergraduate studies in the United States and those who did not. For both the Chinese and American, those students who completed their undergraduate studies in the United States fell in the positive score on the CCTDI and the ones who did not complete their undergraduate studies in the United States fell in the strong positive range of the CCTDI.

Table 35

Levene's Test of Equality of Error Variances for Inquisitiveness Scale

| F | df1 | df2 | p |
|------|-----|-----|------|
| .731 | 3 | 87 | .536 |

Table 36

Tests of Between-participants Effects for Inquisitiveness Scale

| Source | Type III Sum of Squares | df | Mean Square | F | p | Partial Eta Squared | Noncent. Parameter | Observed Power ^b |
|--|-------------------------|----|-------------|---------|------|---------------------|--------------------|-----------------------------|
| Corrected Model | 583.811 ^a | 3 | 194.604 | 3.221 | .027 | .100 | 9.664 | .724 |
| Intercept | 35135.762 | 1 | 35135.762 | 581.642 | .000 | .870 | 581.642 | 1.000 |
| Nationality | 9.954 | 1 | 9.954 | .165 | .686 | .002 | .165 | .069 |
| Undergraduate_US_or_others | 259.482 | 1 | 259.482 | 4.296 | .041 | .047 | 4.296 | .536 |
| Nationality & Undergraduate_US_or_others | 48.990 | 1 | 48.990 | .811 | .370 | .009 | .811 | .145 |
| Error | 5255.485 | 87 | 60.408 | | | | | |
| Total | 201536.000 | 91 | | | | | | |
| Corrected Total | 5839.297 | 90 | | | | | | |

Note. a. R Squared = .100 (Adjusted R Squared = .069); b. Computed using alpha = .05.

Table 37

Means and Standard Deviations by Nationality and Undergraduate in United States or Other for Inquisitiveness Scale

| Nationality | Undergraduate_US_other | Mean | Std. Deviation | N |
|-------------|--------------------------------|---------|----------------|----|
| American | Undergraduate in United States | 44.6735 | 8.05809 | 49 |
| | Undergraduate in Other | 57.0000 | . | 1 |
| | Total | 44.9200 | 8.16373 | 50 |
| Chinese | Undergraduate in United States | 46.7241 | 7.20564 | 29 |
| | Undergraduate in Other | 51.5833 | 7.89083 | 12 |
| | Total | 48.1463 | 7.64709 | 41 |

For the scale of analyticity, Levene's test p-value of .400 (see Table 38) was such that the null hypothesis was rejected. The main effect for completing their undergraduate studies in the United States and nationality were not significant ($p = .761$ and $.910$ respectively) (see Table 39). The p value of .855 failed to allow the researcher to reject the interaction null hypothesis at the .05 level (see Table 39). Therefore there was no evidence that Chinese and American (nationality) means were different (combining across whether students did their undergraduate studies in the United States or not) when comparing their scores on the CCTDI scale of analyticity, nor that there were differences between students who did their undergraduate studies in the United States or elsewhere (combining across nationality) in the population.

Table 38

Levene's Test of Equality of Error Variances for Analyticity Scale

| F | df1 | df2 | p |
|------|-----|-----|------|
| .993 | 3 | 87 | .400 |

Table 39

Tests of Between-participants Effects for Analyticity Scale

| Source | Type III Sum of Squares | df | Mean Square | F | p | Partial Eta Squared | Noncent. Parameter | Observed Power ^b |
|---|-------------------------|----|-------------|---------|------|---------------------|--------------------|-----------------------------|
| Corrected Model | 58.123 ^a | 3 | 19.374 | .467 | .706 | .016 | 1.402 | .141 |
| Intercept | 25975.822 | 1 | 25975.822 | 626.627 | .000 | .878 | 626.627 | 1.000 |
| Nationality | 3.846 | 1 | 3.846 | .093 | .761 | .001 | .093 | .060 |
| Undergraduate_US_or_other | .537 | 1 | .537 | .013 | .910 | .000 | .013 | .051 |
| Nationality & Undergraduate_US_or_other | 1.392 | 1 | 1.392 | .034 | .855 | .000 | .034 | .054 |
| Error | 3606.448 | 87 | 41.453 | | | | | |
| Total | 174167.000 | 91 | | | | | | |
| Corrected Total | 3664.571 | 90 | | | | | | |

Note. a. R Squared = .016 (Adjusted R Squared = -.018); b. Computed using alpha = .05

For the scale of systematicity, Levene's test p-value of .199 (see Table 40) was such that the null hypothesis was rejected. The main effect for completing their undergraduate studies in the United States and nationality were not significant ($p = .579$ and $.577$ respectively) (see Table 41). The p value of .285 failed to allow the researcher to reject the interaction null hypothesis at the .05 level. Therefore, there was no evidence

that Chinese and American (nationality) means were different (combining across whether students did their undergraduate studies in the United States or not) when comparing their scores on the CCTDI scale of systematicity, nor that there were differences between students who did their undergraduate studies in the United States or elsewhere (combining across nationality) in the population.

Table 40

Levene's Test of Equality of Error Variances for Systematicity Scale

| F | df1 | df2 | p |
|-------|-----|-----|------|
| 1.584 | 3 | 87 | .199 |

Table 41

Tests of Between-participants Effects for Systematicity Scale

| Source | Type III Sum of Squares | df | Mean Square | F | p | Partial Eta Squared | Noncent. Parameter | Observed Power ^b |
|--|-------------------------|----|-------------|---------|------|---------------------|--------------------|-----------------------------|
| Corrected Model | 108.823 ^a | 3 | 36.274 | .705 | .552 | .024 | 2.114 | .194 |
| Intercept | 24563.519 | 1 | 24563.519 | 477.058 | .000 | .846 | 477.058 | 1.000 |
| Nationality | 15.948 | 1 | 15.948 | .310 | .579 | .004 | .310 | .085 |
| Undergraduate_US_or _other | 16.178 | 1 | 16.178 | .314 | .577 | .004 | .314 | .086 |
| Nationality & Undergraduate_US_or _other | 59.644 | 1 | 59.644 | 1.158 | .285 | .013 | 1.158 | .186 |
| Error | 4479.594 | 87 | 51.490 | | | | | |
| Total | 153406.000 | 91 | | | | | | |
| Corrected Total | 4588.418 | 90 | | | | | | |

Note. a. R Squared = .024 (Adjusted R Squared = -.010); b. Computed using alpha = .05.

For the scale of confidence in reasoning, Levene's test p-value of .510 (see Table 42) was such that the null hypothesis was rejected. The main effect for completing their undergraduate studies in the United States and nationality were not significant ($p = .614$ and $.449$ respectively) (see Table 43). The p value of .595 (see Table 43) failed to allow the researcher to reject the interaction null hypothesis at the .05 level. Therefore this was no evidence that Chinese and American (nationality) means were different (combining across whether students did their undergraduate studies in the United States or not) when comparing their scores on the CCTDI scale of confidence in reasoning, nor that there were differences between students who did their undergraduate studies in the United States or elsewhere (combining across nationality) in the population.

Table 42

Levene's Test of Equality of Error Variances for Confidence in Reasoning Scale

| F | df1 | df2 | p |
|------|-----|-----|------|
| .777 | 3 | 87 | .510 |

Table 43

Tests of Between-participants Effects for Confidence in Reasoning Scale

| Source | Type III Sum of Squares | df | Mean Square | F | p | Partial Eta Squared | Noncent. Parameter | Observed Power ^b |
|--|-------------------------|----|-------------|---------|------|---------------------|--------------------|-----------------------------|
| Corrected Model | 36.337 ^a | 3 | 12.112 | .207 | .892 | .007 | .620 | .087 |
| Intercept | 30163.720 | 1 | 30163.720 | 514.518 | .000 | .855 | 514.518 | 1.000 |
| Nationality | 15.034 | 1 | 15.034 | .256 | .614 | .003 | .256 | .079 |
| Undergraduate_US_or _other | 33.861 | 1 | 33.861 | .578 | .449 | .007 | .578 | .117 |
| Nationality & Undergraduate_US_or _other | 16.726 | 1 | 16.726 | .285 | .595 | .003 | .285 | .083 |
| Error | 5100.388 | 87 | 58.625 | | | | | |
| Total | 188962.000 | 91 | | | | | | |
| Corrected Total | 5136.725 | 90 | | | | | | |

Note. a. R Squared = .007 (Adjusted R Squared = -.027); b. Computed using alpha = .05.

