

Evaluating & Cultivating First-Year College Students Critical Thinking Skills for the Sino-China English for Academic Purpose Program

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Abstract: The purpose of this research was to identify whether the implantation of specific critical thinking (CT) conglomerate involving Problem Based Learning (PBL) activities and the Communicative Language Teaching (CLT) approach would improve Chinese students CT level whilst completing their first year Sino English for Academic program (EAP).

A Quasi-experiment was piloted at a University in the People's Republic of China, which was formed by Mr. Xi Jinping, who became the President of China in 2012. Chinese students are increasingly looking to study at Anglophone universities. However, Anglophone universities assume an approach to learning that involves critical thinking. Yet, studies that have adopted measures of critical thinking have shown that critical thinking is not prevalent to the same extent by Chinese students. Regardless of the study on the subject, there is limited research on the impact of critical thinking programs such as the Sino English for Academic program in China.

A non-randomized two groups, pretest-posttest design was conducted to examine first year college student's critical thinking level. The Critical thinking disposition was measured by implementing the California Critical Thinking Skills Test (CCST) in the Traditional Chinese version. There were 60 students, 47 females and 13 males between 19-21 years of age, randomly selected and placed in two groups who participated in this study.

The result showed that the intervention improves students' overall CCST mean score compared to the controlled group. The data revealed that the intervention group significantly scored higher on three of the five CCTST subscales. Whereas a negative variance CCST mean score of the controlled group was verified during the posttest analysis. The intervention group that was taught using the PBL and CLT approach increase student scores compared to a control group. As a result, the intervention would seem to provide one way to expand Chinese student's critical thinking scores to prepare for study at Anglophone universities.

KEY WORDS (Tertiary Education, Critical Thinking, English Teaching Methods).

I. INTRODUCTION (BACKGROUND TO THE PROBLEM)

The People's Republic of China has encouraged the establishment of foreign joint educational cooperation to meet the needs of Chinese economic and social development (Schuetze, Tianjin & Gloria, 2008). The purpose of the joint educational programs is to share high quality foreign scholastic resources, cultural exchanges and to enhance outbound, inbound student mobility. The Sino educational programs in China are constantly increasing. In 2004 the top four native English-speaking countries that operated offshore Sino cooperation programs in China were the United States of America with 154 Sino, the Australians with 146, the Canadians with 74 cooperative programs and the United Kingdom were positioned fourth with only 40 programs (Schuetze, Tianjin & Gloria, 2008). Most of these offshore collaborations were held near Shanghai, Beijing, Shandong, Jiangsu, Liaoning, Zhejiang, Tianjin, Shanxi, Guangdong, and Hubei provinces.

These Sino education programs have led Chinese students to further their education at an Anglophone university. For example, in 2013, the Australian Bureau of Statistics (ABS) report showed that 42.2 percent of Chinese students enrolled in an Australian educational institution to further their study. Whereas Egege & Kutieleh (2004) study found that over 80 percent of all the international students in Australian universities arrived from the South-East Asian region. In 2003, Australia was categorized as the third largest supplier of international degree programs in the entire world (Jones, 2005). The Embassy of the United States Beijing China (2015) study showed that in 2009/10 academic year Chinese students enrolled in an American University totalled 128,000 students, or over 18 percent of all international students in US universities were from China. The UK Council of International Affairs (2015) Higher Education Statistics Agency study in 2014 claimed that 87,895 Chinese students enrolled at a UK university which far exceeded than any other nationality. According to the ICEF research, 32 percent of international students in Canada are from China. As a result, the influx of Chinese students studying abroad has led to new academic challenges for Anglophone university educational practitioners.

The teaching of critical thinking dates to more than 2,500 years ago and is embraced by Anglophone culture (Richard *et al.* 1997). Despite the time frame, there are differences in the definition of critical thinking by scholars. One widely accepted definition of critical thinking discovered by Facione and the American Philosophical Delphi Report (1990), which defines critical thinking as "self-regulatory judgment results in interpretation, analysis, evaluation and inference" (p.3). Given the importance of critical thinking in Anglophone culture which is embedded in their education system. This raises question about students who come from other intellectual traditions to study in Anglophone universities. For example, the International Educational Progress Evaluation Organization found that Chinese students' CT level was below other nations and positioned them last for using their imagination and ingenuity (Mattimore, 2010). Hart (2013) conducted research which included 300 private and nonprofit organizations CEO's

and executives in America and discovered that 93 percent of CEO's values employees that think critically, communicate clearly, and solve problems. Additional research was conducted related to CT by Guangwei (2007); Wang & Farmer (2008); Melles (2009); Huang (2008); Catterall & Ireland (2010); Egege and Kutieleh (2004); and Beachboard *et al.*, (2010), who suggest that the insufficient level of Chinese learner's critical thinking has consequences for teaching practice in Anglophone universities.

In my experience living and working in China for over 5 years for the Sino Vocation Education and Training Australian Diploma and the American Bachelor programs as an educational director in China. The problem is twofold, in one hand, the Anglophone teachers face Chinese students who enter the Sino program in China have limited understanding of Anglophone educational system, culture and teaching styles. The Anglophone universities presumes that the Chinese students possess the necessary CT level and comprehension of the Anglophone educational teaching approaches when they begin their courses. Chinese student finds it difficult to write argumentative essays, reports and they copy the work from the book and/or internet using the Baidu translator and submit it to their teachers (Harwood & Hardley, 2004; Catterall & Ireland, 2010). Therefore, when the Anglophone teachers provide case study and problem-solving questions in the exams, the Chinese students are simply unable to and/or find challenging to answer the questions. The Chinese students fail the exams and/or receive low academic grades. For example, Zhao Xinying, (2015) from USA-China daily news reported that 8,000 Chinese students were dismissed in 2014 from various schools around the United States of America because of the improper learning attitude, learning environment and insufficient learning ability contributed to poor academic performance by Chinese students. Chinese students found everything from the curriculum design, teaching approaches and question types of exams in the USA was so different from China. In addition, Chinese students were dismissed from schools for low GPA score.

