

Insights into Chinese College English Undergraduates' Higher Order Thinking Skills

Yue Yin

Language Academy, Faculty of Human Science and Humanities,
Universiti Teknologi Malaysia, Johor, Malaysia

&

School of Foreign Languages for International Business
Hebei Finance University, Hebei, China

Corresponding Author: yueyin@graduate.utm.my

Norhanim Abdul Samat

Language Academy, Faculty of Human Science and Humanities,
Universiti Teknologi Malaysia, Johor, Malaysia

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Abstract

In recent years, educational institutions, administrators, and college EFL teachers in China have advocated for increased emphasis on fostering English undergraduates' higher-order thinking skills. The relevant studies are widely limited in theoretical approaches without extensive empirical examination of Chinese English undergraduates' higher-order thinking. Therefore, it is significant to conduct empirical research to explore English undergraduates' higher-order thinking attitudes and skills separately. This study also assesses their correlation and the impact of different learning stages and language proficiencies on these aspects. By doing this, the study holds substantial significance for empirical inquiries into the characteristics of English undergraduates' HOTS, serving as the reference for Chinese EFL teachers to implement higher-order thinking instructions. A quantitative design of questionnaires and tests was employed on a sample of 240 Chinese-English undergraduates from Hebei Finance University. The data analysis contained descriptive statistical analysis, independent-sample T-test, one-way ANOVA, and Pearson correlation analysis. The findings show that although the responding participants have relatively positive attitudes toward higher-order thinking skills, they exhibit variations in their ability to utilize them. Differences in learning stages and language proficiency do not significantly influence the development of the respondents' higher-order thinking skills. There is no significant correlation between higher-order thinking attitudes and skills among the participants, indicating that having a positive inclination to higher-order thinking differs from having the skills to think.

Keywords: Chinese English undergraduates, critical thinking, higher order thinking, higher order thinking attitude, higher order thinking skills, learning stages and language proficiency

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Introduction

Higher Order Thinking (HOT) is becoming more and more critical because of accelerating changes, intensifying complexity, escalating interdependence, and increasing danger (Paul & Elder, 2006) since many employers have put forward disappointments and complaints from some places in the world, like America, the United Kingdom, and Europe (Bennett et al., 2000) as well as China. A mismatch exists between what employers require and what graduates acquire regarding skills such as reasoning and problem-solving (Bennett et al., 2000). Therefore, HOT is considered a vital necessity of the new century, especially after the information explosion (Halpern, 2003).

The prominent significance of higher-order thinking skills (HOTS) is obvious. Still, some Western scholars think that Asian students are deficient and weak in thinking abilities from a universal stance (Stapleton, 2001). The research conducted by Stapleton (2001) and Davidson (1995) showed that Japanese students in Asia not only possessed higher-order ideas but also displayed the ability to think critically. These studies provided evidence that instruction of critical thoughts could be effectively implemented in EFL classrooms. This finding has significant implications for other Asian countries, such as China, where similar initiatives could be carried out. The exploration of thinking skills in China started in the late 1980s, considerably later than in Western nations. Notably, Chinese scholars such as Wen (1999) and Luo (2001) initiated their research on thinking skills. EFL scholars in China first paid attention to undergraduates thinking in the 1990s (Huang, 1998). Huang proposed the "Absence of Critical Thinking" phenomenon among Chinese EFL teachers and learners, first in 1998 and 2010, eleven years after. It is a pity that thinking skills are the weakness of Chinese English undergraduates (Sun, 2011). Higher education in China puts more and more emphasis on cultivating higher-order thinking skills (Wu, 2012). According to Wen (2006), it is essential and necessary for Chinese college EFL teachers to improve English undergraduates' thinking abilities in EFL instructions.

After reviewing the previous research, the researcher finds that most studies of HOT in China are conducted in primary and secondary schools. Theoretical interests in HOTS have rapidly grown across disciplines in recent years, and studies are primarily scattered and mainly restricted to theoretical perspectives but not to empirical perspectives. In China, many studies on the introduction of HOTS and integration of HOTS, as well as factors hindering the thinking skills of English undergraduates, still stay at the discussion and proposal stage (Huber & Kuncel, 2016; Zhang, 2019; Zhang, 2020). Many references demonstrated the significance of implementing HOTS in an EFL classroom without empirical data and cases for reference (Huang, 2010; Xue, 2014; Sun, 2017). Furthermore, limited systemic empirical studies are focused extensively on the characteristics of English undergraduates' HOTS attitude, HOTS level, and the relationship between them.