For the scale of maturity of judgment, Levene's test p-value of .391 (see Table 44) was such that the null hypothesis was rejected. The main effect for completing their undergraduate studies in the United States and nationality were not significant ($p = .284$ and $.705$ respectively) (see Table 45). The p value of .821 (see Table 45) failed to allow the researcher to reject the interaction null hypothesis at the .05 level. Therefore there was no evidence that Chinese and American (nationality) means were different (combining across whether students did their undergraduate studies in the United States or not) when comparing their scores on the CCTDI scale of maturity of judgment in reasoning, nor that there were differences between students who did their undergraduate studies in the United States or elsewhere (combining across nationality) in the population.

Table 44

Levene's Test of Equality of Error Variances for Maturity of Judgment Scale

| F | df1 | df2 | p |
|-------|-----|-----|------|
| 1.012 | 3 | 87 | .391 |

Table 45

Tests of Between-participants Effects for Maturity of Judgment Scale

| Source | Type III Sum of Squares | df | Mean Square | F | p | Partial Eta Squared | Noncent. Parameter | Observed Power ^b |
|---|-------------------------|----|-------------|---------|------|---------------------|--------------------|-----------------------------|
| Corrected Model | 312.477 ^a | 3 | 104.159 | 1.485 | .224 | .049 | 4.455 | .380 |
| Intercept | 25073.338 | 1 | 25073.338 | 357.433 | .000 | .804 | 357.433 | 1.000 |
| Nationality | 81.582 | 1 | 81.582 | 1.163 | .284 | .013 | 1.163 | .187 |
| Undergraduate_US_or_other | 10.145 | 1 | 10.145 | .145 | .705 | .002 | .145 | .066 |
| Nationality & Undergraduate_US_or_other | 3.622 | 1 | 3.622 | .052 | .821 | .001 | .052 | .056 |
| Error | 6102.908 | 87 | 70.148 | | | | | |
| Total | 164596.000 | 91 | | | | | | |
| Corrected Total | 6415.385 | 90 | | | | | | |

Note. a. R Squared = .049 (Adjusted R Squared = .016); b. Computed using alpha = .05.

This study also asked: Are the differences between Chinese and American students' scores consistent across disciplines?

H₀4: There is no consistency in the differences between Chinese and American students' scores on the CCTDI across disciplines.

A factorial ANOVA was computed on each of the seven scales. Using SPSS, Levene's test was used to compute the homogeneity of variance. When the p value was less than 0.05, the null hypothesis was rejected and findings were considered not significant. The results identified there was no significant difference; therefore, the researched failed to reject the null hypothesis. It was concluded that the discipline of study did not make a difference regarding students' scores on the CCTDI.

For the scale of truth-seeking, Levene's test p-value of .373 (see Table 46) was such that the null hypothesis was rejected. The main effect for nationality and discipline were not significant ($p = .295$ and $.322$ respectively) (see Table 47), thus neither null hypotheses were rejected. The p value of .286 failed to allow the researcher to reject the interaction null hypothesis at the .05 level (see Table 47). Therefore, there was no evidence that Chinese and American (nationality) means were different (combining across disciplines) when comparing their scores on the CCTDI scale of truth-seeking, or that the disciplines were different (combining across nationality) in the population.

Table 46

Levene's Test of Equality of Error Variances for Truth-seeking Scale

| F | df1 | df2 | p |
|-------|-----|-----|------|
| 1.054 | 3 | 87 | .373 |

Table 47

Tests of Between-participants Effects for Truth-seeking Scale

| Source | Type III Sum of Squares | df | Mean Square | F | p | Partial Eta Squared | Noncent. Parameter | Observed Power ^b |
|--------------------------|-------------------------|----|-------------|----------|------|---------------------|--------------------|-----------------------------|
| Corrected Model | 189.004 ^a | 3 | 63.001 | 1.155 | .332 | .038 | 3.465 | .301 |
| Intercept | 80317.926 | 1 | 80317.926 | 1472.508 | .000 | .944 | 1472.508 | 1.000 |
| Nationality | 60.666 | 1 | 60.666 | 1.112 | .295 | .013 | 1.112 | .181 |
| Discipline | 54.124 | 1 | 54.124 | .992 | .322 | .011 | .992 | .166 |
| Nationality & Discipline | 62.958 | 1 | 62.958 | 1.154 | .286 | .013 | 1.154 | .186 |
| Error | 4745.413 | 87 | 54.545 | | | | | |
| Total | 115571.000 | 91 | | | | | | |
| Corrected Total | 4934.418 | 90 | | | | | | |

Note. a. R Squared = .038 (Adjusted R Squared = .005); b. Computed using alpha = .05.

For the scale of open mindedness, Levene's test p-value of .023 (see Table 48) was significant. The main effect for nationality and discipline were not significant ($p = .273$ and $.898$ respectively) (see Table 49). The p value of .802 (see Table 49) failed to allow the researcher to reject the interaction null hypothesis at the .05 level. Therefore, there was no evidence that Chinese and American (nationality) means were different (combining across disciplines) when comparing their scores on the CCTDI scale of open mindedness, or that the disciplines were different (combining across nationality) in the population.

Table 48

Levene's Test of Equality of Error Variances for Open Mindedness Scale

| F | df1 | df2 | p |
|-------|-----|-----|------|
| 3.349 | 3 | 87 | .023 |

Table 49

Tests of Between-participants Effects for Open Mindedness Scale

| Source | Type III Sum of Squares | df | Mean Square | F | p | Partial Eta Squared | Noncent. Parameter | Observed Power ^b |
|--------------------------|-------------------------|----|-------------|----------|------|---------------------|--------------------|-----------------------------|
| Corrected Model | 85.750 ^a | 3 | 28.583 | .681 | .566 | .023 | 2.042 | .188 |
| Intercept | 113532.005 | 1 | 113532.005 | 2703.706 | .000 | .969 | 2703.706 | 1.000 |
| Nationality | 51.175 | 1 | 51.175 | 1.219 | .273 | .014 | 1.219 | .194 |
| Discipline | .695 | 1 | .695 | .017 | .898 | .000 | .017 | .052 |
| Nationality & Discipline | 2.666 | 1 | 2.666 | .063 | .802 | .001 | .063 | .057 |
| Error | 3653.239 | 87 | 41.991 | | | | | |
| Total | 158932.000 | 91 | | | | | | |
| Corrected Total | 3738.989 | 90 | | | | | | |

For the scale of inquisitiveness, Levene's test p-value of .859 (see Table 50) was such that the null hypothesis was rejected. The main effect for nationality and discipline were not significant ($p = .060$ and $.891$ respectively) (see Table 51). The p value of .160 (see Table 51) failed to allow the researcher to reject the interaction null hypothesis at the .05 level. Therefore, there was no evidence that Chinese and American (nationality) means were different (combining across disciplines) when comparing their scores on the

CCTDI scale of inquisitiveness, or that the disciplines were different (combining across nationality) in the population.

Table 50

Levene's Test of Equality of Error Variances for Inquisitiveness Scale

| F | df1 | df2 | p |
|------|-----|-----|------|
| .253 | 3 | 87 | .859 |

Table 51

Tests of Between-participants Effects for Inquisitiveness Scale

| Source | Type III Sum of Squares | df | Mean Square | F | p | Partial Eta Squared | Noncent. Parameter | Observed Power ^b |
|--------------------------|-------------------------|----|-------------|----------|------|---------------------|--------------------|-----------------------------|
| Corrected Model | 368.018 ^a | 3 | 122.673 | 1.951 | .127 | .063 | 5.852 | .487 |
| Intercept | 142076.998 | 1 | 142076.998 | 2259.197 | .000 | .963 | 2259.197 | 1.000 |
| Nationality | 228.702 | 1 | 228.702 | 3.637 | .060 | .040 | 3.637 | .471 |
| Discipline | 1.183 | 1 | 1.183 | .019 | .891 | .000 | .019 | .052 |
| Nationality & Discipline | 126.383 | 1 | 126.383 | 2.010 | .160 | .023 | 2.010 | .289 |
| Error | 5471.279 | 87 | 62.888 | | | | | |
| Total | 201536.000 | 91 | | | | | | |
| Corrected Total | 5839.297 | 90 | | | | | | |

Note. a. R Squared = .063 (Adjusted R Squared = .031); b. Computed using alpha = .05.

