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Fostering L2 Speaking and Thinking Through a HOT Approach

Mei-Hui Chen

This study investigated the effect of a Higher-Order Thinking (HOT) approach on the speaking proficiency and thinking performance of L2 students. Empirical research on higher-order questions has shown positive impact on the quantity of L2 speaking output, syntactic complexity, and higher cognition. However, some researchers argued that questioning does not truly facilitate L2 speaking and cognitive development. In association, a world-wide increase in teaching thinking has led to a debate about its applicability to L2 settings, especially to Asian learners. To enable students to enhance L2 speaking proficiency and to proactively use HOT, this study based on a review of literature related to higher-order questions, questioning techniques, and communication skills designed and undertook a HOT approach. It included thinking tasks designed with higher-order questions in two steps. First, in a teacher-led setting the teacher modelled the tasks to the students focusing on how to responding to higher-order questions and language use. Secondly, thinking tasks were performed in small groups as part of L2 learning where students subsequently practiced the communicative skills and language use acquired in the first step. The researcher conducted this innovative study with a case study design for 12 weeks in a Taiwanese university L2 classroom. Two classes of non-English major freshmen participated in this study: one class received the innovation, while the other class did not. The group discussion data collected at the pre-, post-, and delayed post-test were assessed for L2 speaking proficiency and cognitive performance. The results show strong evidence that the thinking approach exerts statistically significant positive effects on L2 speaking proficiency and thinking performance and the effects are long-lasting, indicating that it is practicable to train Asian L2 learners to think critically and independently. The researcher suggests the value of introducing higher-order thinking into L2 classrooms to broaden learning basic linguistic skills and expand the learning dynamic.

Key words: L2 speaking, higher-order thinking, higher-order questioning

Mei-Hui Chen, Assistant Professor, Language Center, Shih Chien University Kaohsiung Campus

Corresponding Author: Mei-Hui Chen, email: meihuichen@mail.kh.usc.edu.tw

Introduction

Learning to speak English is problematic for students in Taiwan. Among the four language learning skills, speaking is considered by many Taiwanese learners to be the most difficult and essential skill to acquire (Hsu, 2004). Numerous learners are unable to communicate freely in English even after learning English conversation for several years (Nunan, 2003). This implies that the current L2 teaching methods used in Taiwan, namely the grammar-translation method and the communicative language teaching approach (Liu, 2005), do not fully achieve the educational goal of equipping students with English speaking proficiency to communicate and negotiate, particularly, in an international setting (Ministry of Education [MOE hereafter], 2008). Thus, the need to improve the speaking proficiency of L2 students with enhanced communication skills, using a more effective teaching approach is required.

Related Literature

The Importance of Higher-order Thinking

Higher-order thinking (HOT) refers to the mental processes of application, analysis, synthesis, and evaluation of Bloom's (1956) taxonomy of the cognitive domain, while lower-order thinking refers to more superficial thought, e.g., recalling information and summarizing. In classrooms, higher-order thinking is primarily used for active learning where students must think critically and creatively, whereas in practice, it is an essential tool used to compete in a global job market (Au, 2006). Educators and researchers (e.g., McGuinness, 1999) have highlighted the importance of teaching thinking. Halx and Reybold (2006) emphasized the crucial aspect of developing student high-cognitive ability in the educational curriculum and a desirable goal in higher education (HE) worldwide. Reducing rote learning to equip students with high-cognitive ability to think independently and proactively has become the goal of current educational reforms in numerous countries, including Taiwan (MOE, 2008). Studies have suggested that cognition and language development are closely related (Carter, 2004), and L2 education also reflects the importance of higher-order thinking (Ayaduray & Jacobs, 1997; Dong, 2006).

The Teaching and Learning of Thinking

Thinking can be taught as an isolated subject or through integration with major subjects (e.g., Science, English). Wenden (1997) suggested that integrating thinking instruction into regular language instruction may be the most effective approach, as was implemented by Ayaduray and Jacobs (1997). A primary approach to integrating thinking instruction into foreign language teaching is to pose higher-order questions, which require students to conduct higher-order thinking. Empirical studies have shown that teacher questioning using higher-order questions develops grammatical complexity, longer utterances, and higher cognition in L2 students (Ayaduray & Jacobs, 1997; Godfrey, 2001). Student questioning using higher-order questions in group discussion promotes oral interaction, which assists students' language comprehension and writing (Alcón, 1993). A recent study (Zhang, Anderson, & Nguyen-Jahiel, 2013) revealed that group discussion using higher-order questions accelerates the acquisition of spoken and written English by English language learners. However, these studies were primarily implemented in Western countries and the former British colonies in Asia (e.g., Singapore and Malaysia). The effect of applying HOT on L2 student performance outside these countries remains unknown.

A Critical Review of the Effect of Higher-order Questioning on Cognitive Development

Previous studies have demonstrated that questioning using higher-order questions benefits higher cognition in students; however, whether questioning truly facilitates cognitive development requires critical evaluation. Teacher questioning causes students to take a passive approach to higher cognition because students only think when the teacher asks questions. Dillon (1978) and Yamada (1913) argued that teacher questioning makes students passive by reducing their chances to conduct high cognitive thinking, to probe further, to tackle problems that arise, and to inquire; such behavior limits student participation and involvement (Fairclough, 1989). Tan (2007) also observed that higher-order questioning does not necessarily encourage L2 students to think and talk critically in teacher-fronted settings. This indicates that higher-order questioning has some drawbacks associated with cognitive development. Thus, to motivate students to think proactively and independently, opportunities for students to dominate the talk, ask others about their thoughts, and comment on their viewpoints are required.