Therefore, this study aims to explore the characteristics of Chinese English undergraduates' HOTS attitude and HOTS level. Investigating the characteristics of students' HOTS holds significant value for empirical studies that aim to enhance their HOT, serving as the guideline for Chinese EFL educators in effectively incorporating HOTS instructions into their teaching practices. The specific objectives of this study are to independently examine the characteristics of Chinese English undergraduates' HOTS attitudes and levels, and the correlation between the two variables. Within this framework, the study also explores the impact of varying language proficiencies and learning stages on the manifestation of HOTS attitude and level. Based on the research objectives, the following specific research questions (RQ) are set up:

Question One: What are the characteristics of Chinese English undergraduates' HOTS attitude?

- a. What are the characteristics of Chinese English undergraduates' HOTS attitude regarding different learning stages?
- b. What are the characteristics of Chinese English undergraduates' HOTS attitude regarding different language proficiency?

Question Two: What are the characteristics of Chinese English undergraduates' HOTS level?

- a. What are the characteristics of Chinese English undergraduates' HOTS levels in different learning stages?
- b. What are the characteristics of Chinese English undergraduates' HOTS level regarding different language proficiency?

Question Three: What is the relationship between Chinese English undergraduates' HOTS attitude and HOTS level?

This paper will first do a literature review of the studies on HOTS and its relevant studies concerning HOTS attitude and HOTS level. Then, it will introduce the research method containing this study's participants, instruments, and data analysis. Finally, in the last sections of this paper, findings, discussions, conclusions, and implications based on the research results will be presented.

Literature Review

Higher Order Thinking Skills

Despite unclear definitions, the term "Higher Order Thinking Skills (HOTS)" could refer to human's mental process of analysis, evaluation, and creation, which was widely engaged in complicated cognitive activities like reflective thinking, reasoning, problem-solving and critical thinking (Bloom, 1956; Glaser, 1984; Lewis & Smith, 1993; Barak & Dori, 2009). Brookhart (2010) provided a more practical definition of HOTS, in which HOTS was divided into three categories: 1) transfer, 2) critical thinking, 3) problem-solving. Another higher-order thinking skills framework was Bloom's Taxonomy. According to Bloom's (1956) taxonomy, analyzing, synthesizing, and evaluating skills were categorized into higher-order thinking skills. In contrast, remembering, understanding, and applying skills are lower-order thinking skills. Halpern (2006) holds that critical thinking is not only a simple and mechanical skill but also contains skills like judgment, analysis, and synthesis. These skills were categorized as HOTS in the thinking pyramid model developed by Bloom. From the above literature, definitions proposed by different scholars have shown some of the most essential characteristics of HOTS. Bloom's taxonomy framework about HOTS (analyze, synthesize, and evaluate) was one of the most influential ones. Under the framework of Bloom's taxonomy about HOTS, questions in the HOTS instrument designed for assessing the participating English undergraduates' HOTS in this study were developed based on the components of HOTS mentioned above, like skills of analyzing, problem-solving, decision-making, inferences, evaluative thinking, and reasoning. Different items assessed various aspects of HOTS. The details of this instrument will be stated in-depth in the next section of the research method.

HOTS in EFL Context

HOTS is becoming essential to education, especially in higher educational systems (Zohar & Cohen, 2016; Roets & Maritz, 2017). One of the fundamental purposes of school education is to achieve students' HOTS, like observing things, accepting and analyzing new ideas, and testing an issue's positive and negative sides (Willingham, 2007). According to Ahmad and Ismail (2017), several studies indicate that HOTS is predominantly employed in science and engineering fields in higher education. Others maintain that HOTS can also be fostered in non-science majors, such as English language (Resnick, 1987; Carter, 2004; Li, 2016). According to Numrich (2011a), developing critical thinking is crucial in language instruction. Many researchers hold that EFL teachers and scholars understand what strong influence thinking skills have on language proficiency since "Critical thinking (CT) tends to expand the learning experience of students, making language learning deeper and more meaningful" (Zhao, Pandian, & Singh, 2016, p.14). Moreover, Facione (2001) claimed that students needed to use their critical thinking skills to express ideas critically through the language, using some interdisciplinary essential thinking skills like analyzing, inference, and evaluating to promote L2 learning.

Compared with students from Europe or other areas in Asia, whose native language was also not English, Chinese English undergraduates were not worse in pronunciation, intonation, and language sensitivity. The most prominent deficiency was pronounced weak thinking abilities (Zhang & Wen, 2022). A language environment seldom surrounded most Chinese students, so they had little chance to experience authentic English in a traditional Chinese EFL classroom (Yu, 2019). Based on Wen's research (2010a), the English undergraduates had relatively positive attitudes toward HOT, and the HOTS of English undergraduates were not worse than any other majors. The participants of Wen's study were first-year to third-year students with better academic performance in high-quality universities in China. Future research can further investigate English undergraduates at an average proficiency level in China's ordinary colleges.