For the scale of analyticity, Levene's test p-value of .917 (see Table 52) was such that the null hypothesis was rejected. The main effect for nationality and discipline were not significant (p = .435 and .898 respectively) (see Table 53). The p value of .412 failed to allow the researcher to reject the interaction null hypothesis at the .05 level (see Table

53). Therefore, there was no evidence that Chinese and American (nationality) means were different (combining across disciplines) when comparing their scores on the CCTDI scale of analyticity, or that the disciplines were different (combining across nationality) in the population.

Table 52

Levene's Test of Equality of Error Variances for Analyticity Scale

| F | df1 | df2 | p |
|------|-----|-----|------|
| .169 | 3 | 87 | .917 |

Table 53

Tests of Between-participants Effects for Analyticity Scale

| Source | Type III Sum of Squares | df | Mean Square | F | p | Partial Eta Squared | Noncent. Parameter | Observed Power ^b |
|--------------------------|-------------------------|----|-------------|----------|------|---------------------|--------------------|-----------------------------|
| Corrected Model | 84.607 ^a | 3 | 28.202 | .685 | .563 | .023 | 2.056 | .190 |
| Intercept | 123776.357 | 1 | 123776.357 | 3008.003 | .000 | .972 | 3008.003 | 1.000 |
| Nationality | 25.346 | 1 | 25.346 | .616 | .435 | .007 | .616 | .121 |
| Discipline | .674 | 1 | .674 | .016 | .898 | .000 | .016 | .052 |
| Nationality & Discipline | 27.979 | 1 | 27.979 | .680 | .412 | .008 | .680 | .129 |
| Error | 3579.964 | 87 | 41.149 | | | | | |
| Total | 174167.000 | 91 | | | | | | |
| Corrected Total | 3664.571 | 90 | | | | | | |

Note. a. R Squared = .023 (Adjusted R Squared = -.011); b. Computed using alpha = .05.

For the scale of systematicity, Levene's test p-value of .366 (see Table 54) was such that the null hypothesis was rejected. The main effect for nationality and discipline

were not significant ($p = .318$ and $.820$ respectively) (see Table 55). The p value of $.408$ (see Table 55) failed to allow the researcher to reject the interaction null hypothesis at the $.05$ level. Therefore, there was no evidence that Chinese and American (nationality) means were different (combining across disciplines) when comparing their scores on the CCTDI scale of systematicity, or that the disciplines were different (combining across nationality) in the population.

Table 54

Levene's Test of Equality of Error Variances for Systematicity Scale

| F | df1 | df2 | p |
|-------|-----|-----|------|
| 1.071 | 3 | 87 | .366 |

Table 55

Tests of Between-participants Effects for Systematicity Scale

| Source | Type III Sum of Squares | df | Mean Square | F | p | Partial Eta Squared | Noncent. Parameter | Observed Power ^b |
|--------------------------|-------------------------|----|-------------|----------|------|---------------------|--------------------|-----------------------------|
| Corrected Model | 73.819 ^a | 3 | 24.606 | .474 | .701 | .016 | 1.423 | .142 |
| Intercept | 108355.064 | 1 | 108355.064 | 2088.090 | .000 | .960 | 2088.090 | 1.000 |
| Nationality | 52.402 | 1 | 52.402 | 1.010 | .318 | .011 | 1.010 | .169 |
| Discipline | 2.701 | 1 | 2.701 | .052 | .820 | .001 | .052 | .056 |
| Nationality & Discipline | 35.869 | 1 | 35.869 | .691 | .408 | .008 | .691 | .130 |
| Error | 4514.599 | 87 | 51.892 | | | | | |
| Total | 153406.000 | 91 | | | | | | |
| Corrected Total | 4588.418 | 90 | | | | | | |

Note. a. R Squared = $.016$ (Adjusted R Squared = $-.018$); b. Computed using alpha = $.05$.

For the scale of confidence in reasoning, Levene's test p-value of .643 (see Table 56) was such that the equality of error variances was not significant. The assumptions were not violated. The researcher went ahead with the factorial analysis of variance. The effect for nationality was not significant ($p = .478$ and $.740$ respectively) (see Table 57). However, when the researcher tested the interaction: Is the difference between Chinese and American students different for disciplines, the interaction was significant ($p = .050$) (see Table 57). The difference between the Chinese and American students on this scale was not the same for the two disciplines. This significant interaction led the researcher to view the descriptive statistics (see Table 58). The reason for the significance was the Chinese students in the category of science scored higher (Mean = 46.2800) on the CCTDI sub scale of confidence in reasoning than the American students in science (Mean = 41.333). However, in the case of the other discipline, the Chinese students scored lower (Mean = 43.2500) than the American students in this category (Mean = 45.5854).

Table 56

Levene's Test of Equality of Error Variances for Confidence in Reasoning Scale

| F | df1 | df2 | p |
|------|-----|-----|------|
| .559 | 3 | 87 | .643 |

Table 57

Tests of Between-participants Effects for Confidence in Reasoning Scale

| Source | Type III Sum of Squares | df | Mean Square | F | p | Partial Eta Squared | Noncent. Parameter | Observed Power ^b |
|--------------------------|-------------------------|----|-------------|----------|------|---------------------|--------------------|-----------------------------|
| Corrected Model | 224.734 ^a | 3 | 74.911 | 1.327 | .271 | .044 | 3.980 | .342 |
| Intercept | 130814.984 | 1 | 130814.984 | 2316.963 | .000 | .964 | 2316.963 | 1.000 |
| Nationality | 28.651 | 1 | 28.651 | .507 | .478 | .006 | .507 | .109 |
| Discipline | 6.275 | 1 | 6.275 | .111 | .740 | .001 | .111 | .063 |
| Nationality & Discipline | 222.805 | 1 | 222.805 | 3.946 | .050 | .043 | 3.946 | .502 |
| Error | 4911.991 | 87 | 56.460 | | | | | |
| Total | 188962.000 | 91 | | | | | | |
| Corrected Total | 5136.725 | 90 | | | | | | |

Note. a. R Squared = .044 (Adjusted R Squared = .011); b. Computed using alpha = .05.

Table 58

Means and Standard Deviations by Nationality and Discipline for Confidence in Reasoning Scale

| Nationality | Science_Other | Mean | Std. Deviation | N |
|-------------|---------------|---------|----------------|----|
| American | Other | 45.5854 | 7.61898 | 41 |
| | Science | 41.3333 | 7.88987 | 9 |
| Chinese | Other | 43.2500 | 8.53620 | 16 |
| | Science | 46.2800 | 6.45187 | 25 |

For the scale of maturity of judgment, Levene's test p-value of .842 (see Table 59) was such that the null hypothesis was rejected. The main effect for nationality and

discipline were significant and not significant ($p = .025$ and $.205$ respectively) (see Table 60). However, the p value of $.733$ fails to allow the researcher to reject the interaction null hypothesis at the $.05$ level (see Table 60).

Table 59

Levene's Test of Equality of Error Variances for Maturity of Judgment Scale

| F | df1 | df2 | p |
|------|-----|-----|------|
| .276 | 3 | 87 | .842 |

Table 60

Tests of Between-participants Effects for Maturity of Judgment Scale

| Source | Type III Sum of Squares | df | Mean Square | F | p | Partial Eta Squared | Noncent. Parameter | Observed Power ^b |
|--------------------------|-------------------------|----|-------------|----------|------|---------------------|--------------------|-----------------------------|
| Corrected Model | 432.098 ^a | 3 | 144.033 | 2.094 | .107 | .067 | 6.283 | .519 |
| Intercept | 116530.298 | 1 | 116530.298 | 1694.409 | .000 | .951 | 1694.409 | 1.000 |
| Nationality | 358.835 | 1 | 358.835 | 5.218 | .025 | .057 | 5.218 | .618 |
| Discipline | 111.932 | 1 | 111.932 | 1.628 | .205 | .018 | 1.628 | .243 |
| Nationality & Discipline | 8.044 | 1 | 8.044 | .117 | .733 | .001 | .117 | .063 |
| Error | 5983.286 | 87 | 68.773 | | | | | |
| Total | 164596.000 | 91 | | | | | | |
| Corrected Total | 6415.385 | 90 | | | | | | |

Note. a. R Squared = $.067$ (Adjusted R Squared = $.035$); b. Computed using $\alpha = .05$.

This study also asked: Are the differences between scores consistent between Chinese and American undergraduate and graduate students?