The research was conducted by WholeRen Education Institute in China and was supported by the American Business in China (AmCham) White Paper (2015). Anglophone teachers are confronted with indifference to Chinese students' learning styles, culture, lack of English language proficiency and low CT level (Catterall & Ireland, 2010; Egege & Kutieleh, 2004). Any variance in the university academic standards will have major consequences for students. Therefore, if Chinese students desire to study in Anglophone universities to further their education than critical thinking is imperative to identify problems and provide argumentative essays, projects, presentations; thesis papers, critique books, ancient knowledge, moving away from rote learning, memorizing, and focusing on analyzing, synthesizing, evaluating, which is unequivocally expected by the Anglophone educators (Wang & Farmer 2008).

To date, limited research has been conducted to understand the first-year college student's critical thinking skills for the Sino-China English for Academic program. For example, an educational institute runs two foreign cooperation programs in China. The Sino-Australian Diploma Vocational Education and Training (VET) program and the Sino-American Bachelor program. It is a prerequisite for Chinese students to complete the English for Academic Purpose courses before entering the diploma and/or bachelor programs. These programs are mutually supported and have been approved by the Australian government, the Chinese Ministry of Education, and the Chinese Service Center for Scholarly Exchange (CSCSE). The mode provided by the Sino-American Bachelor program, include 2+2 (2 year's domestic study and 2 years foreign partner university study) or 4+0 (4 year's domestic study only). After the completion of the course in China, the aim of the students is to further their education in an American university. Whereas the Sino-Australian Vocational Education (VET) program runs 3+ (1-2) modes. After the successful completion of the course, a diploma certification is issued by an Australian educational institution. The Recognition for prior learning (RPL) and/ or credit transfer technique has been used by both the Australian and the American universities for those students who wish to further their study to get a bachelor or master's degree. Hence, this is an especially substantial issue which must be addressed by the Sino program policy makers in China and abroad. Therefore, the significance of this study is imperative to develop the CT skills and capacities amongst the first-year Chinese college students before entering their 2nd and 3rd year of their study in China and finally enrolling into higher education in Anglophone University. As a result, leaving the Chinese students well equipped with the notion of Anglophone teaching method, CT concepts, teaching style and reducing Anglophone educational culture shock. However, the complexity of this problem varies from the definition to the teaching of critical thinking, have generated a debate between academics and deliberations is still unending today (Quinn, 1994; McPeak, 1990).

II. PROBLEM STATEMENT

The research paper addresses interconnected research problems. The main problem is associated with the critical thinking of first year EAP Chinese college students. First, Chinese students' rote learn and memorize the work from books and regurgitate in their essays, projects, presentations, and exams which they have been taught by Chinese teachers from primary to high school CT (Tiwari, Avery & Lai, 2003); Guangwei, 2007; Yuan, Kunaviktikul, Klunklin & Williams, 2008); Wang, & Farmer, 2008;). However, this form of academic work would be unacceptable by the Anglophone teachers, and they would basically call it plagiarism and fail the students. Following this problem, the second problem is how to evaluate and nurture Chinese student's CT skills and capacities who are aiming to pursue study in Anglophone countries and/or Sino courses in China? What I assume is that CT skills are important to Anglophone universities and courses but are not common to beginning Chinese students. Therefore, the problem is that the courses the Anglophone universities assume that students have CT skills, where these are not possessed by Chinese students when they begin their courses. These two research problems are interconnected in this investigation.

The apparent low-level CT illustrated by Chinese students has affected their progress in Anglophone educational work practice. The origin of these complications stems from the differences in learning and teaching styles, educational traditions and social cultural norms, leaving Chinese students confused about CT. Chinese students are not taught CT skills before they go abroad, leaving them unprepared and underdeveloped on the notion of CT (Tiwari, Avery & Lai, 2003; Guangwei, 2007; Chang & Strauss 2010; Yuan, Kunaviktikul, Klunklin & Williams, 2008; Wang, & Farmer, 2008; Melles, 2009; Zhou, Yan Zhao, Liu & Xing, 2012; Catterall & Ireland, 2010; Egege & Kutieleh, 2004; and Beachboard *et al.*, 2010). The Chinese people are taught to rote learn, which is communicated by authority figures and students are informed not to dispute ancient knowledge because of the Chinese educational tradition and cultural values (Wang & Farmer, 2008; Zhou, Yan Zhao, Liu, & Xing, 2012). According to Wang

& Farmer (2008) Chinese students are taught on lower three levels of Bloom's Taxonomy that focuses on knowledge, understanding and application. In comparison, the Anglophone students are taught on the top three levels of Bloom's Taxonomy that focuses on analysis, synthesis, and evaluation to promote higher order of thinking. Rote learning and memorizing information are not encouraged but to think critically about an issue and making a stance on a particular topic is highly sought after by the Anglophone educational practitioners. As a result, there is a difference in relation to the value of CT between China and the Anglophone countries (Hofstede & Hofstede, 2005; Wang & Farmer, 2008).