A Critical Review of the Effect of Higher-order Questioning on L2 Speaking

Higher-order questioning enhances the quantity of L2 speaking output and syntactic complexity; however, considering the type of talking and the learning environment created by such questioning behavior is crucial. Teacher questioning provides students with opportunities to talk more, but it does not provide students the opportunity to raise issues proactively or to explore the topic further. Also, student questioning mainly focuses on asking higher-order questions rather than on the manner in which students react to each other's responses. Rowe (1974) stressed that the classroom talk produced by high frequency of teacher questioning results in classroom language that feels similar to an "inquisition" rather than a reasonable conversation. Thus, questioning does not fully promote a more interactive learning environment for L2 speaking. Ellis (1990) proposed that the optimal conditions for classroom language learning include allowing learners to initiate and control the topics.

Cognitive Development

Cognition occurs most optimally during authentic interaction. For cognition instruction, instead of simply requiring students to reply to higher-order questions, Paul (1992) argued that a primary principle for nurturing students to think proactively and independently is for them to raise issues or problems related to the topic under discussion and argue and reason among themselves. Various types of thinking are classified in Bloom's taxonomy, including six cognitive levels of *complexity*, namely, from the least to the most complex thinking level: knowledge, comprehension, application, analysis, synthesis, and evaluation. Increasing learner thinking levels necessitates that teachers first increase complexity to guide learners to a more complex thinking level (Sousa, 2001). However, Sousa (2001) argued along with Bloom that the real connection to cognitive ability is *difficulty,* which refers to the amount of effort a learner expends within a level of *complexity* to accomplish a learning objective. Thus, compared with the effort expended in higher cognition in answering higher-order questions in a teacher-fronted setting, the effort expended in higher cognition for social interaction is much higher because it requires that students process more information with HOT when exchanging their views. This further elucidates the importance of the social context when fostering student thinking.

The Importance of a Social Context

Vygotsky (1978) and Swain (2000) emphasized the importance of interaction in a social context for cognition and language development. From a sociocultural theory perspective, Swain's (2000) output hypothesis posited that language serves as a cognitive tool in a social context that assists in the learning process. Promoting interaction with students using activities, Johnson, Johnson, and Holubec (1993) stressed that merely putting students in groups and asking them to work together may be insufficient to generate the type of language and learning expected. Smith and Higgins (2006) concluded that promoting interaction should focus less on the questions posed, and more on the manner in which one reacts to others' responses to questions. This indicates that encouraging interaction for L2 speaking and thinking requires providing a social context (implemented through group work) and equipping students with communication skills to allow interactions to occur in the learning context.

Research Gaps

A review of previous studies investigating the effectiveness of higher-order questions on learning performance in L2 classrooms has identified numerous research gaps. First, empirical studies (e.g., Alcón, 1993) have explored only the length and syntactic complexity of student utterances, and no study has examined the overall speaking proficiency of students in a social context. Students' speaking proficiency is not merely determined by increased output or improved syntactic complexity, but by a positive command of spoken language in a social context. Ortega (2003) observed that syntactic complexity does not necessarily have a positive relationship with L2 proficiency. Second, previous studies related to questioning (e.g., Godfrey, 2001) have examined the frequency of higher-order thinking, which does not necessarily reveal improved cognitive performance because (a) posing more higher-order questions generates additional high-cognitive ideas, and (b) higher cognition is not used proactively in such learning situations. The core issue of enhanced cognition lies in whether without prompting, students proactively use their higher cognition to raise issues, make comments, probe further, or solve problems. Third, previous studies (e.g., Ayaduray & Jacobs, 1997) have investigated only the immediate effect of treatment. However, the real issue regarding implementing a treatment is whether it results in learning by examining its

long-lasting effect (Mackey & Gass, 2005). Fourth, no study has targeted a student population in Asia outside the former British colonies, populations that are largely under-researched. The issue of teaching thinking to Asian L2 learners is controversial with certain educational researchers (e.g., Atkinson, 1997), who contend its inappropriateness because of students' collective and hierarchical cultural background where they are passive learners, rarely challenge what they learn from the teacher, and where memorization and recitation are the primary learning strategies in schools, whereas others (e.g. Gieve, 1998) argue its suitability.

The Present Study

The present study is innovative in conception and design. The main aim of this study was to evaluate the practicability of a HOT approach in a Taiwanese university L2 classroom. Having identified the research gaps, the researcher designed a HOT approach to investigate the effect of such an approach on speaking proficiency and thinking performance of L2 students. The approach adopted was designed to overcome the shortcomings of teacher questioning. The research was designed to train students to conduct higher-order thinking and communication and was based on a two-step approach. First, in a teacher-led setting the teacher modelled the tasks to the students focusing on how to responding to higher-order questions and the language use. Second, thinking tasks were performed in small groups as part of L2 learning where students subsequently practiced the communicative skills and language use acquired in the first step. Higher-order questions formulated in this study were mainly based on the question stems adapted from Morgan and Saxton (1994). Wait-time and probing were applied to facilitate questioning. Teachers can use probing to elicit students' responses (Wu, 1993) and scaffold or mediate students' thinking in which a shared and co-constructed sense of the meaning is established in a social context (Smith & Higgins, 2006). Extended wait-time assists high cognitive level learning by providing teachers and students with additional time to think (Tobin, 1987). Therefore, to encourage high cognitive responses, adequate wait-time was provided. The communication skills of responding to higher-order questions and making comments were also instructed.