H₀₅: There is no consistency in the differences between Chinese and American students' scores on the CCTDI between undergraduate and graduate students.

A factorial ANOVA was computed on the each of the seven scales of the CCTDI. Using SPSS, Levene's test was used to compute the homogeneity of variance. The determination to retain or to reject the null hypothesis was based on the p value computed. When the p value was less than 0.05, the null hypothesis was rejected and findings were considered significant. The results identified that there was no significant difference; therefore the researched failed to reject the null hypothesis. It was concluded that being an undergraduate student or graduate student did not make a difference to the student's score on the total CCTDI and its seven scales.

For the scale of truth-seeking, Levene's test p-value of .122 (see Table 61) was such that the null hypothesis was rejected. The main effect for nationality and whether students were undergraduates or graduates were significant and not significant ($p = .029$ and $.062$ respectively) (see Table 62). The p value of $.087$ failed to allow the researcher to reject the interaction null hypothesis at the $.05$ level (see Table 62). Therefore, there was no evidence that Chinese and American (nationality) means were different (combining across undergraduate vs. graduate students) when comparing their scores on the CCTDI scale of truth-seeking, or that the categories of undergraduate or graduates were different (combining across nationality) in the population.

Table 61

Levene's Test of Equality of Error Variances for Truth-seeking Scale

| F | df1 | df2 | p |
|-------|-----|-----|------|
| 1.988 | 3 | 87 | .122 |

Table 62

Tests of Between-participants Effects for Truth-seeking Scale

| Source | Type III Sum of Squares | df | Mean Square | F | p | Partial Eta Squared | Noncent. Parameter | Observed Power ^b |
|--------------------------|-------------------------|----|-------------|----------|------|---------------------|--------------------|-----------------------------|
| Corrected Model | 294.968 ^a | 3 | 98.323 | 1.844 | .145 | .060 | 5.531 | .463 |
| Intercept | 56868.964 | 1 | 56868.964 | 1066.420 | .000 | .925 | 1066.420 | 1.000 |
| Nationality | 264.041 | 1 | 264.041 | 4.951 | .029 | .054 | 4.951 | .595 |
| Ugrad_Grad | 190.093 | 1 | 190.093 | 3.565 | .062 | .039 | 3.565 | .463 |
| Nationality & Ugrad_Grad | 160.056 | 1 | 160.056 | 3.001 | .087 | .033 | 3.001 | .403 |
| Error | 4639.450 | 87 | 53.327 | | | | | |
| Total | 115571.000 | 91 | | | | | | |
| Corrected Total | 4934.418 | 90 | | | | | | |

Note. a. R Squared = .060 (Adjusted R Squared = .027); b. Computed using alpha = .05.

For the scale of open mindedness, Levene's test p-value of .071 (see Table 63) was such that the null hypothesis was rejected. The main effect for nationality and whether students were undergraduates or graduates were both significant ($p = .012$ and $.039$ respectively) (see Table 64). However, there was no significance difference on the interaction as the p value of .146 failed to allow the researcher to reject the interaction null hypothesis at the .05 level (see Table 64). The descriptive statistics (see Table 65) showed that the means for American undergraduate and graduates were significantly different; however, both groups still fell into the positive range on the CCTDI.

Table 63

Levene's Test of Equality of Error Variances for Open Mindedness Scale

| F | df1 | df2 | p |
|-------|-----|-----|------|
| 2.424 | 3 | 87 | .071 |

Table 64

Tests of Between-participants Effects for Open Mindedness Scale

| Source | Type III Sum of Squares | df | Mean Square | F | p | Partial Eta Squared | Noncent. Parameter | Observed Power ^b |
|--------------------------|-------------------------|----|-------------|----------|------|---------------------|--------------------|-----------------------------|
| Corrected Model | 271.992 ^a | 3 | 90.664 | 2.275 | .085 | .073 | 6.825 | .557 |
| Intercept | 77522.264 | 1 | 77522.264 | 1945.326 | .000 | .957 | 1945.326 | 1.000 |
| Nationality | 261.294 | 1 | 261.294 | 6.557 | .012 | .070 | 6.557 | .716 |
| Ugrad_Grad | 175.805 | 1 | 175.805 | 4.412 | .039 | .048 | 4.412 | .547 |
| Nationality & Ugrad_Grad | 85.944 | 1 | 85.944 | 2.157 | .146 | .024 | 2.157 | .306 |
| Error | 3466.997 | 87 | 39.851 | | | | | |
| Total | 158932.000 | 91 | | | | | | |
| Corrected Total | 3738.989 | 90 | | | | | | |

Note. a. R Squared = .073 (Adjusted R Squared = .041); b. Computed using alpha = .05.

Table 65

Means and Standard Deviations by Nationality and Undergraduate and Graduate

Students for Open Mindedness Scale

| Nationality | Ugrad_Grad | Mean | Std. Deviation | N |
|-------------|------------|---------|----------------|----|
| American | Undergrad | 41.6087 | 7.01579 | 46 |
| | Graduate | 48.5000 | 7.00000 | 4 |
| | Total | 42.1600 | 7.19512 | 50 |
| Chinese | Undergrad | 39.5000 | 6.37704 | 16 |
| | Graduate | 40.7200 | 4.54166 | 25 |
| | Total | 40.2439 | 5.29047 | 41 |

For the scale of inquisitiveness, Levene's test p-value of .117 (see Table 66) was such that the null hypothesis was rejected. The main effect for nationality and whether students are undergraduates or graduates were not significant and significant ($p = .418$ and $.000$ respectively) (see Table 67). When comparing their scores on the interaction combining across nationality in the population, there was no difference. The p value of .379 failed to allow the researcher to reject the interaction null hypothesis at the .05 level (see Table 67). Therefore, there was no evidence that Chinese and American (nationality) were different.

Table 66

Levene's Test of Equality of Error Variances for Inquisitiveness Scale

| F | df1 | df2 | p |
|-------|-----|-----|------|
| 2.023 | 3 | 87 | .117 |

Table 67

Tests of Between-participants Effects for Inquisitiveness Scale

| Source | Type III Sum of Squares | df | Mean Square | F | p | Partial Eta Squared | Noncent. Parameter | Observed Power ^b |
|--------------------------|-------------------------|----|-------------|----------|------|---------------------|--------------------|-----------------------------|
| Corrected Model | 1031.885 ^a | 3 | 343.962 | 6.225 | .001 | .177 | 18.674 | .958 |
| Intercept | 100025.170 | 1 | 100025.170 | 1810.161 | .000 | .954 | 1810.161 | 1.000 |
| Nationality | 36.521 | 1 | 36.521 | .661 | .418 | .008 | .661 | .127 |
| Ugrad_Grad | 754.443 | 1 | 754.443 | 13.653 | .000 | .136 | 13.653 | .955 |
| Nationality & Ugrad_Grad | 43.247 | 1 | 43.247 | .783 | .379 | .009 | .783 | .141 |
| Error | 4807.412 | 87 | 55.258 | | | | | |
| Total | 201536.000 | 91 | | | | | | |
| Corrected Total | 5839.297 | 90 | | | | | | |

Note. a. R Squared = .177 (Adjusted R Squared = .148); b. Computed using alpha = .05.

For the scale of analyticity, Levene's test p-value of .755 (see Table 68) was such that the null hypothesis was rejected. The main effect for nationality and whether students were undergraduates or graduates were both significant ($p = .021$ and $.007$ respectively) (see Table 69). The p value of .883 failed to allow the researcher to reject the interaction null hypothesis at the .05 level (see Table 69). Therefore there was no evidence that Chinese and American (nationality) means were different (combining across undergraduate vs. graduate students), when comparing their scores on the CCTDI scale of analyticity.

Table 68

Levene's Test of Equality of Error Variances for Analyticity Scale

| F | df1 | df2 | p |
|------|-----|-----|------|
| .397 | 3 | 87 | .755 |

Table 69

Tests of Between-participants Effects for Analyticity Scale

| Source | Type III Sum of Squares | df | Mean Square | F | p | Partial Eta Squared | Noncent. Parameter | Observed Power ^b |
|--------------------------|-------------------------|----|-------------|----------|------|---------------------|--------------------|-----------------------------|
| Corrected Model | 397.890 ^a | 3 | 132.630 | 3.532 | .018 | .109 | 10.597 | .767 |
| Intercept | 83074.425 | 1 | 83074.425 | 2212.482 | .000 | .962 | 2212.482 | 1.000 |
| Nationality | 207.290 | 1 | 207.290 | 5.521 | .021 | .060 | 5.521 | .642 |
| Ugrad_Grad | 284.434 | 1 | 284.434 | 7.575 | .007 | .080 | 7.575 | .777 |
| Nationality & Ugrad_Grad | .815 | 1 | .815 | .022 | .883 | .000 | .022 | .052 |
| Error | 3266.682 | 87 | 37.548 | | | | | |
| Total | 174167.000 | 91 | | | | | | |
| Corrected Total | 3664.571 | 90 | | | | | | |

Note. a. R Squared = .109 (Adjusted R Squared = .078); b. Computed using alpha = .05.