To succeed in Anglophone universities, Chinese students required CT skills. Therefore, to improve Chinese students' CT level researchers such as (Clark, 2010; Yuan, *et al.* 2008; Harwood & Hardley, 2004; Catterall & Ireland, 2010) advocate implementing the instructional models such as the Problem Based Learning approach; and the Corpus-Based Critical Pragmatic to improve the level of CT of Chinese students. Despite these suggestions, limited research has been attempted by scholars on the evaluation and cultivation of the first-year Chinese college student's critical thinking skills for the Sino-China English for Academic Purpose program. Even though there are these differences in learning and teaching styles, educational traditions, and social cultural norms, if Chinese students wish to study in an Anglophone university, then they must develop an adequate level of CT. Therefore, to examine Chinese students CT level this research will test students in the five sub-score (Analysis, Inference, Evaluation, Induction, and Deduction) using the CCST instrument. However, if the CCST participants achieve "55th percentile in relationship to similar CCST test-takers, then the group's CT level is above average". If the groups CCST takes achieve below 50 percentiles, then the groups CT level is classified as low compared to an aggregate sample of CCTST four-year college students (Insight Assessment & the California Academic Press, 2105, p.31). In 1997, Facione and Facione set the standard CCTDI mean score of 280 for college students in America. If students fall below the mean score of 280, then the students' CT level is below the standard (Zhang & Lambert, 2008). Many empirical data and research claims that Chinese students significantly possess low CT score comparing with the Anglophone students (Tiwari, Avery, & Lai, 2003; Guangwei, 2010; Yuan *et al.*, 2008; Harwood & Hardley, 2004; Catterall & Ireland, 2010). Hence, this is an especially substantial issue which must be addressed by the educational faculty, key legislators, and the Anglophone universities abroad and in China.

III. RESEARCH QUESTION

This research was governed by the below question:

How to evaluate and cultivate first-year college student's critical thinking skills for the Sino-China English for Academic Purposes program?

IV. METHODOLOGY

This research paper deploys an on Quasi-experiment, which is a quantitative method used in social sciences (Dimitrova & Rumrill, 2003; Black, 1999). This method offers a purposeful way of researching Chinese students' CT level as it is equally a concept and a technique. Conversely, many scholars have stated that quasi-experiments are not a true experiment as it does not supply for an indiscriminate compulsion to behavior of test subject whereas true experiments do. There are varieties of methods (mix method design, blended design, quantitative and qualitative design) to measure CT level of Chinese students. However, because of the complexity of the two interconnected research problems on how to evaluate and nurture Chinese student's CT skills who are aiming to pursue study in Anglophone countries and/or Sino courses in China. The second complication is that CT skills are important to Anglophone universities and courses but are not common to beginning Chinese students. As a result, the study partakes in a quantitative method because the selected approach is prevalent amongst scholars for the reliability and validity for detecting CT level of Chinese students.

V. RESEARCH DESIGN

The non-randomized pre-test-post-test design has been specifically selected because of the nature and the complexity of the research problem. The non-randomized designed associated with lower cost and the convenience of time factors comparing to the random allocation design. Therefore, it would have been impractical for this study to implement random allocation because of the higher cost, increase time factors, legal and political obstacles (Watkins, 2009). As a result, there is a warrant for the chosen research design. Non-randomized design is defined as "a study where participants have been assigned to the treatment, procedure, or intervention alternatives by a method that is not random" (Watkins, 2009, p. 223). The researcher manipulates the alternative. Non-randomized pre-test-post-test design can identify whether the CT test score falls out as a positive or a negative, providing the researcher with a clear difference in test score, Schafer, and Kang, (2008). At the pretest group, AC1 (n=30 standard treatment) students were educated by bilingual (English and Chinese) teachers from AUS, NZ, USA, UK, CAN, and China. The Anglophone EAP teachers held a minimum of a bachelor's degree with a Teaching English to Speakers of other Languages (TESOL) qualification and had a minimum of 2 years teaching experience. Whereas the Chinese teachers held a bachelor's or above degree with the International English Language Testing System (IELTS) band of 6.5-8.

The EAP teachers were instructed both groups of students using the Communicative Language Teaching approach for 6 hours per week 6 months continuously. A selection of textbooks was implemented during the examination. The composition book applied in this research was called the College English, Writing for Life, Second Edition writing by Roen, Glau, & Maid, in 2012. In addition, the Oral English book implemented in this research experiment was called the Takeaway English 3 Student Book International Edition, which was composed in 2012 by Loveday, Koop, Trowbridge, and Scarr. The Reading book applied in study was called the Mosaic Reading Six Edition written in 2014 by Wegmann and Knezevic. Finally, the Listening book applied in this research paper was called the Interactions Listing Six Edition created in 2014 by Tanka and Baker. The above books were published by McGraw Hill, and some were adapted to suit the Chinese University students. The AC3 (n=30 students received identical standard treatment) as AC1 group. Only incongruity was that AC1 group (n=30 new treatment) received specific critical thinking merged with the Problem Base Learning approach theories and activities for 6 hours per week for 6 months continuously. The AC1 student's lessons were specially catered towards debates, analysis of case studies and puzzles with explicit problem-solving activities to challenge students to think critically, which was merged with the EAP curriculum design. At the post-test, both the AC1 and AC3

were examined to measure variance in their CT level by using the Traditional Chinese version of The California Critical Thinking Skills Test.