HOTS Study in China

The study of thinking skills in China began in the late 1980s, much later than in Western countries. During the first twenty years, studies on thinking in China stayed at the introduction and discussion stage. Basic concepts and theories about thinking and cognition were introduced without empirical studies. According to Luo (2001), although scholars in psychology, nursing, math, and education were the first group to recognize the importance of thinking skills development, comprehensive and systematic research was still lacking. Some researchers proposed their theories, emphasizing the significance and methods for thinking skills development (Luo, 2001; Wen, 2010a). The second period of thinking skills studies in China transferred to the application and further development in the Chinese context. Theoretical studies, empirical studies, and thinking assessments characterized this period. Theoretical studies predominantly focused on applying foreign findings in the Chinese context, focusing on integrating thinking skills with other disciplines. Some Chinese scholars began to do empirical studies on dispositions of higher-order thinking (Wen, 2006; Xue, 2014). Foreign language scholars in China first paid attention to undergraduates' thinking skills in the 1990s (Huang, 1998), drawing some scholars' attention (Wen, 2006; Liu, 2005; Huang, 1998). Using foreign thinking assessment tools, researchers modified and created practical tools to assess thinking skills in Chinese EFL contexts (Luo, 2001; Wen, 2009).

Previous researchers all hold that Chinese learners do not have a solid willingness to criticize or question authority and do not have a habit of practicing critical thinking skills (Li, 2016). According to Wu (2017), there is a long-term tradition of rote learning and knowledge remembering instead of evaluating or creating for Chinese education, not to mention the summary-oriented assessment model. Against this background, China's Ministry of Education launched the *National Criteria of Teaching Quality for Undergraduate English Majors* in 2018. The new national curriculum claims university EFL majors should foster HOTS and language proficiency. Unfortunately, implementing and teaching HOTS has not become a widespread practice in Chinese higher education (Huber & Kuncel, 2016). The results in this aspect were few in the early years, and the overall quality of the research was poor. Wen (2010a), a research pioneer of HOT in China, argued that there were only a few empirical and systematic studies on the current situation of college students' HOT compared with foreign countries. In China, the exploration and suggestions for the implementation of higher-order thinking Skills (HOTS) in English undergraduates, as well as the impediments to their thinking abilities, have mainly remained in the realm of theoretical deliberation (Huber & Kuncel, 2016; Zhang, 2019; Zhang, 2020). Furthermore, there is a lack of comprehensive empirical studies that delve deeply into the attitudes and levels of HOTS among English undergraduates and their interrelation. Therefore, based on the research background and the reviews above, conducting a study concentrating on the characteristics of Chinese English undergraduates' HOTS is necessary and significant.

Factors affecting HOTS

Learning phases and academic performance are two significant factors affecting thinking skills (Kelly, 2010). Bekie, Lowry, and Barnett's study (2001) argued that seniors' HOT disposition was not significantly improved since they were preoccupied with employment concerns. Facione et al. (2001) discovered that the critical thinking disposition scores either remained stable or improved after tracing the progression of 147 students' four-year college learning, indicating a positive correlation between participants' higher-order thinking skills and their increases in academic knowledge. Rosyati and Rosna (2008) conducted research among Malaysian undergraduates to find out the correlation between HOTS and language proficiency. They have said that English proficiency is positively related to thinking abilities with the help of thinking instruments and official English tests. Nikpour (2011) completed a study focusing on HOTS and language learning among Iranian students. And it showed a positive correlation between Iranian language learning and way of thinking. Malmir and Shoorcheh (2012) and Najme Bagheri (2018) researched HOTS and speaking among Iranian undergraduates, finding a significant relationship between HOTS and speaking proficiency, and training in HOTS positively affects students' learner speaking. In her empirical research, Xue (2014) found no significant difference in HOTS regarding different learning stages. Based on the above, the researcher intends to explore whether there is a positive relationship between Chinese English undergraduates' HOTS level and different language proficiencies. While previous scholars have examined the influence of these factors on thinking skills, most merely presented their research findings without providing further details or explanations. Therefore, this study aims to delve deeper into these two variables to analyze Chinese English undergraduates' HOTS.

Method

Under the research framework of the research objectives, a quantitative design supported by HOTS attitude questionnaires and assessment data will be employed to achieve the above objectives. Descriptive statistical analysis such as mean, standard deviation, percentages, and *p*-value is used to analyze the five-point Likert-scale HOTS attitude questionnaires and the HOTS assessment. Independent-sample T-test and one-way ANOVA analysis are used to investigate if different stages of learning and language proficiency influence HOTS. Finally, Pearson correlation analysis shows the relationship between the responding Chinese English undergraduates' HOTS attitudes and HOTS.