For the scale of systematicity, Levene's test p-value of .858 (see Table 70) was such that the null hypothesis was rejected. The main effect for nationality and whether students were undergraduates or graduates were not significant and significant ($p = .630$ and $.034$ respectively) (see Table 71). The p value of .865 failed to allow the researcher to reject the interaction null hypothesis at the .05 level (see Table 71).

Table 70

Levene's Test of Equality of Error Variances for Systematicity Scale

| F | df1 | df2 | p |
|------|-----|-----|------|
| .255 | 3 | 87 | .858 |

Table 71

Tests of Between-participants Effects for Systematicity Scale

| Source | Type III Sum of Squares | df | Mean Square | F | p | Partial Eta Squared | Noncent. Parameter | Observed Power ^b |
|--------------------------|-------------------------|----|-------------|----------|------|---------------------|--------------------|-----------------------------|
| Corrected Model | 342.599 ^a | 3 | 114.200 | 2.340 | .079 | .075 | 7.020 | .570 |
| Intercept | 72286.930 | 1 | 72286.930 | 1481.213 | .000 | .945 | 1481.213 | 1.000 |
| Nationality | 11.414 | 1 | 11.414 | .234 | .630 | .003 | .234 | .077 |
| Ugrad_Grad | 225.343 | 1 | 225.343 | 4.617 | .034 | .050 | 4.617 | .566 |
| Nationality & Ugrad_Grad | 1.411 | 1 | 1.411 | .029 | .865 | .000 | .029 | .053 |
| Error | 4245.818 | 87 | 48.803 | | | | | |
| Total | 153406.000 | 91 | | | | | | |
| Corrected Total | 4588.418 | 90 | | | | | | |

Note. a. R Squared = .075 (Adjusted R Squared = .043); b. Computed using alpha = .05.

For the scale of confidence in reasoning, Levene's test p-value of .060 (see Table 72) was such that the null hypothesis was rejected. The main effect for nationality and whether students were undergraduates or graduates were not significant and significant ($p = .282$ and $.023$ respectively) (see Table 73). The p value of .947 failed to allow the researcher to reject the interaction null hypothesis at the .05 level (see Table 73).

Table 72

Levene's Test of Equality of Error Variances for Confidence in Reasoning Scale

| F | df1 | df2 | p |
|-------|-----|-----|------|
| 2.561 | 3 | 87 | .060 |

Table 73

Tests of Between-participants Effects for Confidence in Reasoning Scale

| Source | Type III Sum of Squares | df | Mean Square | F | p | Partial Eta Squared | Noncent. Parameter | Observed Power ^b |
|--------------------------|-------------------------|----|-------------|----------|------|---------------------|--------------------|-----------------------------|
| Corrected Model | 380.136 ^a | 3 | 126.712 | 2.318 | .081 | .074 | 6.953 | .565 |
| Intercept | 89412.762 | 1 | 89412.762 | 1635.397 | .000 | .949 | 1635.397 | 1.000 |
| Nationality | 64.171 | 1 | 64.171 | 1.174 | .282 | .013 | 1.174 | .188 |
| Ugrad_Grad | 293.166 | 1 | 293.166 | 5.362 | .023 | .058 | 5.362 | .629 |
| Nationality & Ugrad_Grad | .241 | 1 | .241 | .004 | .947 | .000 | .004 | .050 |
| Error | 4756.590 | 87 | 54.673 | | | | | |
| Total | 188962.000 | 91 | | | | | | |
| Corrected Total | 5136.725 | 90 | | | | | | |

Note. a. R Squared = .074 (Adjusted R Squared = .042); b. Computed using alpha = .05.

For the scale of maturity of judgment, Levene's test p-value of .606 (see Table 74) was such that the null hypothesis was rejected. The main effect for nationality and whether students are undergraduates or graduates were both significant ($p = .004$ and $.046$ respectively) (see Table 75). However, the p value of .161 failed to allow the researcher to reject the interaction null hypothesis at the .05 level (see Table 75).

Table 74

Levene's Test of Equality of Error Variances for Maturity of Judgment Scale

| F | df1 | df2 | p |
|------|-----|-----|------|
| .617 | 3 | 87 | .606 |

Table 75

Tests of Between-participants Effects for Maturity of Judgment Scale

| Source | Type III Sum of Squares | df | Mean Square | F | p | Partial Eta Squared | Noncent. Parameter | Observed Power ^b |
|--------------------------|-------------------------|----|-------------|----------|------|---------------------|--------------------|-----------------------------|
| Corrected Model | 596.160 ^a | 3 | 198.720 | 2.971 | .036 | .093 | 8.913 | .685 |
| Intercept | 79910.235 | 1 | 79910.235 | 1194.694 | .000 | .932 | 1194.694 | 1.000 |
| Nationality | 591.017 | 1 | 591.017 | 8.836 | .004 | .092 | 8.836 | .836 |
| Ugrad_Grad | 274.084 | 1 | 274.084 | 4.098 | .046 | .045 | 4.098 | .517 |
| Nationality & Ugrad_Grad | 133.482 | 1 | 133.482 | 1.996 | .161 | .022 | 1.996 | .287 |
| Error | 5819.225 | 87 | 66.888 | | | | | |
| Total | 164596.000 | 91 | | | | | | |
| Corrected Total | 6415.385 | 90 | | | | | | |

Note. a. R Squared = .093 (Adjusted R Squared = .062); b. Computed using alpha = .05.

This study also asked: Is there a relationship between the number of years Chinese students have been in the United States and their scores on the CCTDI?

H₀₆: There is no relationship between the number of years Chinese students have been in the United States and their scores on the CCTDI.

A Pearson's correlation was computed on the total score of the CCTDI and on each of the seven scales for the Chinese students. Using SPSS, the relationship was

computed and as Tables 76 through 83 indicate, there was not significant correlation between U.S. tenure and the scores on the seven sub-scales of the CCTDI. It is important to note that only ten participants answered this question on the demographic questionnaire and therefore due to the small number, it may have affected the outcome of the analysis.

Table 76

Correlation Showing the CCTDI Total Score and Time in the United States

| | | CCTDI Total Score | Time_in_US |
|-------------------|-----------------------|-------------------|------------|
| CCTDI Total Score | Pearson's correlation | 1 | .275 |
| | Sig. (2-tailed) | | .441 |
| | N | 41 | 10 |
| Time_in_US | Pearson's correlation | .275 | 1 |
| | Sig. (2-tailed) | .441 | |
| | N | 10 | 10 |

Table 77

Correlation Showing the Scale of Truth-seeking on the CCTDI and Time in the United States

| | | Time_in_US | Truth-Seeking |
|---------------|-----------------------|------------|---------------|
| Time_in_US | Pearson's correlation | 1 | .178 |
| | Sig. (2-tailed) | | .624 |
| | N | 10 | 10 |
| Truth-seeking | Pearson's correlation | .178 | 1 |
| | Sig. (2-tailed) | .624 | |
| | N | 10 | 41 |

Table 78

Correlation Showing the Scale of Open Mindedness on the CCTDI and Time in the United States

| | | Time_in_US | Open Mindedness |
|-----------------|-----------------------|------------|-----------------|
| Time_in_US | Pearson's correlation | 1 | .177 |
| | Sig. (2-tailed) | | .625 |
| | N | 10 | 10 |
| Open Mindedness | Pearson's correlation | .177 | 1 |
| | Sig. (2-tailed) | .625 | |
| | N | 10 | 41 |

Table 79

Correlation Showing the Scale of Inquisitiveness on the CCTDI and Time in the United States

| | | Time_in_US | Inquisitiveness |
|-----------------|-----------------------|------------|-----------------|
| Time_in_US | Pearson's correlation | 1 | .158 |
| | Sig. (2-tailed) | | .664 |
| | N | 10 | 10 |
| Inquisitiveness | Pearson's correlation | .158 | 1 |
| | Sig. (2-tailed) | .664 | |
| | N | 10 | 41 |