This approach aimed to assist students to produce more high-level elaborations (King, 1990) by giving detailed description of how to solve a problem, providing rationales or reasons, explaining an idea or relationship, generating examples, clarifying concepts, making justifications, drawing conclusions, and probing further

with higher-order questions, which require a use of HOT. The thinking approach allows the occurrence of socio-cognitive conflicts (Mugny & Doise, 1978) through social interaction which contributes greatly to cognitive development. During the social interaction, different perceptions, ranging from simply having more or less schemata to holding completely contradictory perspectives, arise and are readjusted. Students are forced to externalize their thoughts, making their ideas explicit to themselves and to others. In the thinking approach language serves as a cognitive tool in a social context that facilitates L2 learning (Swain, 2000). Further, students listen to their peer's thoughts in a social context, thereby having opportunities to notice features of the L2 and enhance speaking proficiency (Gass, 1997).

The research attempted to answer one main research question with two sub-questions which were derived from the literature related to L2 speaking problems and higher-order questioning and the identified research gap. They are as follows:

The main question:

Is it practicable to use the HOT approach to enhance speaking proficiency and foster higher-order thinking in a Taiwanese university L2 classroom?

The sub-questions:

1. How does the introduction of the HOT approach affect L2 students' high cognitive performance?

2. How does the introduction of the HOT approach affect L2 students' speaking proficiency?

Methods

Research Design

This study was designed as a case study of an innovation, and a comparison class was included, aiming to provide theoretical generalization. As Yin (2003) argues, the heart of a case study is to test a theory regarding a particular phenomenon within its real-life context. The particular phenomenon in this study

referred to the practicability of the HOT approach. The context under which the phenomenon was studied was in a Taiwanese university L2 classroom where teachers lectured on grammar and vocabulary and students often sat quietly to listen. Group discussions were sometimes conducted with higher-order questions such as 'why' questions occasionally posed. Students' learning style tended to be passive and higher-order thinking was seldom operated.

Participants

The target students for this study were from a large university in Taiwan. Two classes of non-English-major freshmen were recruited, aged between 18 and 19 years. One class was randomly assigned to be the innovation class (N = 40) majoring in visual-art design, and the other as the comparison class (N = 32), majoring in math.

Within each class, six study group members based on volunteer sampling were selected. They further formed two small groups of three (comparison class: Group 1 (1 male and 2 female members), Group 2 (2 male and 1 female members); innovation class: Group 1 (1 male and 2 female members), and Group 2 (1 male and 2 female members). The average academic score in English language proficiency in the comparison class was 83.5, whereas that of the innovation class was 84.5. Five of six study group members in each class had passed the beginner level of the General English Proficiency Test (GEPT) where English proficiency is equivalent to understanding and using daily life vocabulary with approximately 2000 stored words and phrases. None of the group members in both classes had taken extra English lessons after school and approximately 90% of the students in each class had passed the beginner level GEPT. Before choosing the study group members, the aim and responsibilities of becoming a study group member were explained (e.g., to be video-taped).

The effect of using various subject majors in this study design was recognized. The thinking styles of these two classes can differ: Math students are typically more proficient at analyzing figures, whereas visual-art design students excel at creating images, which may affect the results. However, both analyzing and creative thinking belong to higher cognition and the effect of this variable between the two groups can be limited.

Treatments

An innovative HOT approach was conducted over a twelve week period to foster the speaking and higher cognition of L2 students. This cognitive approach was designed based on a review of literature related to higher-order questions, questioning techniques (e.g., wait-time and probing) and communication skills (e.g., making comments and inquiries). It included thinking tasks designed with higher-order questions in two steps. First, questioning was conducted in a teacher-fronted setting. The teacher modeled the tasks for students, focusing on activating students' schemata, how to answer higher-order questions with detailed explanation and reasons, comment on one another's opinions, probe for further information, and language use. Second, thinking tasks were performed in small groups. Students were first required to contribute their individual thoughts and opinions to the questions listed in the thinking task and then encouraged to think critically regarding their peers' contributions to the discussion and interact by commenting on one another's views and persuading others of their viewpoints with examples. Through discussion, they were expected to reach a consensus within each group. Students subsequently practiced the communicative skills acquired in the first step when undertaking the thinking tasks focusing on L2 learning outcomes.

Four types of thinking tasks, including *5Ws*, *Odd One Out*, *Make-Up-A-Story*, and *Guess What I Say*, used with each task, provided opportunities to exercise particular higher cognition (an example of a thinking task, see Appendix 1). The following is a summary of the tasks:

- *5Ws* (Butterworth & O'Connor, 2005) activates students' higher-order thinking using application, analysis, synthesis, and evaluation, primarily asking higher-order questions such as "why," "how," and "What would you do if…"

- *Odd One Out* (Leat, 1998) aims to develop classification skills, and requires students to use thinking-level analysis to categorize three or four objects or events and identify which one differs from the others, and what the others have in common.