VI. PARTICIPANTS

There were 60 first year college students for the Sino-American English for an academic program from the educational institution. The students were invited to partake in this study and randomly assigned equally into two groups (AC1 experimental group) and (AC3 controlled group). There were 25 females and 5 males between 19 -21 years of age in the AC1 group. Whereas the AC3 groups had 8 males and 22 females between 19 -21 years of age. However, 1 student withdraw from this experiment and 2 students failed to show up in the post-test examination from group AC3 because of illness. All the participants were raised in Fujian province, and they were from a middle-income family. None of the above students have been taught by Anglophone teachers before and the participants have never heard of the word critical thinking.

VII. DATA COLLECTION METHODS

The California Critical Thinking Skills Test in Traditional Chinese version was given to the first-year college students for the Sino-American English for Academic program. At the pre-test and post-test, two Chinese EAP teachers administered the tests to the Chinese students. An identical policy and procedure were implemented and portrayed to the students during the pre-test and post-test by the Chinese teachers.

VIII. SAMPLING TECHNIQUES

This research paper has employed the volunteer, accidental, convenience sampling techniques to select participants for this experiment. The volunteer, accidental, convenience is a non-probability sampling method where people are nominated because of the approachability and immediacy to the investigator (Black, 1999). Therefore, the first-year college EAP students from the educational Institution received an QQ email where explanation were provided to students regarding the critical thinking research and had the option to partake in the experiment. Chinese EAP teachers were required to follow up on the email and inform students about the procedures of the study by face contact. The name list of all the students' that wish to volunteer in the experiment were sent to the Chinese administration. The Chinese administration team selected sixty students and allocated them into two equally divided groups (AC1 and AC3) randomly.

INTERVENTION

In the experiment, 60 students were voluntarily divided into two groups AC1 (N=30) and AC3 (N=30). Both groups were provided with the section of requisite textbooks: College English; Writing for Life, 2nd edition; Take Away English; Mosaic Reading 6th edition and Interactions Listing 6th edition. Both groups received tutorials, which comprised 30 students in one class with a designated Anglophone and Bilingual Chinese teachers continuously for 6 hours per week for 6 months. However, only AC1 group (intervention) received specific CT amalgamated with PBL activities in each lesson for 6 hours per week for 6 months. The AC1 group was divided into small groups during the English lessons and both the Anglophone and Bilingual Chinese teachers were informed to teach the students using the Communicative Language Teaching approach. Each lesson comprised CT questions with responses, and PBL activities where students were required to solve simple problems to start with and then more complex problems scenario were provided to the students to solve towards the end of the semester. Some activities were pair and/or group work, where students were given topics and they were required to debate and make a stance. Students were provided with a CT assignment and informed to keep a reflective journal at the beginning of the semester. All the CT and PBL activities were interwoven into the EAP lessons.

The progression of CT and PBL activities were implemented in the following order: (A). Both Anglophone and Bilingual Chinese teachers explained to AC1 group why CT is important and why they must apply CT it into their study when they arrive in Anglophone countries to further their education. The resources used in this lesson were created by Facione & Insight Assessment (2013). Students were informed about PBL scenarios and students were encouraged to raise their hands if they did not understand any of the concepts and/or instructions. (B). Self Reflection and Assessments: The teachers explained to the students about keeping a reflective log which students were required to submit towards the end of the semester. In the log, students could draw pictures, symbols, trees, or diagrams if helpful in organizing ideas and they were told not erase anything. In addition, CT assessment were distributed to the students where they were informed to write 500-1000 words report that examines the advantages and disadvantages of cloning and they told to make stance on the topic. Assessment was designated to be submitted one month before the semester finished. The aim of the CT assignment and the reflective log were for students to analyze, synthesize and evaluate the work of scholars to promote higher order of thinking and to increase student's critical thinking level of meta-cognitive and self-correction. The assessments were produced by Facione & Insight Assessment (2002). (C). Power of Asking Good Question: Teachers expressed the power of asking good questions and why it is imperative to ask good questions. The purpose of the lesson was to encourage students to ask questions, ones that promote critical thinking and it is an excellent way to collect information and clarify issues that students did not understand Facione & Insight Assessment, (2002). (D). Group Participation: The students were asked to write ten things that made them happy and then they were asked to work in pairs and share their information. Problem solving questions were distributed in class.

The activities allowed students to give opinions, agree and disagree statements. The aim of this lesson was to make students to think about the question and response with an answer to promote self-confidence (Raviv, 2004 and Yuan at all, 2008). (E). Creativity Exercise: Students were asked to read a short story and answer true or false questions. Then they were informed to create their own ending for the story. The purpose of this activity was to build student to think creatively and propose their own ending of the stories that were given to the students by the teacher Facione and Insight Assessment, (2002). (F). Lateral Thinking Exercise: Students were given a set of 15 puzzles to which they were informed to find a solution. The purpose was to increase students' lateral thinking skills (Ravi, 2004). (G). Reliable Data: Teacher discussed with students regarding reliable data and information vs nonreliable data, and they were taught the difference between fact and opinion. This is a teaching tool which enables teachers to guide students to think critically about what to believe and not believe. Information on the internet examples were provided (Facione & Insight

Assessment, 2002). (H). Case Study and Debates: Students were given case study on ethics: genes, gestation, or nurturing and should romance be allowed at the workplace or should it be banned by the organization. Students were encouraged to debate with group members about the case study problem, which allowed students to strengthen their critical thinking skills (Facione and Insight Assessment 2013). (I) Your Views: Students were given various topics with statements, and they were informed to provide their own opinion on the subject and there was a question about love (compare marriage customs between Anglophone countries and China). Students were informed to discuss and provide opinions and make stance on their beliefs. Finally, a critical thinking feedback session was held to acquire valuable feedback from AC1 students. The feedback intended to ask the learners to reflective specifically on their thinking experience related to the learning opportunity (Facione, 1990 & Insight Assessment, 2013).