Participants

According to Wen's (2009) research results on Chinese undergraduates' cognitive condition, a critical period of undergraduates' development of thinking skills is from the second to the third year. The research participants of this study include 120 second-year (sophomores) and 120 fourth-year (seniors) English undergraduates enrolled in the School of Foreign Languages for International Business (SFLIB) at Hebei Finance University in China. This study adopts the convenience and purposive sampling method of choosing eight intact classes in two grades with 30 members in each class, a total of 240 students. All of them have participated in TEM-4¹ (Test for English Majors, Band4), an authoritative and compulsory examination for all English undergraduates in China. The TEM-4 grade has a passing score of 60 points, classified into four levels: fail, pass, good, and excellent. The score ranges for each group are as follows: below 60 points is considered Fail; 60-69 points is considered Pass; 70-79 points is considered Good; 80 points and above is considered Excellent. The participants' language proficiency will be determined based on their scores in TEM-4. The ones who scored Excellent and Good of 120 sophomores (26 students) are classified as high achievers, the ones scoring Pass are moderate achievers (65 students), and the Fail ones as low achievers (29 students). The same classification applies to the 120 seniors, with 30 high achievers, 64 moderate achievers, and 26 low achievers. The respondents' demographic information regarding gender, grades, and language proficiency is presented in Table One. All facts about the respondents mentioned above will support this study.

Table 1 The *Demographic Figure of Participants*

Demographic Variables		Frequency	Percentage (%)
Gender	Male	35	14.6%
	Female	205	85.4%
Grades	Grade Two	120	50%
	Grade Three	120	50%
Language Proficiency	High	56	23.3%
	Moderate	129	53.6%
	Low	55	22.9%

Research Instruments

The quantitative HOTS instrument in this study consists of two sections. The first part is a 5-Likert Scale questionnaire to investigate the responding students' attitude toward HOTS, and the second part is a HOTS test to assess their HOTS level. An adapted Critical Thinking Attitude Scale (Akatsuka, 2019) will be used for the first section of the HOTS assessment. The adapted scale tends to measure the attitude of several cognitive domains: Awareness of logical thinking

(13 items), Critical thinking (10 items), Inquiry mind (7 items), Objectivity and evaluation (3 items). They are considered to be essential elements of HOTS. Participants must complete 33 items on a Likert scale, ranging from 5 (strongly agree) to 1 (strongly disagree). It can be assigned into 5, 4, 3, 2, and 1 point, respectively, with total points ranging from 33 to 165. Four points and above in each item mean strong tendency, and three are considered positive. The higher the scale score, the more positive the respondent's attitude toward a particular thing or topic. Therefore, participants who received above 99 are considered to have a positive HOTS attitude, and ones getting 132 are categorized as having a strong tendency. By contrast, the respondents receiving less than 99 points are of a negative attitude. Before conducting a comprehensive analysis, the researcher assessed the reliability and normality of the scale items to ensure the integrity of the quantitative data analysis throughout the process. The reliability of the 33 items, measured by Cronbach's alpha, yielded a value of 0.881. Sub-scale alphas range from 0.546 to 0.863, which indicates a highly acceptable internal consistency and reliability.

The second section is a HOTS test. There did not exist any scientific instruments developed initially in China. Therefore, measuring tools for assessing Chinese students' thinking skills are translated and adopted directly or re-edited from Western instruments. Some Chinese researchers tested the feasibility of some Western instruments and found that they are applicable in China (Wang, 2008; Wen, 2010c). To improve the reliability of the assessment, the researcher needs to choose one instrument most proper for the Chinese participants of this study. Concerning the research objectives and participants of this study, the HOTS instrument utilized will be designed by referring to the framework and components of Watson-Glaser Critical Thinking Appraisal (WGCTA), Critical Thinking Skills Assessment (CTSA), and Wen's framework (2010b). Though with different descriptions, after analyzing the sub-scales of the above instruments, the researcher finds that the core assessed thinking skills are the same: analyzing, problem-solving, decision-making, inferences, evaluation, and logic deduction and can be categorized into three main segments: Analysis, Synthesis, and Evaluation, which are considered to be HOTS. Afterward, the HOTS-level instrument of this study consists of 30 multiple-choice items with ten questions for each assessed cognitive domain: Analysis, Synthesis, and Evaluation. The percentage score assesses higher-order thinking skills (HOTS). The HOTS level was calculated by comparing the percentage score to the HOTS level category in Table Two. Because the study included Chinese certificates of TEM-4 candidates, the TEM-4 scoring system is referred to as a standard category. The results reflect the HOTS levels among Chinese English undergraduates. Since the respondents of this study are Chinese, the HOTS assessment instrument will be conducted in Chinese to avoid misunderstanding of languages and ensure the validity of assessing results.