- *Make-Up-A-Story* fosters students' creative thinking, requiring learners to create a story based on four provided pictures. The pictures provided in this

study were related to travelling and a background story.

- *Guess What I Say* requires students to arrive at an answer using analytical thinking. Students were required to infer what the idiom is based on the information provided.

Each type of task was developed for three different topics, totaling 12 tasks in which links to related sentence patterns and vocabulary were provided. One task was used each week for the four types used in rotation. The topics used in these thinking tasks were all related to the student context and life, such as travel experience and the ideal mate.

Assessment

The core assessment focused on practice in one of the four thinking tasks: 5Ws. The topics used for data collection at the pre-, post-, and delayed post-test included:

- "What do you consider the most ideal country to live in?"
- "What are the three most crucial characteristics of a good friend?"
- "What are the most crucial criteria for choosing an ideal mate?"

In each task students were required to reach an agreement within a group. They would elaborate individual thoughts towards the topic first and then move on to comment on each other's viewpoints, persuade others of their thoughts, and tried to reach a consensus. A 15-min discussion was video-recorded from the study groups in both the comparison and innovation classes.

Procedures

The study was completed as a partial compulsory general English course for non-English-major freshmen, featuring a two-credit course offering 2 hr of English lessons per week to improve students' general English-language proficiency. The innovation was conducted by the teacher with 7 years of experience teaching English to adults, once a week for 12 consecutive weeks. Both the innovation and comparison classes received a 50-min lecture in the first lesson and in the second lesson the innovation class conducted the thinking approach for 50 minutes, while the comparison class received speaking tasks provided by the textbook (Yeldham, 2001) without any guidance in discussion techniques. However, speaking tasks

provided by the textbook occasionally contained higher-order "why" questions.

At the semester onset, both the comparison and innovation classes completed a demographic survey, and the pre-test was also conducted. Participants in both classes were randomly divided into groups of three. Two camcorders were used to record the discussion of the two study groups in each class. Before conducting the group discussion, the teacher explained the task, what the students were to discuss, and encouraged them to elaborate their thoughts and comment on each other's ideas. The first step of the HOT approach, teacher modeling, was not conducted during the data collection phases. The study group members activated and produced the oral discourse without teacher interference. Using the same processes for collecting the video data of the thinking-task discussion, the post-test was conducted after the 12-week innovation and delayed post-test data were collected 4 weeks after completing the innovation.

Data Analysis

Analysis of Thinking Performance

The students' thinking performance was analyzed based on an adaptation of the classification systems of Ayaduray and Jacobs (1997), King (1990), and Webb (1989), relating to peer interaction and cognition using group discussion data (for classification systems of thinking performance, see Appendix 2). The data were analyzed as to the response given and the types of questions asked and assigned one of four categories: a) low-level elaboration, referring to information provided without any explanation or examples, b) high-level elaboration, referring to elaborations with examples, reasons, detailed description, and concept clarification and comments on each other's thoughts, c) lower-order question, referring to a question, which received low-level elaboration, and d) higher-order question, referring to a question, which received high-level elaboration. Procedure questions, questions listed on the handout, and off-task talk were not coded, as they were not the focus of the present study. Classification of thinking performance was done at group of three rather than for individual level, because some ideas or comments were collaboratively achieved by the group members.

The following examples extracted from the video transcripts demonstrate the coding of each category. For instance, a learner commented on other student's opinions by saying, "I agree" without any reasons provided which was coded low-level elaboration. While a student was arguing the unimportance of appearance when choosing an ideal mate by saying "I think appearance is the most unimportant because everyone will get older and older. Beauty doesn't last forever, just 10 years or 20 years." was coded high-level elaboration. When a question "Do you agree?" received a response "I disagree," the question was coded lower-order question. Whereas a question "Why do you think being supportive is important?" which was responded with an elaboration "Because when we do something that we haven't done it before, we have a friend to support us, to encourage us, we might be successful. That's why it is important to choose a friend who is supportive." was coded higher-order question.

Analysis of Speaking Proficiency

Green and Harker (1988) indicated that verbal outcomes produced in a social context are complex and challenging to measure because the communicative performance of a student relies on the actions of other interlocutors. However, it was decided to analyze the speaking proficiency of each student because of the opportunities for individual student monologue (to express personal viewpoints in responding to the questions listed on the handout) and interaction (e.g., to comment on others' ideas or to raise questions) provided by the thinking tasks.

Overall speaking proficiency was evaluated using the public version of IELTS speaking-band descriptors containing four categories: fluency and coherence, lexical resource, grammatical range and accuracy, and pronunciation. These four categories were used to examine individual students' speaking skills, while the criterion of coherence was used to examine the coherence not only within a speaker's talk but also between the student and other group members. The IELTS speaking-band score descriptors range from 0 to 9, whereas this study scores were based on a .1 scale rather than a .5 scale (e.g., 5.1, 5.2), showing more subtle changes in student utterances.