IX. DATA ANALYSIS

Data calculation was conducted by subtracting the pretest from the post-test Overall group's mean CCTST score. The CCTST Overall is the average score for group's (AC1 and AC3) preeminent overall measures of critical thinking level of the group. Higher the overall group's mean CCTST score, the stronger the critical thinking level possessed by the group. Therefore, the variance of the Overall group's mean CCTST score makes it possible to evaluate the efficacy of the critical thinking level of Chinese students. Paired Sample Test was employed by using the Microsoft Excel data analyses to calculate each of the five CCTST subscales' total score (Analysis, Inference, Evaluation Induction and Deduction) to examine internal consistency of the CCTST. Graphic statistical analysis was generated to provide the CT dispositions of both the AC1 and AC3 group to compare significant main effects. Based on the distribution of the overall score percentiles of AC1 and AC3 group, has been compared to an aggregate sample of CCTST Four Year College Students, the average percentile score from various other countries and over 50 states in America (Insight Assessment, a Division of the California Academic Press manual, 2015).

X. RESULTS

At the pretest, there were 47 females (78.3 percent) and 13 males (21.6 percent), giving 60 respondents. 60 California Critical Thinking Skills Test in Traditional Chinese version given to respondents. 59 CCTST questionnaires were returned, representing a response rate of (98.3 percent). The response rate for the AC1 group was (100 percent), with 30 CCTST questionnaire returned. The response rate for the AC3 group was (96 percent), with 29 CCTST questionnaire returned. One respondent from AC3 group withdraws from the experiment because of illness. The pretest CCTST score of AC1 and AC3 group is provided in table 6.1 and table 6.2. The AC1 group included 30 respondents, ranging in age from 19 to 21 years, with the overall mean score of 16.0: median of 16 and standard deviation of 3.6. The AC1 group falls below the CT average mean score, exhibiting a low level of CT. The descriptive statistics on the results from the CCTST subscales show AC1 group significantly scored low on the Inference 7.8; Deduction 6.5 and Induction 9.5. However, based on the distribution of the overall score percentiles for the test takers in the AC1 group, as compared to an aggregate sample of CCTST four-year college students, the average percentile score of 46. Displaying a negative endorsement of CT.

Table 6.1 AC1-Student's Critical Thinking skills Pretest Results

Skill/Attribute Name	N	Mean	Median	Standard Deviation	SE Mean
OVERALL	30	16.0	16	3.6	0.7
Analysis	30	3.7	4	1.3	0.2
Inference	30	7.8	9	2.4	0.4
Evaluation	30	4.4	4	1.5	0.3
Induction	30	9.5	10	1.9	0.4
Deduction	30	6.5	6	2.1	0.4

Skill/Attribute Name	Minimum	Maximum	Quartile 1	Quartile 3
OVERALL	9	23	14	18
Analysis	1	6	3	5
Inference	2	11	6	9
Evaluation	2	8	3	6
Induction	6	13	8	11
Deduction	2	11	5	8

The pretest CCTST score of AC3 group is provided in table (6.2). The AC3 group 29 respondents (96 percent), ranging in age from 19 to 21 years, with the overall mean score of 19.6; median of 20 and standard deviation of 3.8. However, based on the distribution of the overall score percentiles for the test takers of AC3 group, as compared to an aggregate sample of CCTST four-year college students, the average percentile score of 66. The AC3 group exhibiting higher level of CT than AC1 group.

Table 6.2 AC3-Student's Critical Thinking skills Pretest Results

Skill/Attribute Name	N	Mean	Median	Standard Deviation	SE Mean
OVERALL	29	19.6	20	3.8	0.7
Analysis	29	4.4	4	1.1	0.2
Inference	29	9.9	10	2.2	0.4
Evaluation	29	5.3	5	1.8	0.3
Induction	29	11.2	11	2.1	0.4
Deduction	29	8.4	9	2.5	0.5

Skill/Attribute Name	Minimum	Maximum	Quartile 1	Quartile 3
OVERALL	11	27	17	22
Analysis	2	6	4	5
Inference	5	13	8	12
Evaluation	2	9	4	7
Induction	7	16	10	12
Deduction	3	13	7	11

Paired Sample Statistical Test analysis was generated to provide CT dispositions of both the AC1 and AC3 group to compare significant main effects. The total test variance of the CCTST overall mean score of 3.6; median of 4 and standard deviation of 0.2. The descriptive statistics on the results from the CCTST subscales between the AC1 group and AC3 group are reported in Table 6.3. The AC3 group scored higher on every aspect of CCTST subscales score (Analysis 0.7; Inference 2.1; Evaluation 0.9; Induction 1.7 and Deduction 1.9) Greater differences were noted on the Inference 2.1; Deduction 1.9 and Induction 1.7. A positive endorsement toward CT on five of the subscales shown by AC3 group. However, based on the distribution of the overall score percentiles for the test takers of AC3 and AC1 group, as compared to an aggregate sample of CCTST four-year college students, the average percentile score variance exited of 20. Presenting AC3 group possessing higher CT level than AC1 group.