Table 80

Correlation Showing the Scale of Analyticity on the CCTDI and Time in the United States

| | | Time_in_US | Analyticity |
|-------------|-----------------------|------------|-------------|
| Time_in_US | Pearson's correlation | 1 | .263 |
| | Sig. (2-tailed) | | .464 |
| | N | 10 | 10 |
| Analyticity | Pearson's correlation | .263 | 1 |
| | Sig. (2-tailed) | .464 | |
| | N | 10 | 41 |

Table 81

Correlation Showing the Scale of Systematicity on the CCTDI and Time in the United States

| | | Time_in_US | Systematicity |
|---------------|-----------------------|------------|---------------|
| Time_in_US | Pearson's correlation | 1 | .166 |
| | Sig. (2-tailed) | | .647 |
| | N | 10 | 10 |
| Systematicity | Pearson's correlation | .166 | 1 |
| | Sig. (2-tailed) | .647 | |
| | N | 10 | 41 |

Table 82

Correlation Showing the Scale of Confidence in Reasoning on the CCTDI and Time in the United States

| | | Time_in_US | Confidence in Reasoning |
|-------------------------|-----------------------|------------|-------------------------|
| Time_in_US | Pearson's correlation | 1 | .312 |
| | Sig. (2-tailed) | | .380 |
| | N | 10 | 10 |
| Confidence in Reasoning | Pearson's correlation | .312 | 1 |
| | Sig. (2-tailed) | .380 | |
| | N | 10 | 41 |

Table 83

Correlation Showing the Scale of Maturity of Judgment on the CCTDI and Time in the United States

| | | Time_in_US | Maturing of Judgment |
|----------------------|-----------------------|------------|----------------------|
| Time_in_US | Pearson's correlation | 1 | .083 |
| | Sig. (2-tailed) | | .820 |
| | N | 10 | 10 |
| Maturity of Judgment | Pearson's correlation | .083 | 1 |
| | Sig. (2-tailed) | .820 | |
| | N | 10 | 41 |

Chapter Summary

This chapter rendered the results of the research study. At the beginning of the chapter, sample demographics information was presented (see Table 6), together with the research questions and the null hypotheses. This chapter also included the findings of all of the research questions.

The researcher failed to reject all of the hypotheses for the main research question. No differences were found between Chinese and American undergraduate and graduate students on their scores on the seven scales of the CCTDI: truth-seeking, open mindedness, inquisitiveness, analyticity, systematicity, confidence in reasoning, and maturity of judgment.

A factorial analysis of variance measured the moderator questions that included determining whether the difference between Chinese and American students' CCTDI

scores (see Tables 16 through 83) was influenced by other variables including: gender, whether belonging to a social group made a difference, discipline of study, whether the students were an undergraduate or graduate student, and whether the students did their undergraduate studies within the United States. The analysis concluded that there were significant differences between the critical thinking dispositions of Chinese and American undergraduate and graduate students when comparing the scale of open mindedness and gender. The interaction was significant ($p = .007$). The reason for the significance was the American females scored higher than the Chinese females and the Chinese males scored higher than the American males on the CCTDI sub scale of open mindedness. The Chinese males were in the positive range of the CCTDI scale of open-mindedness and the Chinese females were in the ambivalent range. The American females were in the positive range of the CCTDI scale and the American males were in the ambivalent range. For the remaining sub-scales on the CCTDI and gender, there were no significant differences.

For the moderator factors of belonging to a social group, there were no significant effects. For the scale of confidence in reasoning, when the researcher tested the interaction: Is the difference between Chinese and American students different for disciplines, the interaction was significant ($p = .050$). The difference between the Chinese and American students on this scale was not the same for the two disciplines. Chinese students in the category of science scored higher on the CCTDI sub scale of confidence in reasoning than the American students in science. However, in the case of the other discipline, the Chinese students scored lower than the American students in this category. It should be noted that all scores fell into the positive range of the CCTDI

scale. For the remaining sub-scales for discipline of study, there were no significant differences. For the moderator factors of whether the students were an undergraduate or graduate student, and whether the students did their undergraduate studies within the United States the analysis concluded that there were no significant differences between the critical thinking disposition scores and these factors.

Finally a Pearson's correlation was conducted (see Tables 76 through 83) to determine whether there was a relationship between the length of time students had been in the United States and their scores on the CCTDI. The Pearson's correlation determined there was no relationship. Chapter Five provides the conclusion, discusses the limitations of the research study, and offers recommendations.

CHAPTER 5. CONCLUSIONS, DISCUSSION, AND RECOMMENDATIONS

Chapter Four provided the data analysis and the findings of the study. Each research question and null hypotheses were examined with corresponding data analysis methods. This chapter begins to provide conclusions, discussion, limitations, and further recommendations of this research study.

Purpose of the Study

The purpose of this study was to compare the critical thinking dispositions between undergraduate and graduate Chinese and American college students across disciplines.

Research Questions and Null Hypotheses

This study sought to answer the following question: Are there differences between Chinese and American students' scores on the individual seven scales of the CCTDI?

H₀1: There are no differences between Chinese and American students' scores on the CCTDI.

The study helped to answer this question along with the following subquestions that were posed:

1. Are the differences between Chinese and American students' scores on the CCTDI consistent between male and female students?

H₀2: There is no consistency in the differences in the Chinese and American students' scores on the CCTDI between male and female students.

2. Are the differences consistent between Chinese and American students who did their undergraduate studies in the United States and those who did not do their undergraduate studies in the United States?

H₀3: There is no consistency in the differences between Chinese and American students' scores on the CCTDI between students who did their undergraduate studies in the United States and those who did not do their undergraduate studies in the United States.

3. Are the differences between Chinese and American students' scores consistent across areas (disciplines)?

H₀4: There is no consistency in the differences between Chinese and American students' scores on the CCTDI across disciplines.

4. Are the differences between Chinese and American students' scores consistent between undergraduate and graduate students?

H₀5: There is no consistency in the differences between Chinese and American students' scores on the CCTDI between undergraduate and graduate students.

5. Is there a relationship between the number of years that Chinese students have resided in the United States and their scores on the CCTDI?

H₀6: There is no relationship between the number of years Chinese students have been in the United States and their scores on the CCTDI.

Conclusions

The results of the data analysis are summarized in this section.

This study sought to answer the following question: Are there differences between Chinese and American students' scores on the individual seven scales of the CCTDI?

H₀1: There are no differences between Chinese and American students' scores on the CCTDI.

The researcher failed to reject the null hypothesis. The results showed no statistical difference in the level of change of differences between Chinese and American students' score on the CCTDI on all seven scales: truth-seeking, open-mindedness, inquisitiveness, analyticity, systematicity, confidence in reasoning, and maturity of judgment.

The study helped to answer this question along with the following subquestions that were posed:

1. Are the differences between Chinese and American students' scores on the CCTDI consistent between male and female students?

H₀2: There is no consistency in the differences in the Chinese and American students' scores on the CCTDI between male and female students.

The researcher failed to reject the null hypothesis on six scales: truth-seeking, inquisitiveness, analyticity, systematicity, confidence in reasoning and maturity of judgment. The results showed no statistical difference in the level of differences between Chinese and American students' score on the CCTDI on the six scales. However the researcher rejected the null on the sub-scale of open-mindedness. There was a statistical

difference in the level of differences between Chinese and American students' scores on the CCTDI sub-scale of open-mindedness between male and female students.

2. Are the differences between Chinese and American students' scores consistent between students who did their undergraduate studies in the United States and those who did not do their undergraduate studies in the United States?

H₀3: There is no consistency in the differences between Chinese and American students' scores on the CCTDI between students who did their undergraduate studies in the United States and those who did not do their undergraduate studies in the United States.

The researcher failed to reject the null hypothesis. The results showed no statistical difference in the level of change of differences between students who did their undergraduate studies in the United States and those who did not do their undergraduate studies in the United States, and Chinese and American students' scores on the CCTDI on all seven scales: truth-seeking, open-mindedness, inquisitiveness, analyticity, systematicity, confidence in reasoning, and maturity of judgment.

3. Are the differences between Chinese and American students' scores consistent across disciplines?

H₀4: There is no consistency in the differences between Chinese and American students' scores on the CCTDI across disciplines.