Inter-rater Reliability

The coding of thinking performance

The video data were transcribed and coded by the researcher and an English instructor to analyze students' thinking performance. The two raters discussed the concept of the four categories, agreed upon a definition of each category. Prior to the coding, the raters separately evaluated and assigned ratings to a discussion transcript sample collected from the innovation class during the innovation with a 91.30% agreement. The two raters then coded the transcripts individually. After coding these transcripts, the total number of analysis units was counted. Applying the Miles and Huberman (1994) inter-rater reliability formula, the inter-rater reliability coding reached 92.80%, 91.48 %, 96.07%, and 100% agreement for the category of low-level elaboration, high-level elaboration, lower-order questions, and higher-order questions, respectively. The two raters discussed and negotiated the discrepancies in the coding results until reaching a mutual agreement. Based on these ratings, both the accuracy and reliability of using the cognitive classification systems met the general check-coding standard, requiring a 90% range (Miles & Huberman, 1994).

The rating of speaking proficiency

Two speaking test experts who were native English speakers, assessed the speaking proficiency. One has performed such work for more than 10 years and was familiar with the IELTS speaking-band descriptors and the other was a specialist in teaching English speaking and experienced in rating student English-speaking proficiency. Prior to the assessment, rating standardization between the two raters was conducted using a group discussion data sample collected from the innovation class during the innovation and reached a 94.11% agreement. The two raters then individually assessed the overall speaking proficiency by using the audio data based on the public version of IELTS speaking-band descriptors. The raters were blind to the innovation condition, and the audio recording was played in a non-sequential order of pre-, post-, and delayed post-test to diminish rater bias of certain outcomes. The inter-rater reliability for overall speaking proficiency reached a 91.35% agreement. Since the inter-rater reliability was high, all ratings gained from the two raters were averaged for each student.

Findings

The researcher used qualitative data analysis to explore L2 student speaking and thinking performance and quantified group discussion data by using content analysis for analyzing cognitive performance. Due to a small sample size, the descriptive results were computed using nonparametric statistical test, Mann-Whitney U test, to identify the effects of the HOT approach on student speaking and cognitive performance. Further, Wilcoxon Signed-Rank test was applied to reveal individual class progress. Results of Mann-Whitney U test revealed that no statistically significant differences were found between the innovation and comparison classes on the low-level elaboration, high-level elaboration, lower-order questions, higher-order questions, and overall speaking proficiency (Z = -1.60, -0.16, -1.67, 0.00, and -0.65, respectively; see Table 1, Table 2, Table 3, Table 4, and Table 5) in the pre-test. This suggests that before conducting the research the two classes were equivalent in the English speaking proficiency and the ability and tendency to ask higher-order questions and provide high-level elaboration.

Effect of the HOT Approach on Cognitive Performance

Low-level elaboration

Table 1 shows statistical significance, using low-level elaboration between the two classes in the post-test (Z = -2.42, $p < .05$) and the delayed post-test (Z = -2.81, $p < .01$) and the median value of the innovation class was higher than that of the comparison class both in the post-test (8.5 > 3.5) and delayed post-test (11.5 > 5.0), meaning that the innovation class outperformed the comparison class, using low-level elaboration, which maintained the result. However, within the innovation class the results of the Wilcoxon test indicated that a substantial increase in low-level elaboration occurred only in the delayed post-test (Z = -2.03, $p < .05$) rather than post-test (Z = 0.00, $p > .05$).

High-level elaboration

Table 2 also reveals a statistically significant difference between the two classes in high-level elaboration in the post-test (Z = -2.77, $p < .01$) and the delayed post-test (Z = -2.44, $p < .05$), meaning that the innovation students significantly outperformed the comparison students immediately following the innovation,

Table 1 Cognitive performance results of low-level elaboration

	Comparison (n=6)	Innovation (n=6)	Mann-Whitney U	Z value (Mann-Whitney U)
Pre-test	4.0 [1.0;7.0]	8.5 [6.0;10.0]	8.0	-1.60
Post-test	3.5 [3.0;6.0]	8.5 [6.0;10.0]	3.0	-2.42*
Delayed post-test	5.0 [4.0;6.0]	11.5 [10.0;13.0]	0.5	-2.81**
Z value (pre-post) Wilcoxon Signed- Rank	-0.13	0.00		
Z value (pre-delayed) Wilcoxon Signed- Rank	-0.67	-2.03*		

*$p < .05$, **$p < .01$, ***$p < .001$

achieving higher median values with a long-term result. Very importantly, the innovation class itself also made considerable improvement in the post-test (Z = -2.20, $p < .05$) and delayed post-test (Z = -2.20, $p < .05$). Results presented in Table 2 indicate the significant, positive, long-term effect of the HOT approach on high-level elaboration.

Table 2 Cognitive performance results of high-level elaboration

	Comparison (n=6)	Innovation (n=6)	Mann-Whitney U	Z value (Mann-Whitney U)
Pre-test	1.0 [0.0;2.0]	1.0 [0.0;2.0]	17.0	-0.16
Post-test	2.0 [0.0;2.0]	4.0 [3.0;7.0]	1.0	-2.77**
Delayed post-test	1.5 [0.0;2.0]	4.5 [3.0;9.0]	3.0	-2.44*

Table 2 Cognitive performance results of high-level elaboration (continued)

	Comparison (n=6)	Innovation (n=6)	Mann-Whitney U	Z value (Mann-Whitney U)
Z value (pre-post) Wilcoxon Signed- Rank	-1.41	-2.20*		
Z value (pre-delayed) Wilcoxon Signed- Rank	-0.27	-2.20*		

*p < .05, **p < .01, ***p < .001

Lower-order questions

Table 3 demonstrated that the innovation class itself did not increase the use of lower-order questions in both the post-test (Z = 0.00, p > .05) and the delayed post-test (Z = 0.00, p > .05), though a statistical significance between the two classes was shown in the post-test (Z = -2.27, p < .05) and delayed post-test (Z = -2.32, p < .05). It indicates that the innovation class did not actually increase the use of lower-order questions and this can be explained by the fact that the median value of the comparison class decreased in the post-test (Median = 0.0) and the delayed post-test (Median = 0.0).