Table 6.3 Comparison of CT Pre-Test Results of AC1 & AC3

Skill/Attribute Name	AC1 N	AC3 N	V	AC1 Minimum	AC3 Minimum	V	AC1 Maximum	AC3 Maximum	V	AC1 Quartile 1	AC3 Quartile 1	V	AC1 Quartile 3	AC3 Quartile 3	V
OVERALL	30	29	1	9	11	2	23	27	4	14	17	3	18	22	4
Analysis	30	29	1	1	2	1	6	6	0	3	4	1	5	5	0
Inference	30	29	1	2	5	3	11	13	2	6	8	2	9	12	3
Evaluation	30	29	1	2	2	0	8	9	1	3	4	1	6	7	1
Induction	30	29	1	6	7	1	13	16	3	8	10	2	11	12	1
Deduction	30	29	1	2	3	1	11	13	2	5	7	2	8	11	3

Skill/Attribute Name	AC1 N	AC3 N	V	AC1 Mean	AC3 Mean	V	AC1 Median	AC3 Median	V	AC1 Standard Deviation	AC3 Standard Deviation	V	AC1 SE Mean	AC3 SE Mean	V
OVERALL	30	29	1	16	19.6	3.6	16	20	4	3.6	3.8	0.2	0.7	0.7	0
Analysis	30	29	1	3.7	4.4	0.7	4	4	0	1.3	1.1	-0	0.2	0.2	0
Inference	30	29	1	7.8	9.9	2.1	9	10	1	2.4	2.2	-0	0.4	0.4	0
Evaluation	30	29	1	4.4	5.3	0.9	4	5	1	1.5	1.8	0.3	0.3	0.3	0
Induction	30	29	1	9.5	11.2	1.7	10	11	1	1.9	2.1	0.2	0.4	0.4	0
Deduction	30	29	1	6.5	8.4	1.9	6	9	3	2.1	2.5	0.4	0.4	0.5	0.1

At the posttest, there were 44 females (77.1 percent) and 13 males (22 percent), giving 57 respondents. The response rate for the AC1 group was (100 percent), with 30 CCTST questionnaire returned. The response rate for the AC3 group was (90 percent), with 27 CCTST questionnaire returned. Three respondents withdraw from the research study because of illness. The posttest CCTST score of AC1 and AC3 group is provided in table (6.4). The AC1 group's overall CCTST mean score of 18.7 median of 19 and standard deviation of 2.9. Demonstrating a higher level of CT. The descriptive statistics on the results from the CCTST indicate AC1 group significantly scored higher on the Inference 9.2; Deduction 8.7 and Induction 10. Based on the distribution of the overall score percentiles of AC1 group, compared to an aggregate sample of CCTST four-year college students, the average percentile score of 62. Revealing a positive testimonial toward CT.

Table 6.4 AC1-Students' Critical Thinking Skills Posttest Results

Skill/Attribute Name	N	Mean	Median	Standard Deviation	SE Mean
OVERALL	30	18.7	19	2.9	0.5
Analysis	30	4.3	5	1.2	0.2
Inference	30	9.2	9	1.6	0.3
Evaluation	30	5.2	5	1.3	0.2
Induction	30	10.0	10	2.0	0.4
Deduction	30	8.7	9	1.7	0.3

Skill/Attribute Name	Minimum	Maximum	Quartile 1	Quartile 3
OVERALL	12	24	16	21
Analysis	2	6	3	5
Inference	6	13	8	10
Evaluation	3	8	4	6
Induction	6	13	9	11
Deduction	6	12	8	10

The posttest CCTST score of AC3 group is provided in table (6.5). The AC3 group 27 respondents (90 percent), with the overall mean score of 19.2; median of 20 and standard deviation of 2.7. There were no significant main effects showed on AC3 groups, CCTST's overall score. However, based on the distribution of the overall score percentiles for AC3 group, as compared to an aggregate sample of CCTST four-year college students, the average percentile score of 65.

Table 6.5 AC3-Students' Critical Thinking Skills Posttest Results

Skill/Attribute Name	N	Mean	Median	Standard Deviation	SE Mean
OVERALL	27	19.2	20	2.7	0.5
Analysis	27	3.9	4	1.1	0.2
Inference	27	9.4	10	2.3	0.4
Evaluation	27	5.8	6	1.4	0.3
Induction	27	10.6	11	1.5	0.3
Deduction	27	8.6	8	2.0	0.4

Skill/Attribute Name	Minimum	Maximum	Quartile 1	Quartile 3
OVERALL	14	24	17	21
Analysis	2	6	3	5
Inference	5	13	8	12
Evaluation	3	9	5	7
Induction	8	14	10	11
Deduction	5	11	7	11

The statistical test analysis comparison detected the CT disposition of both the AC1 and AC3 group. The total test variance of the CCTST overall mean score of 0.5 median of 1 and standard deviation of 0.2. The descriptive statistics on the results from the CCTST subscales are reported in Table 6.6. The higher mean scores for AC3 group remain on the Inference, Evaluation, and Induction. Conversely, AC1 group scored higher on Analysis and Deduction than AC3 group. Conversely, based on the distribution of the overall score percentiles for the test takers of AC3 and AC1 group, as compared to an aggregate sample of CCTST four-year college students, the average percentile score variance exited of 3. Presenting a greater level of CT improvement by AC1 group than AC3 group.