The researcher failed to reject the null hypothesis for six sub-scales on the CCTDI. The results showed no statistical difference in the level of difference between the disciplines and Chinese and American students' score on the CCTDI on the following six scales: truth-seeking, open-mindedness, inquisitiveness, analyticity, systematicity, and

maturity of judgment. For the scale of confidence in reasoning, the researcher rejected the null hypothesis. The results showed a statistical effect in the level of difference between the disciplines and Chinese and American students' score on the CCTDI sub-scale of confidence in reasoning. Chinese students in the category of science scored higher on the CCTDI sub scale of confidence in reasoning than the American students in science. However, in the case of the other discipline, the Chinese students scored lower than the American students in this category. It should be noted that all scores fell into the positive range of the CCTDI scale. For the remaining sub-scales for discipline of study, there were no significant differences.

4. Are the differences between Chinese and American students' scores consistent between undergraduate and graduate students?

H₀5: There is no consistency in the differences between Chinese and American students' scores on the CCTDI between undergraduate and graduate students.

The researcher failed to reject the null hypothesis. The results showed no statistical difference in the level of differences between undergraduate and graduate Chinese and American students' score on the CCTDI on all seven scales: truth-seeking, open-mindedness, inquisitiveness, analyticity, systematicity, confidence in reasoning, and maturity of judgment.

5. Is there a relationship between the number of years Chinese students have been in the United States and their scores on the CCTDI?

H₀6: There is no relationship between the number of years Chinese students have been in the United States and their scores on the CCTDI.

The researcher failed to reject the null hypothesis. The results showed no statistical relationship between the number of years Chinese students have been in the United States and their scores on each of the individual scales of the CCTDI: truth-seeking, open-mindedness, inquisitiveness, analyticity, systematicity, confidence in reasoning, and maturity of judgment.

Discussion

This study had similar findings to a study conducted by Biber et al. (2013) when measuring the critical thinking skills of 99 mathematics teacher candidates at a university in Turkey and used the following variables: grade level in college, high school, gender, and the teacher's reading practice. When scored on the CCTDI, the results indicated that the critical thinking skills did not change significantly the longer the participants were in school, and there were no significant differences between male and females' scores on the CCTDI.

The results of the study might have been impacted by factors not measured in this research study. It is possible that globalization may have influenced the results. As stated earlier, China realizes the need to develop the critical thinking dispositions of higher education students (Zhao, 2011). The *2020 Blueprint* (Zhao, 2011) is China's evidence of committing to improve China's higher education. The vision to replace a memorization style of learning with more of a critical thinking approach to learning and problem-solving may actually be taking place. Additional recent research studies are needed to measure the more recent critical thinking dispositions of students from China. The research may help to increase more international exchange between countries should the findings identify that critical thinking dispositions have improved since coming to the

United States. To help with measurement, it may be wise to offer a pre-test and post-test. Chinese students could be tested before they leave China to come to the United States and then these students may be tested again after a period of time in the country.

Another question arose, as a result of the findings, was whether students in China who were interested in traveling to another country to study may have already possessed critical thinking dispositions rather than students who had no interest in studying abroad. This question was not addressed in this study. However, the disordinal interaction of differences between the critical thinking dispositions of Chinese and American students when comparing the scale of open mindedness and gender indicates that this disposition is note-worthy. American females scored higher than the Chinese females and the Chinese males scored higher than the American males for open mindedness.

A possible reason might be that the Chinese males in this research study decided to leave China to study and therefore it is possible they may have already had disposition to be open minded. American females may have been raised in a culture of open mindedness and the Chinese females may not. Again, more research with a larger population is encouraged.

There was no consideration in this particular research study of students' prior experiences. As Glaser (1942) stated, experiences can be a foundation to support problem-solving and critical thinking when making a decision. Future studies may include a qualitative part to include a demographic questionnaire that asks students to share their past experiences. Mezirow (1991) agrees that reflecting on experiences is important to learning. He stressed the importance of interpretation and giving meaning to situations. A measurement of the students' dispositions on the CCTDI at the end of their

American university experience may assist in determining whether reflection developed their critical thinking dispositions while in the United States.

The study did not consider FAU's instructors' methods to help students develop critical thinking dispositions. It is possible that instructors were already incorporating learning activities in the classroom to strengthen critical thinking dispositions. As stated earlier, Paul and Elder (2010) mentioned that when instructors encourage the connection between theory and application in the classroom, students can develop their critical thinking styles.

Thirteen years ago, organizations' opinions regarding the quality of adult training and educational courses in China were recommended to the China Enterprise Confederation. Critical thinking, organizational, problem-solving, teamwork and communication skills were identified as needing improvement (Dahlman et al., 2007). It is possible that China took the information seriously and made changes within its higher educational system to develop critical thinking, problem-solving, teamwork, organizational, and communication skills. Certainly instructors from the United States have been invited to teach in Chinese universities. Perhaps the change is coming to fruition and the results from this study are evidence that at last, change is occurring in China. Perhaps we are seeing education moving away from a rote style of learning to more of a critical thinking approach.

The literature supports that critical thinking is an important skill necessary for problem for problem-solving and in decision-making. Learning is assisted when both traditional students and adult learners possess dispositions to think critically (Insight Assessment, 2013). There is a possibility that the Chinese and Western styles of

leadership and management have arrived at a similar juncture and share the view that there is a continuing need for adults to demonstrate critical thinking mindsets, and by providing activities and opportunities to develop these skills, may help to alleviate costly mistakes incurred due to poor decision-making. Chinese and American educators may have increased student engagement for both the traditional-aged college learners and adult learners, and may be more sensitive to the differences in learning and the use of a variety of teaching techniques to encourage critical thinking. Merriam et al. (2007) point out that problem-solving skills need to be continuously developed in order to cultivate growth needed to perform future jobs in organizations and that critical thinking skills may form a strong foundation for future leaders in the world to use.

In this research study there was a significant interaction between nationality and discipline. Chinese students in science scored higher than students in the category of the other discipline for the sub scale of confidence in reasoning. However, for the other discipline Chinese students scored lower than the American students. Included in the category of science were math, chemistry, science, and nursing. It might be that these topics attract students who have been educated in how to solve problems and to make decisions and to trust their reasoning ability. Again, more research is needed across additional disciplines and with a larger population. Included in the other discipline were art, education, and non-declared. Since the Chinese students scored lower than the American students, a reason might be that the Chinese students have not had any studies that focused on or encouraged critical thinking.

This study is significant because it contributes to the literature. Although the results found few differences between the critical thinking dispositions between the

Chinese and American students, this study leads to the need for future studies. This research is valuable to instructors of students and adults because there is a need to continue to develop learning activities to encourage and develop critical thinking dispositions, therefore possibly impacting future teaching methods. Educators and instructors of adult learners may use the learner's critical thinking profile prior to participating in the education or learning activity to determine where the student's disposition to critical thinking falls. Instructional activities may be tailored to maximize the use of the learning activities to develop critical thinking dispositions. The results of the CCTDI may be an excellent foundation on which to base future learning activities.

FAU may find this research study useful since the sample included FAU's own students. The literature emphasized the importance of critical thinking dispositions and these results form a breakdown of critical thinking dispositions. FAU can continue to reinforce learning activities that nurture the development of critical thinking. The results can be used to help with marketing the school for the for the university's international program.

Adult learners will benefit from the results of the study because instructors of adult learners understand the importance of critical thinking and can incorporate activities to encourage the development of critical thinking. The CCTDI may be used as a tool to measure employees' and adult learners' critical thinking dispositions in order to serve as a baseline measurement. Activities may be structured around areas where certain scales on the CCTDI need to be developed. As organizations continue to compete in the global marketplace for employees that possess dispositions to think critically, organizations can incorporate activities in training programs to build critical thinking dispositions. This

research study may also form the path for future studies that may be performed across other universities and with larger samples with similar contextual variables.