Table 3 Cognitive performance results of lower-order questions

	Comparison (n=6)	Innovation (n=6)	Mann-Whitney U	Z value (Mann-Whitney U)
Pre-test	0.5 [0.0;1.0]	1.5 [1.0;3.0]	8.0	-1.67
Post-test	0.0 [0.0;0.0]	2.0 [2.0;4.0]	5.0	-2.27*
Delayed post-test	0.0 [0.0;0.0]	1.5 [1.0;3.0]	4.5	-2.32*
Z value (pre-post) Wilcoxon Signed- Rank	-0.81	0.00		
Z value (pre-delayed) Wilcoxon Signed- Rank	-1.63	0.00		

*p < .05, **p < .01, ***p < .001

Higher-order questions

Interestingly, as shown in Table 4, the innovation class significantly improved their ability to ask higher-order questions as a statistically significant difference was found between the two classes in the post-test (Z = -2.34, p < .05) and the delayed post-test (Z = -2.73, p < .01) with the innovation class achieving higher median values. As also shown in Table 4, the innovation class itself significantly increased the use of higher-order questions in the post-test (Z = -2.00, p < .05) and the delayed post-test (Z = -2.12, p < .05). These results infer that the HOT approach enhances students' ability to ask higher-order questions and the effect is long-lasting.

Table 4 Cognitive performance results of higher-order questions

	Comparison (n=6)	Innovation (n=6)	Mann-Whitney U	Z value (Mann-Whitney U)
Pre-test	0.0 [0.0;0.0]	0.0 [0.0;0.0]	18.0	0.00
Post-test	0.0 [0.0;0.0]	1.0 [0.0;1.0]	6.0	-2.34*
Delayed post-test	0.0 [0.0;0.0]	1.0 [1.0;1.0]	3.0	-2.73**
Z value (pre-post) Wilcoxon Signed- Rank	0.00	-2.00*		
Z value (pre-delayed) Wilcoxon Signed- Rank	0.00	-2.12*		

*p < .05, **p < .01, ***p < .001

Effect of the HOT Approach on L2 Speaking Proficiency

Overall speaking proficiency

There was a significant difference between the two classes in overall speaking proficiency in the post-test (Z = -2.26, p < .05) and the delayed post-test (Z = -2.43, p < .05) shown in Table 5 and the median value of the innovation class was higher than that of the comparison class in the post-test (5.6 > 5.0) and the delayed post-test (5.6 > 4.9). This means that the innovation students enhanced their speaking proficiency significantly more than the comparison students did. Also, the innovation class itself made significant improvement in both the post-test (Z = -2.23, p < .05) and the delayed post-test (Z = -2.21, p < .05). It is apparent from this table that the effect of the thinking approach on student speaking proficiency is significant, positive, and long-term. Further, it is interesting to note that speaking proficiency of the comparison class decreased slightly, though not statistically significant, at the post-test and the delayed post-test.

Table 5 A comparison of overall speaking proficiency

	Comparison (n=6)	Innovation (n=6)	Mann-Whitney U	Z value (Mann-Whitney U)
Pre-test	5.2 [4.6;5.3]	5.3 [5.1;5.4]	14.0	-0.65
Post-test	5.0 [4.6;5.4]	5.6 [5.4;5.7]	4.0	-2.26*
Delayed post-test	4.9 [4.5;5.4]	5.6 [5.4;5.7]	3.0	-2.43*
Z value (pre-post) Wilcoxon Signed- Rank	-0.74	-2.23*		
Z value (pre-delayed) Wilcoxon Signed- Rank	-1.29	-2.21*		

*p < .05, **p < .01, ***p < .001

Discussion

Conducting the HOT Approach

The results of this study lend support to the view that it is possible and practicable to train L2 learners from a traditional Chinese cultural background to think critically and independently using HOT. The finding is particularly noteworthy as the participants not only substantially fostered their high-level elaboration and the use of higher-order questions but also made significant improvements in their overall English speaking proficiency. Most significantly, the results were long-lasting. No empirical research has been found examining both cognitive improvement and overall speaking proficiency in L2 group discussion contexts. This can be argued as a more thorough and comprehensive inspection to reveal L2 students' performance to proactively use higher cognition for social interaction than showing just the frequent use of higher cognition or the length and syntactic complexity of students' utterances in a questioning-responding context, as occurred in other research (e.g., Alcón, 1993; Ayaduray & Jacobs, 1997; Godfrey, 2001).

Effect of the HOT Approach on Thinking Performance

The effect of the HOT approach on higher cognition is significant, positive and long-term. Unlike using higher cognition passively in teacher questioning, the thinking approach encourages students to think proactively and independently in a social context. Students in the innovation class proactively provided high-level elaboration and used higher-order questions in a social context by reasoning, commenting on other's opinions, persuading others of their thoughts, solving problems, and clarifying concepts. The results involve two explanations. One is the modeling conducted in a teacher-fronted setting, where students learned necessary interaction skills, indicated by Yang, Newby, and Bill (2005) to highlight the importance of modeling to allow the interaction with higher cognition to occur. The other is the thinking tasks conducted in small groups in which students were allowed to provide high-level elaboration and practice interaction by commenting and probing.