Table 6.6 Comparison of CT Posttest Results of AC1 & AC3

Skill/Attribute Name	AC1 N	AC3 N	V	AC1 Mean	AC3 Mean	V	AC1 Median	AC3 Median	V	AC1 Standard Deviation	AC3 Standard Deviation	V	AC1 SE Mean	AC3 SE Mean	V
OVERALL	30	27	3	18.7	19.2	0.5	19	20	1	2.9	2.7	0.2	0.5	0.5	0
Analysis	30	27	3	4.3	3.9	0.4	5	4	1	1.2	1.1	0.1	0.2	0.2	0
Inference	30	27	3	9.2	9.4	0.2	9	10	1	1.6	2.3	0.1	0.3	0.4	0.1
Evaluation	30	27	3	5.2	5.8	0.6	5	6	1	1.3	1.4	0	0.2	0.3	0.1
Induction	30	27	3	10	10.6	0.6	10	11	1	2	1.5	0.5	0.4	0.3	0.1
Deduction	30	27	3	8.7	8.6	0.1	9	8	1	1.7	2	0.3	0.3	0.4	0.1

Skill/Attribute Name	AC1			AC3			AC1			AC3			AC1			AC3		
	N	N	V	Minimum	Minimum	V	Maximum	Maximum	V	AC1 Quartile 1	AC3 Quartile 1	V	Quartile 3	Quartile 3	V			
OVERALL	30	27	3	12	14	2	24	24	0	16	17	1	21	21	0			
Analysis	30	27	3	2	2	0	6	6	0	3	3	0	5	5	0			
Inference	30	27	3	6	5	1	13	13	0	8	8	0	10	12	2			
Evaluation	30	27	3	3	3	0	8	9	1	4	5	1	6	7	1			
Induction	30	27	3	6	8	2	13	14	1	9	10	1	11	11	0			
Deduction	30	27	3	6	5	1	12	11	1	8	7	1	10	11	1			

The statistical empirical data analysis comparisons of AC1 group's pretest-posttest CT score stated in table 6.7. The higher mean scores occurred on every aspect of the five CCTST subscales score (Analysis 0.6; Inference 1.4; Evaluation 0.8; Induction 0.5 and Deduction 2.2). Conversely, based on the distribution of the overall score percentiles for the test takers of AC1 group, as compared to an aggregate sample of CCTST four-year college students, the average percentile positive score of 20. The data showed AC1 group explicitly enhanced their overall CT level.

Table 6.7 AC1 Comparison of Pretest to Posttest Results

Skill/Attribute Name	Pretest			Posttest			Pretest			Posttest			Pretest			Posttest		
	AC1 N	AC1 N	V	AC1 Mean	AC1 Mean	V	AC1 Median	Posttest AC1 Median	V	Pretest AC1 Standard Deviation	Posttest AC1 Standard Deviation	V	Pretest AC1 SE Mean	Posttest AC1 SE Mean	V			
OVERALL	30	27	3	16	18.7	2.7	16	19	3	3.6	2.9	0.7	0.7	0.5	0.2			
Analysis	30	27	3	3.7	4.3	0.6	4	5	1	1.3	1.2	0.1	0.2	0.2	0			
Inference	30	27	3	7.8	9.2	1.4	9	9	0	2.4	1.6	0.8	0.4	0.3	0.1			
Evaluation	30	27	3	4.4	5.2	0.8	4	5	1	1.5	1.3	0.2	0.3	0.2	0.1			
Induction	30	27	3	9.5	10	0.5	10	10	0	1.9	2	0.1	0.4	0.4	0			
Deduction	30	27	3	6.5	8.7	2.2	6	9	3	2.1	1.7	0.4	0.4	0.3	0.1			

Skill/Attribute Name	Pretest			Posttest			Pretest			Posttest			Pretest			Posttest		
	AC1 N	AC1 N	V	AC1 Minimum	AC1 Minimum	V	AC1 Maximum	AC1 Maximum	V	Pretest AC1 Quartile 1	Posttest AC1 Quartile 1	V	Pretest AC1 Quartile 3	Posttest AC1 Quartile 3	V			
OVERALL	30	30	3	9	12	3	23	24	1	14	16	2	18	21	3			
Analysis	30	30	3	1	2	1	6	6	0	3	3	0	5	5	0			
Inference	30	30	3	2	6	4	11	13	2	6	8	2	9	10	1			
Evaluation	30	30	3	2	3	1	8	8	0	3	4	1	6	6	0			
Induction	30	30	3	6	6	0	13	13	0	8	9	1	11	11	0			
Deduction	30	30	3	2	6	4	11	12	1	5	8	3	8	10	2			

The statistical empirical data analysis comparisons of AC3 group's pretest-posttest CT score stated in table 6.8. The higher mean scores occurred on two out of the three CCTST subscales score (Evaluation 0.2 and Deduction 2.2). The data showed AC3 group achieved a negative score on (Analysis 0.5; Inference 0.5 and Induction 0.6). Based on the distribution of the overall score percentiles for the test takers of AC3 group, as compared to an aggregate sample of CCTST four-year college students, the average percentile negative score of -1. The data showed AC3 group overall CT level microscopically decreased.