Recommendations for Future Research

Based on this study, the following are recommendations for future research:

1. Since it was difficult to quantify the length of time students had been in the United States for the purpose of the analysis, a pilot study using the demographic questionnaire should be developed so that the questions asked can be tested prior to the research study being conducted.
2. Since students volunteered to participate in the study, it was very difficult for the researcher to obtain an equal sample of 50 Chinese students and 50 American students. There were 41 Chinese students and 50 American students who participated in the study. Further, the university only had a total population of 63 Chinese students (including both undergraduate and graduate students), and obtaining a sample of 50 proved to be too difficult. This study should be replicated with different universities and larger sample to see whether the results would be the same. If the power were greater the researcher may have rejected more hypotheses.
3. One instrument was used to measure critical thinking dispositions: the CCTDI. Though the instrument was viewed as a valid instrument, the test may have been normed on a larger population sample.
4. The study was conducted at the end of the summer semester and at the beginning of the fall semester. There may have been factors that contributed to the students' critical thinking dispositions. Their reading ability or use of language on the

exam. No evidence was provided about the past educational success of the students and other experiences the students' may have had prior to coming to this particular school or any work experiences. Therefore the study is only generalizable to institutions similar to this particular institution with similar characteristics.

5. Another important factor to consider when interpreting the results of this research study is the proportion of undergraduate and graduate students in the sample. In this sample, there were 25 Chinese graduate students and there were 16 undergraduate Chinese students. It is possible that graduate Chinese students may have a stronger disposition toward critical thinking than undergraduate Chinese students and undergraduate American students simply because graduate students have more education than undergraduate students. It is also possible that the time already spent in the United States influenced the level of critical thinking dispositions of the Chinese students. It might be worthwhile to test the Chinese students' critical thinking dispositions before they come to the United States, or immediately upon arrival. It may also be useful to conduct studies with only US students who are in the US in order to have a consistent sample.
6. A question arises as to whether a Chinese student who is interested in attending college in another country, such as the United States, may have a higher critical thinking disposition than a student who is not interested in attending college in another country. Therefore, it would be useful to compare the scores between the students who come to the United States from China and the students who choose to remain in China to study.

7. Additional variables should be included on the demographic questionnaire to measure moderator questions.
8. There were more Chinese graduate students than American graduate students; therefore, American graduate students should be compared with Chinese graduate students rather than a mix of undergraduate and graduate students as was done in this study.
9. Additional research is recommended to include students who have taken the Program of International Study Assessment (PISA) and compare their scores on the PISA to their scores on the CCTDI. The PISA was a study conducted by the Organization for Economic Cooperation and Development (OECD). The study reviews the students' performance on an educational standard and compared across various countries; including China (Yore, Anderson, & Chiu, 2010).
10. Further research should include mixed methods so that more qualitative detail may be gathered and with an older population rather than college students to determine whether critical thinking dispositions change as people age. The length of time the students were in the US may have impacted the study.

Final Thoughts

This research study set out to explore the differences between the critical thinking dispositions between Chinese and American undergraduate and graduate college students. The study took place at one university in southeast Florida. Although this research study had limitations due to its small sample size and limitation to only one university, the findings in this research study are important to the educational setting both within higher education and in learning for adults in organizations.

SPSS was used to analyze the data; independent t-tests were used to analyze the first research question, factorial analysis of variance was used to analyze the moderator questions, and a Pearson's correlation was used to measure the correlation question. Although this particular research study found no significant differences between the scales: truth-seeking, open-mindedness, inquisitiveness, analyticity, systematicity, confidence in reasoning, and maturity of judgment on the critical thinking dispositions among Chinese and American undergraduate and graduate students, the study contributes to the literature and paves the way for future studies.

The literature did support that there are differences between the way students and adults are educated in China and the way students are educated in the United States. Data exists that shows that there is a more passive and pedagogical approach to education and learning in China, where as in the United States, there is a more andragogical approach to learning and education. There have been many studies using the CCTDI in order to compare critical thinking dispositions across a variety of samples sets.

When considering the importance of critical thinking and the many consequences of weak critical thinking skills, such as mistakes that become costly due to not analyzing a problem adequately or not reflecting on an action and thus resulting in making a poor future decision (Insight Assessment, 2013), it is crucial that educators and instructors of adults focus on how to develop these critical thinking skills. To summarize Bryan (2013), there are jobs in the world that have not been created yet. It is important that universities and organizations prepare students and adult learners for these jobs. Students and adults who have the ability to think creatively, be adaptive, and have the dispositions

to think critically, may be better equipped for these jobs than those individuals who do not possess the skills.

APPENDIXES

Appendix A. Student Characteristics Questionnaire

Code Number: _____

Would you like to have the results of your assessment emailed to you? Yes No

Please provide email address of where the assessment will be emailed to you

Please take a few minutes to answer these questions related to student characteristics.
Please check the box associated with your answer.

Nationality: American Chinese if Chinese indicate mainland China
Taiwan Other _____

If you are a nationality other than American, how long have you been in the US?

Less than 1 year

More than 1 year and less than 3 years

More than 3 years and less than 5 year's

More than 5 years

Gender: Male Female

Student: Undergraduate Graduate

If you are a graduate student, did you do your undergraduate studies in the US?

Yes No where? _____

Discipline: Math Language Arts Education

Other _____

What college social groups do you belong to? _____

Appendix B. Adult Consent Form

1) Title of Research Study: A study to compare the critical thinking dispositions between Chinese and American undergraduate and graduate college students.

2) Investigator(s): Dr. Valerie Bryan and Susan Dennett

3) Purpose: The purpose of this research study is to compare the critical thinking dispositions between Chinese and American undergraduate and graduate college students.

4) Procedures:

- You will complete a paper questionnaire.
- Your questionnaire should take approximately forty five minutes to complete.
- Research will be conducted on the Florida Atlantic University, Boca Raton campus during the summer of 2013.
- You will be provided with a McDonald's coupon for participating in the study.

5) Risks:

The risks involved with participation in this study are no more than you would experience in regular daily activities. It is unlikely you will experience any harm or discomfort.

6) Benefits:

We do not know if you will receive any direct benefits by taking part in this study. However, this research will contribute to a greater understanding of understanding Chinese and American students' dispositions to critical thinking.

7) Data Collection & Storage:

Any information collected about you will be kept confidential and secure and only the people working with the study will see your data, unless required by law. The data will be kept for 10 years in a locked cabinet [or password-protected computer] in the investigator's office. After 10 years, paper copies will be destroyed by shredding and electronic data will be deleted. We may publish what we learn from this study. If we do, we will not let anyone know your name/identity unless you give us permission.

8) Contact Information:

**For questions or problems regarding your rights as a research subject, you can contact the Florida Atlantic University Division of Research at (561) 297-0777. For other questions about the study, you should call the principal investigator(s), Susan Dennett at (772) 286-3924 and the faculty advisor, Dr. Valerie Bryan at bryan@fau.edu or 561-799-8639 or 954-592-3224.*

9) Consent Statement:

****I have read or had read to me the preceding information describing this study. All my questions have been answered to my satisfaction. I am 18 years of age or older and freely consent to participate. I understand that I am free to withdraw from the study at any time without penalty. I have received a copy of this consent form. I am returning to sdennett@fau.edu . By signing this document below, I consent to participate in this interview.***

Signature of Subject: _____ Date: _____

Printed name of Subject:

First Name _____ Last Name _____

Signature of Investigator: _____

Date: _____

Appendix C. Recruitment Script for Researcher to Use at Students' Classes at FAU

Researcher visited classes and met people face-to-face.

Students, I am a doctoral student working toward my PhD. I am collecting data to examine students' critical thinking dispositions. In particular I am interested in data of undergraduate and graduate Chinese and American students. I am asking if you would be willing to participate in a survey. You would take a critical thinking disposition inventory by answering a series of questions. This will take approximately fifteen minutes to complete. I understand your time is valuable and I appreciate your cooperation. Your participation in this research study is voluntary. I will be offering a small incentive to participate: A McDonalds coupon.

After this meeting, I will be outside of the classroom with the measuring instrument. If you are willing to participate, please see me after this class.

Appendix D. Email Recruitment Script

This email was sent by the Department of International Student and Scholar Services to Chinese Undergraduate and Graduate Students.

Students, we are asking for your help in assisting a doctoral student in gathering data for her research study. Susan Dennett is collecting data to examine students' critical thinking dispositions. In particular she is interested in data of undergraduate and graduate Chinese and American students. We are asking if you would be willing to participate in a survey. You would take a "critical thinking disposition inventory" by answering a series of questions. This will take approximately fifteen minutes to complete. We understand your time is valuable and we appreciate your cooperation. Your participation in this research study is voluntary. Susan Dennett will be offering a small incentive to participate: A McDonalds coupon. If you are willing to participate in this study, please email Susan Dennett at sdennett@fau.edu.

Thank you,

The Department of International Student and Scholar Services

Appendix E. Studies that have Employed the CCTDI

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