The present study results concur with the findings of the Thinking Skills Review Group (2004) and Burke and Williams (2008), who conducted thinking programs in L1 classrooms, concluding that thinking activities are effective in improving learner cognitive performance. Further, the cognitive improvement was

sustainable. Such sustainability has not been previously explored in L2 classrooms, although there are emerging L1 findings (e.g., Yang et al., 2005). The sustainability observed in the present study indicates that the HOT approach is effective in developing higher cognition in L2 classrooms.

Such cognitive enhancement further suggests that Asian L2 learners from a traditional Chinese cultural background can be trained to think independently and proactively through a HOT approach. This contrasts with the argument made by Atkinson (1997) that non-native English speakers, particularly Asian learners, are deficient in critical and proactive thinking. The result of the present study supports the claim of Gieve (1998) that L2 students can be trained to think proactively and critically, and that of Fisher (1998), that higher cognition can be developed through training, education, and experience. The primary issue is whether teachers have sought methods to impose HOT on students; it is not a matter of students' initial deficiency to think critically (Benesch, 1999).

The present study's result also suggests that embedding HOT into L2 instruction enables effective cognitive development. As argued by Wenden (1997) and McGuinness (1999), integrating thinking into subject content may be the most effective approach for the learning of thinking. In contrast, Jones, Palincsar, Ogle, and Carr (1987) indicated that teaching thinking in isolation might not transfer across the curriculum, particularly with less proficient learners.

It needs to be noted that while highlighting the importance of using HOT in L2 classrooms to foster students' thinking performance and speaking proficiency, lower cognition is not trivial. Both lower and higher cognition can assist L2 learning. The use of lower cognition strengthens meaning negotiation (Long, 1996) which is facilitative of L2 development, yet it hardly offers greater speaking opportunities to expand the conversation and thinking. While higher cognition provides more opportunities for speaking and thinking critically in a social context through the occurrence of socio-cognitive conflict (Mugny & Doise, 1978).

Effect of the HOT Approach on L2 Speaking Proficiency

The HOT approach exerts a significant effect on L2 speaking. An exploration of how students in the innovation class increased their speaking proficiency showed that at the innovation onset, their utterances were less coherent with few completed sentences and very little "real" dialogue. Because coherence is a sign of

development in communication and comprehension, this indicates that communication at this initial stage was immature. Following innovation, coherence was more developed, including both the fluency and clarity of argument; the students worked collaboratively to reach a consensus as requested by the tasks, gradually cultivating real communication. The students were able to maintain speech flow and speak at length, but experienced fluency problems with more complex communication, caused by occasional repetition, self-correction, or hesitation. For vocabulary use, students could talk about topics, paraphrase successfully, and make their meaning clear in spite of certain inappropriacies. They expressed their opinions primarily using basic sentence forms with reasonable accuracy and demonstrated limited flexibility and made mistakes using complex syntax, although they sometimes caused comprehension problems. Through communication development, the students focused more on their pronunciation so that they could make themselves understood, and because mispronunciation of words or sounds reduced clarity, listeners would either ask for clarification or provide correct pronunciation. The students did not only focus on speaking skills, but on ensuring that their speech made sense. Speech quality was developed by using high-level elaboration to provide logical reasons and evidence, and make comments, and by using low-level elaboration to negotiate meaning and enhance communication. The spoken language used in the innovation class served as a cognitive tool, and students co-constructed and developed L2 knowledge by interacting with their peers and reflecting on their own language use.

In contrast, speaking proficiency slightly decreased in the comparison class, possibly because of the lack of negotiated meaning and interaction. In the comparison class, students' pronunciation in the pre-test was effective and sounded more similar to English than it did in the post-test. The students also seemed to possess greater confidence and used more vocabulary, although their utterances were much shorter at this stage; hence the impression that their pronunciation was clearer in the pre-test. In the post- and delayed post-test, however, pronunciation was poorer, and although the students elaborated their thinking with more complex syntax, they did not seem aware that their pronunciation or their meaning lacked the required clarity to communicate their ideas. The comparison students primarily focused on expressing their own thoughts with very little interaction among group members, thus that they did not receive any feedback on ideas or pronunciation from their interlocutors (e.g., "What do you mean by…")? Without this feedback, a speaker

would not realize that his or her pronunciation could cause problems for listeners or that the meaning delivered was insufficiently clear.

The literature has not explored students' overall speaking proficiency in a social context in the field of infusing higher cognition into L2 classrooms. However, Zhang et al. (2013) observed that engaging students in collaborative reasoning discussions accelerates the spoken narrative ability of English language learners and thinking programs conducted in L1 classrooms have shown positive results on student oracy performance. Bowdler, Webb, and Dyke (1992) and Lipman, Sharp, and Oscanyan (1980) observed that students improved at elaborating and asking for reasons, justifying their opinions, and building on each other's ideas. The thinking approach fosters L2 speaking, including the occurrence of numerous speaking opportunities (e.g., making comments, probing further, and reasoning) driven by using high-level elaboration and higher-order questions and the comprehensible input achieved using lower-order questions and low-level elaboration to negotiate meaning. However, using high-level elaboration for interaction is the most essential for providing numerous speaking opportunities for students to implement their hypotheses regarding linguistic structure and comprehensibility, leading to L2 speaking achievement. The thinking approach exerts an immediate effect on L2 speaking and long-term effectiveness for L2 learners. Mackey and Gass (2005) argued that such sustainability is essential for a successful teaching approach.