Table 2. *The Category of HOTS Level with Score Percentage*

Score Percentage	Level
80.0% - 100.0% (24-30)	Very High
70.0% - 79.0% (21-23)	High
60.0% - 69.0% (18-20)	Moderate
40.0%-59.0% (12-17)	Low
0.0%-39.0% (0-11)	Very Low

Research Procedures

Before doing the research, the researcher will ask for permission from SFLIB to conduct the survey. The researcher then explained the research objectives and ensured that the study's

implementation would not interfere with the regular teaching in SFLIB. Moreover, the researcher will inform the participants that their information and answers for questionnaires or other instruments will be confidential and only be used for this study. The data collection instruments will be distributed when the responding students are gathered together in a classroom for formality. This way, the researcher can offer timely explanations if students have doubts or problems completing. Afterward, the researcher integrated and interpreted the quantitative data to answer the research questions.

Results

Results of HOTS Attitude Questionnaires

A summary of the descriptive statistics of Chinese English undergraduates' attitudes toward HOTS, containing the number of participants, the maximum, the minimum, mean, and standard deviation, is listed below in Table Three.

Table 3. *General characteristics of Chinese English undergraduates' HOTS attitudes*

Four Domains (33 Items)	N	Minimum	Maximum	Mean	SD
Awareness of logical thinking	240	26	65	42.64	11.96
Critical thinking	240	21	50	39.3	9.6
Inquiry mind	240	16	35	25.13	6.37
Objectivity and evaluation	240	5	15	10.75	2.62
Total	240	77	165	117.82	30.55

Accounting for the four domains of HOTS items, the perceived data showed that the responding English undergraduates generally have relatively positive attitudes towards HOTS ($M=117.82$, $SD=30.55$). Moreover, a significant disparity is between the highest and lowest scores, with a maximum score of 165 and a minimum score of 77. This reveals that the educational environment has failed to cultivate a conducive atmosphere for students to foster higher-order thinking attitudes.

Differences in HOTS Attitude Concerning Learning Stages

A summary of the descriptive statistics of Chinese English undergraduates' attitudes toward HOTS, containing the number of participants, grades, mean, standard deviation, and p-value, is listed below. Independent-sample T-test is combined to show whether any differences exist between them. Table Four below lists the specific descriptive data from participants of different grades.

Table 4. *HOTS Attitude concerning different learning stages*

Four Domains (33 Items)	Grade	N	Mean	SD	P
Awareness of logical thinking	Grade 2	120	40.19	5.76	.018
	Grade 4	120	44.97	7.60	
Critical thinking	Grade 2	120	37.73	5.67	.778
	Grade 4	120	40.73	5.57	
Inquiry mind	Grade 2	120	25.47	3.78	.115
	Grade 4	120	24.83	3.28	
Objectivity and evaluation	Grade 2	120	10.68	1.90	.658
	Grade 4	120	10.83	1.80	
Total	Grade 2	120	114.07	12.31	.090
	Grade 4	120	121.36	14.65	

According to the findings presented in Table Four, there is a minor disparity in the general attitude toward HOTS between sophomores and seniors. The ratio of positive attitudes towards

HOTS is 114.07 for sophomores and 121.36 for seniors, indicating that seniors are slightly more positive towards HOTS. However, it is essential to note that both grades exhibited positive attitudes. Despite the positive attitudes, neither grade showed a strong tendency towards HOTS. These findings suggest that further exploration is needed to understand the factors influencing the variation in attitudes toward HOTS among sophomores and seniors. This trend remains consistent across almost all dimensions of HOTS.

Differences in HOTS Attitude Concerning Different Language Proficiency

After thoroughly investigating the difference in HOTS attitude across distinct learning stages, the researcher wants to examine the disparity in HOTS attitude depending on various degrees of language competency. The one-way ANOVA analysis investigated the difference between the three language proficiency groups. The results from participants with multiple levels of language competence and college degrees are shown in Table Five.