Table 6.8 AC3 Comparison of Pretest to Posttest Results

Skill/Attribute Name	Pretest			Posttest			Pretest			Posttest			Pretest			Posttest		
	AC3 N	AC3 N	V	AC3 Mean	AC3 Mean	V	AC3 Median	Posttest AC3 Median	V	Pretest AC3 Standard Deviation	Posttest AC3 Standard Deviation	V	Pretest AC3 SE Mean	Posttest AC3 SE Mean	V			
OVERALL	29	27	2	19.6	19.2	0.4	20	20	0	3.8	2.7	1.1	0.7	0.5	0.2			
Analysis	29	27	2	4.4	3.9	0.5	4	4	0	1.1	1.1	0	0.2	0.2	0			
Inference	29	27	2	9.9	9.4	0.5	10	10	0	2.2	2.3	0	0.4	0.4	0			
Evaluation	29	27	2	5.3	5.8	0.5	5	6	1	1.8	1.4	0.4	0.3	0.3	0			
Induction	29	27	2	11.2	10.6	0.6	11	11	0	2.1	1.5	0.6	0.4	0.3	0.1			
Deduction	29	27	2	8.4	8.6	0.2	9	8	1	2.5	2	0.5	0.5	0.4	0.1			

Discussion

The empirical data analysis showed that AC1 group pretest over all means CCTST score was 16.0. However, based on the distribution of the overall score percentiles for the test takers in the AC1 group, as compared to an aggregate sample of CCTST four-year college students, the average percentile score of 46. The result verifies low attainment of the CT tests. Therefore, has not met the CT standard of “55th percentile in relationship to similar CCST test-takers of four-year college students in America (Insight Assessment, 205; Facione, 1990 & the California Academic Press, 2015). The outcome of this analysis supports the work of Retsas & Wilson (1996); Tiwari, Avery, & Lai (2003); Catterall & Ireland (2010); Zhou, Yan, Liu, & Xing (2012) and Turner (2006), who suggested that Chinese students possess a low level of CT. In comparison, AC3 overall group mean CCTST score of 19.6 and based on the distribution of the overall score percentiles for the test takers of AC3 group, as compared to an aggregate sample of CCTST four-year college students, the average percentile score of 66.

Skill/Attribute Name	Pretest	Posttest	V	Pretest	Posttest	V	Pretest	Posttest	V	Pretest	Posttest	V	Pretest	Posttest	V
	AC3	AC3		AC3	Posttest AC3		AC3	Posttest AC3		AC3	Posttest AC3		AC3	Posttest AC3	
	N	N		Minimum	Minimum		Maximum	Maximum		Quartile 1	Quartile 1		Quartile 3	Quartile 3	
OVERALL	29	27	2	11	14	3	27	24	-3	17	17	0	22	21	-1
Analysis	29	27	2	2	2	0	6	6	0	4	3	-1	5	5	0
Inference	29	27	2	5	5	0	13	13	0	8	8	0	12	12	0
Evaluation	29	27	2	2	3	1	9	9	0	4	5	1	7	7	0
Induction	29	27	2	7	8	1	16	14	-2	10	10	0	12	11	-1
Deduction	29	27	2	3	5	2	13	11	-2	7	7	0	11	11	0

The AC3 group score exceeded the norm of “55th percentile in relationship to similar CCST test-takers of four-year college students. Representing a positive declaration toward CT. However, the posttest data showed a significant growth of AC1 overall group mean CCTST score of 18.7 and based on the distribution of the overall score percentiles of AC1 group, compared to an aggregate sample of CCTST four-year college students, the average percentile score of 62. In contrast, the posttest results of AC3 overall group’s mean CCTST score of 19.2 and based on the distribution of the overall score percentiles for AC3 group, as compared to an aggregate sample of CCTST four-year college students, the average percentile score of 65. Therefore, the intervention improved students’ scores compared to the standard instructional model, even when all curriculum materials were held constant. This seems a challenge to Wang and Farmer (2008), in that it suggests that the intervention improved results given randomly selected students with Chinese backgrounds, cultural beliefs, and heritage. If these background variables were of such importance, the results might show such an improvement. The result supports the work of Guangwei (2010); Raviv (2004); Yuan *et al.*, (2008); Facione, (2013), Harwood & Hardley (2004); Kwan & Max, (2008); Zhang & Lambert, (2008) and Melle, (2009), that explicit Communicative Language Teaching approach amalgamated with Problem Base Learning method incorporated with unambiguous critical thinking activities such as debates, analysis of news and puzzles exercises combined in EAP curriculum improves Chinese students’ critical thinking level.

XI. CONCLUSION

To meet the needs of Anglophone universities, Sino-China EAP programs should endeavor to expedite Chinese students ‘critical thinking level. In this research, the intervention group increased their CT skills through experiencing the Anglophone teaching methods, educational culture, and teaching styles to encourage Chinese students to get away from rote learning, memorizing and expand their skills in synthesizing, analyzing, and evaluating to improve CT level. The Communicative Language Teaching approach combined with Problem Base Learning method and critical thinking activities should be endorsed in Sino educational curriculum to improve Chinese student’s CT skills.

XII. LIMITATIONS

Few of the Chinese students did not take the CCTST seriously because it was not part of their final exam and they felt it was a waste of time. Chinese students are taught about the final examination. This may have influenced the group posttest overall CCTST score (Ren Yanhong & Tao Lin 2014). Therefore, future exploration is required around the cultural and contextual issues in defining effective pedagogy and learning or an exploration of students’ attitudes and their perception of the value of and application of critical thinking in their learning (i.e., ‘students did not know the term critical thinking’ and they ‘did not take the CCTST seriously as it was not part of their final exam and felt it was a waste of time’.

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XIV. ETHICAL CONDUCT OF THE RESEARCH

Ethical approval for this research was obtained from Victoria, Australia Human Research Ethics Committee and from relevant ethics committees and IEN Minjaing University campus site from which the empirical data were collected.

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