Table 5. *HOTS Attitude concerning different language proficiency*

Four Domains (33 Items)	Achievers	N	Mean	SD	P
Awareness of logical thinking	High	56	44.02	7.36	.073
	Moderate	129	42.66	6.71	
	Low	55	40.93	7.69	
Critical thinking	High	56	39.55	5.72	.142
	Moderate	129	39.67	5.60	
	Low	55	37.87	6.26	
Inquiry mind	High	56	25.68	3.82	.429
	Moderate	129	25.02	3.50	
	Low	55	24.89	3.36	
Objectivity and evaluation	High	56	10.88	1.82	.819
	Moderate	129	10.74	1.91	
	Low	55	10.65	1.76	
Total	High	56	120.13	13.45	.083
	Moderate	129	118.09	13.54	
	Low	55	114.35	15.09	

The findings presented in Table Five provide compelling evidence that high achievers do not possess a significantly stronger inclination ($p=0.083$) towards HOTS compared to their moderate and low-achieving counterparts, not only in the aspect of the general HOTS but also in each sub-scale. Specifically, the average scores for HOTS among high achievers were found to be 120.13, slightly higher than the scores of 118.09 recorded for moderate achievers and 114.35 for low achievers. This suggests that although the high achievers perform well academically overall, they may not have a notably stronger inclination towards higher-order thinking skills than their peers who achieve at lower levels.

Results of HOTS Level Tests

Table Six shows the distribution of respondents according to the category of HOTS level based on their total percentage score in the HOTS instrument. A summary of the descriptive statistics of Chinese English undergraduates' levels of HOTS, containing the number of participants, the maximum, the minimum, mean, and standard deviation, is listed below in Table Seven.

Table 6. *The frequency and percentage of students according to the category of HOTS level*

Level of HOTS	Frequency	Percentage
High	2	0.8%

Good	13	5.4%
Moderate	49	20.4%
Low	153	63.8%
Very Low	23	9.6%
Total	240	100%

From Table Six, more than half of the participating English undergraduates (63.8%) have low levels of HOTS. Only two (0.8%) and thirteen (5.4%) out of 240 students have high and good levels of HOTS. And 20.4% of students score moderate. Therefore, the students whose HOTS level is above moderate are only 64 (26.6%) out of 240 participants. Moreover, 23 (9.6%) students still scored less than 11 points, which means their HOTS level is very low.

Table 7. *General characteristics of HOTS level*

Categories (30 Items)	N	Minimum	Maximum	Mean	SD
Analysis	240	0	10	4.50	1.86
Synthesis	240	1	10	6.19	1.58
Evaluation	240	1	9	4.89	1.66
HOTS Score	240	9	28	15.57	3.21

Table Seven demonstrates that respondents exhibit variations in their ability to utilize each sub-skill of HOT. Participants excel in the synthesis aspect (Mean=6.19), followed by evaluation (Mean=4.89) and analysis (Mean=4.50). There is a significantly polarized difference between the highest and lowest scores in each category (10:0; 10:0; 9:1) as well as in total (28:9). And the average score of HOTS in total is only 15.57. This places the participants' overall performance in the "Low Level" category, as determined by the Score Percentage in Table Two. Based on the statistics above, the respondents' abilities to identify arguments, deduct logic, solve problems, evaluate or compare views, and draw conclusions may vary.

Differences in HOTS Concerning Learning Stages

A summary of the descriptive statistics of Chinese English undergraduates' level of HOTS regarding different learning stages, containing the number of participants, mean, standard deviation, and p-value, is listed below. Independent-sample T-tests are combined to show whether any differences exist between them. Table Eight below lists the specific descriptive data from participants of different grades.

Table 8. *HOTS Level concerning different learning stages*

Three Categories (30 Items)	Grade	N	Mean	SD	P
Analysis	Grade 2	120	4.47	1.80	.441
	Grade 4	120	4.53	1.91	
Synthesis	Grade 2	120	6.08	1.51	.074
	Grade 4	120	6.30	1.64	
Evaluation	Grade 2	120	4.77	1.59	.650
	Grade 4	120	5.01	1.72	
Total	Grade 2	120	15.32	2.99	.342
	Grade 4	120	15.83	3.41	

Based on the data shown in Table Eight, no statistically significant disparity was observed between the overall HOTS and each sub-skill of sophomores and seniors. However, when considering the overall HOTS score, including each sub-skill, seniors perform better than sophomores, indicating that their additional years of education have allowed them to refine these skills further, leading to their enhanced overall performance in HOTS. Nevertheless, although seniors perform better overall than sophomores, they are still at the Low level.

Differences in HOTS concerning different language proficiency

As previously indicated, the researcher aims to investigate whether language students with higher-order thinking skills perform better in their language proficiency. The one-way ANOVA analysis examined the difference between the three language proficiency groups. The results are shown in Table Nine.

Table 9. *HOTS Level concerning different language proficiencies*

Three Categories (30 Items)	Achievers	N	Mean	SD	P
Analysis	High	56	4.57	1.80	.695
	Moderate	129	4.54	1.81	
	Low	55	4.31	2.04	
Synthesis	High	56	6.36	1.78	.548
	Moderate	129	6.09	1.47	
	Low	55	6.25	1.60	
Evaluation	High	56	5.36	1.52	.052
	Moderate	129	4.74	1.57	
	Low	55	4.76	1.92	
Total	High	56	16.29	3.40	.167
	Moderate	129	15.37	2.82	
	Low	55	15.33	3.79	

Based on the data above in Table Nine, there is no statistically significant difference between the respondents' HOTS level and their language proficiency ($p=0.167$), both in their overall scores and within each category of HOTS. Further examination of the data reveals that high-achieving students had an average HOTS score of 16.29, slightly higher than their moderately achieving counterparts (15.37) and low achievers (15.33). Interestingly, the data precisely aligns with what has been presented in Table Five, indicating that high achievers do not have a more positive inclination toward HOTS.

Relationship between Students' HOTS Attitudes and HOTS Level

After a descriptive statistical analysis of Chinese English undergraduates' HOTS attitude and level, the researcher aims to investigate the relationship between the two variables in this section. The overall relationship between the two variables, with the help of the Pearson correlation coefficient, is displayed in Table 10 below.

Table 10. *Relationship between HOTS attitude and HOTS [Pearson Correlation / Sig. (2-tailed)]*

Correlation	Analysis	Synthesis	Evaluation	HOTS Total Score
Awareness of logical thinking	.047 / .465	-.020 / .754	.025 / .696	.030 / .639
Critical thinking	.082 / .204	-.022 / .732	.097 / .132	.087 / .180
Inquiry mind	-.010 / .873	-.021 / .749	.104 / .108	.037 / .564
Objectivity and Evaluation	.109 / .092	-.077 / .234	-.051 / .428	-.001 / .982
HOTS attitude Total Score	.070 / .279	-.035 / .589	.073 / .260	.061/.347

The data analysis reveals no significant correlation between HOTS attitude and HOTS level ($p=.347>0.05$), indicating that having a positive attitude to HOTS conceptually differs from having the skills to think. For example, a negative correlation exists between Awareness of logical thinking and Synthesis ($-.020 / .754$), suggesting that individuals who demonstrate a stronger inclination towards logical thinking tend to perform worse in the logical deduction and interpretation of information. The situations are similar in other groups of comparison.

Discussion

The previous section's statistical data analysis uncovers some findings regarding the three research questions in this study.

RQ One: What are the characteristics of Chinese English undergraduates' HOTS attitude?

In this study, the data results in the previous section indicate that the responding English undergraduates have relatively positive attitudes toward HOTS. The findings presented in the study are consistent with the research conducted by Wen (2006) that Chinese English undergraduates have a positive attitude toward critical thinking. Kelly (2010) further concludes from empirical evidence that Chinese students tend to rely on preconceptions, authorities, or others for answers or solutions rather than exercising independent judgment based on truth, evidence, and reasoning. Wen (2006) argues that English undergraduates' learning materials and study methods tend to limit their cognitive development.

Moreover, the findings in Table Four have demonstrated that the increase in learning stages does not significantly influence the development of English undergraduates' HOTS attitude ($p=.090$). In other words, progress in learning stages does not necessarily lead to advancements in HOTS, and vice versa. Among all four domains, sophomores excel over seniors in the Inquiry mind domain, albeit the difference is not statistically significant. This finding may indicate that sophomores are more enthusiastic about exploring new concepts and are more receptive to diverse ideas. However, seniors surpass sophomores in the remaining three domains. In addition, it is worth mentioning that there are remarkable distinctions between the two groups of data in terms of their Awareness of the logical thinking domain, which was found to have a statistically significant p-value of 0.018. These findings suggest that the level of understanding and application of logical reasoning differ significantly between the two groups under investigation. Finally, the data results in Table Five indicate no statistically significant difference in the general HOTS attitude and each sub-scale between high, moderate, and low academic achievers. These findings contradict previous research conducted by Facione et al. (2001), who also found a connection between critical thinking disposition and participants' academic performance.

RQ Two: What are the characteristics of Chinese English undergraduates' HOTS level?

The findings in Table Seven align with the qualitative study of Huang (2010), which focused on what is known as the "Syndrome of Critical Thinking Absence." This finding contradicts the results obtained by Wickersham (2006), who found that most participants in their study excelled in the sub-skills of analysis and evaluation. The poor performance in Analysis and Evaluation suggests that participants struggle to present their arguments logically and effectively, make analytical reasoning based on evidence, and clearly state their ultimate conclusion. This syndrome has been suggested to be caused by a practice in which English

teachers detest thinking but emphasize language flow in their instruction (Wen, 2010a). Another factor contributing to the syndrome is the cultural value placed on conformity in Chinese society. Traditionally, Chinese culture emphasizes respect for authority and adherence to established norms. Consequently, students may find it challenging to challenge existing paradigms or think critically, as doing so can be perceived as disrespectful or rebellious. This cultural influence further perpetuates the absence of HOTS among Chinese college English undergraduates.

Furthermore, according to the data presented in Table Eight, there is no statistically significant difference in HOTS level regarding different learning stages. The findings showed in the study are consistent with the insightful research conducted by Xue (2014), which examined the cognitive abilities of seniors compared to sophomores. Jorge (2010) argued that the analysis of critical thinking development should incorporate various variables. Bekie, Lowry, and Barnett's study (2001) supports this notion by demonstrating how seniors, driven by the urgency to graduate, become preoccupied with employment concerns, diminishing their thinking skills. This lack of significant differentiation in the overall HOTS score and the three sub-skills between sophomore and senior students raises concerns about the college education system's failure to cultivate these crucial abilities in English learning.

Finally, the data presented in Table Nine indicates no statistically significant difference in HOTS between the three language proficiency groups ($p=.167$). The findings challenge the results of Facione's empirical study conducted in 2000, which suggested that academic competence plays a significant role in predicting cognitive abilities. This unexpected result challenges the assumption that higher language proficiency positively correlates with higher HOTS scores. This also suggests that although the high achievers perform well academically overall, they may not have a notably stronger inclination towards higher-order thinking skills than their peers who achieve at lower levels. These findings prompt a reconsideration of the factors that contribute to HOTS performance. Other variables beyond language proficiency alone may influence these skills.

RQ Three: What is the relationship between Chinese English undergraduates' HOTS attitude and HOTS level?

The findings in Table suggest that thinking attitude and thinking skills do not progress simultaneously ($r=.201/376$). This indicates that no specific higher-order thinking attitude can be directly linked to any particular higher-order thinking skill. In other words, these two components of HOT do not significantly impact or contribute to each other's development. Negative correlations highlight the complexity and multifaceted nature of HOT, suggesting that individuals may possess strengths in specific dimensions while exhibiting weaknesses in others. The results above are consistent with Facione's (2001) and Xue's (2014) research, showing a weak correlation between participants' thinking attitudes and thinking skills. In other words, these two aspects of HOT do not exert any influence or contribute to each other. This reiterates Facione's (2007) conclusion that thinking disposition and skills are separate entities within an individual.

Conclusion

This study aims to investigate Chinese English undergraduates' attitudes and levels of HOTS, focusing on assessing the correlation between them and the impact of different learning stages and language proficiencies on these aspects. The findings above indicate that the

responding English undergraduates have relatively positive attitudes towards HOTS while exhibiting variations in their ability to utilize each sub-skill of HOT. And the participants' overall performance is in the "Low Level" category. This study additionally states that no notable difference is observed in HOTS attitude and HOTS level among sophomores and seniors, as well as between high achievers and low achievers. Last but not least, there is no apparent relationship between English undergraduates' HOTS attitude and HOTS level. These insights have significant implications for developing and assessing HOTS in educational contexts. It is important to provide explicit instruction in HOTS as a separate subject and integrate HOT instruction across various disciplines. It is essential to emphasize that developing students' skills within different disciplines alone may not be enough without fostering a certain mindset to apply those skills effectively.

Endnotes

1. TEM-4 (Test for English Majors-Band 4), the National College English Majors-Band 4 Examination. It has been administered by China's Ministry of Education since 1991 and examines English majors in comprehensive universities nationwide. The exam aims to comprehensively assess students' ability to use basic language skills and their mastery of grammatical structures and word usage. It also aims to test students' overall language ability and individual language skills.

About the Authors:

Yue Yin is a current Ph.D. student at Universiti Teknologi Malaysia. She is also a faculty member of Hebei Finance University in China. Her areas of expertise are English Teaching in the EFL classroom, Higher-order thinking in EFL classrooms, Translation theories and interpreting. ORCID ID: <https://orcid.org/0009-0001-3854-4797>.

Dr. Norhanim Abdul Samat is a teacher trainer attached to the University Teknologi Malaysia. She had her doctorate in process drama from the University of Waikato, New Zealand. Her areas of expertise are Applied Literature in the ELT classroom, Process Drama, Drama Education, Communication and Language Arts Education, Student Development and Community Learning. ORCID ID: <https://orcid.org/0000-0003-0110-5798>.

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