Speaking improvement is relevant to the Swain (2000) output hypothesis, which considers second language acquisition from a sociocultural theoretical perspective and suggests that spoken language serving as an intellectual tool assists the L2 learning process. Speech enhancement is closely linked to the Gass (1997) model of second language acquisition. The students listened to the speaker's thoughts, thereby having opportunities to notice features of the target language. After considering each linguistic unit, students then attempted to reproduce it in a new context when expressing their viewpoint. Students who rephrased, repeated, and reorganized linguistic units to make their thoughts more comprehensible and logical to others performed a syntactic and semantic analysis of the language. It allowed students to learn from their peers and implement their hypotheses regarding comprehensibility or linguistic structure. This process involving interaction with real language use (Coyle, 2002) and information regarding pronunciation, vocabulary, and grammar proceduralized and gradually automatized the pragmatic use of the language, facilitating oral output (Segalowitz, 2003). The finding also supports

Paran's (2003) claim, that infusing thinking into L2 classrooms gives learners the space to think out loud, and adds linguistic value to the classroom.

Conclusion

Enhancing high-order thinking in students is a desirable goal in higher education (Halx & Reybold, 2006), and educators and researchers (e.g., McGuinness, 1999) have elucidated the importance of the teaching of thinking. Improving the speaking proficiency of L2 students with the ability to communicate and negotiate is also essential (MOE, 2008). Teacher questioning has been used to improve L2 students' linguistic competence and the frequency of higher cognition; however, it does not facilitate the development of thinking (Dillon, 1978) and L2 speaking (Rowe, 1974). Therefore, additional research focused on a more effective teaching approach to foster L2 student speaking proficiency and thinking performance is necessary. The present study used a case study design to ascertain the effectiveness of a thinking approach, the HOT approach, in fostering the cognitive and speaking performance of L2 students in a social context. Video recorded data of group discussions were used to examine (a) students' cognitive behavior, using high-level elaboration and higher-order questions and application of classification systems of Ayaduray and Jacobs (1997), King (1990), and Webb (1989), and (b) their speaking proficiency using the public version of IELTS speaking-band descriptors. It was observed that the thinking approach fosters the speaking proficiency of L2 students and enables them to use long-term higher cognition proactively for interaction.

The positive findings provide empirical data for educators and teachers of English when considering using the thinking approach to enhance the speaking proficiency and cognitive performance of L2 students. Future researchers are encouraged to use this study as a pilot; a follow-up study could address the research limitations, such as the small sample size and recruiting non-English-major participants with the same major subject. The researcher believes that a HOT approach enhances L2 speaking proficiency and cognitive performance in a social context with superior speaking quality where students use low-level elaboration and lower-order questions to negotiate meaning and use high-level elaboration and higher-order questions to express their thoughts with reasons for their own justifications, comment on one another's ideas, probe for further information, and solve problems, thus resulting in optimal learning performance in the L2 classroom. The HOT approach fulfills the goal of HE – enabling students to think proactively

and independently by using higher cognition and enhancing L2 speaking proficiency. Thus, the researcher suggests the value of introducing the HOT Approach into L2 classrooms to improve learning of basic linguistic skills and to expand the learning dynamic.

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Appendix 1 – An example of a thinking task

Topic: What are the most crucial criteria for choosing an ideal mate?

Task type: 5Ws

Higher-order thinking: Evaluation, analysis

Task: Think about 3 most important criteria for you when choosing an ideal mate. You might have different opinions from other group members. You are required to persuade others of your opinions with reasons, evidence and examples and to reach an agreement with 3 criteria within your group.

The following are some criteria that can be used when looking for an ideal mate.

- appearance: good looking, handsome, beautiful
- characteristics: considerate, responsible, respectful, hardworking , understanding, funny, high EQ
- education: high education with a master or PhD degree
- family background: rich, poor, big family, small family
- occupation: lawyer, doctor, engineer, etc
- hobbies: mountain climbing, travelling, etc.
- health condition: healthy, sick
- financial status: poor, rich, in debt, out of debt, etc.
- soulmate
- nationality: Taiwanese, Japanese, etc.
- others

 Appearance	 Characteristics	 High education	 Family background	 Occupation
 Hobbies	 Health condition	 Financial status	 Soulmate	 Nationality

Sentence patterns:

1. ____, ____, and ___ are the three most important criteria for me when choosing an ideal mate.
2. My partner must be _____ because …
3. My partner should be_____. He needs to be able to ….

4. I see your point, but…..
5. I agree/disagree with you because ….

Appendix 2 – Classification systems of thinking performance

Classification systems of thinking performance

Categories	Definition	Coding	Examples (Extracted from group discussion data)
Low-level elaboration	A statement provided without any explanation or examples	[A]	S1: "I agree." The statement was provided without any explanation and was coded [A] low-level elaboration.
High-level elaboration	A statement with examples, reasons, detailed description, and concept clarification and comments on each other's thoughts	[B]	S2: "I think appearance is the most unimportant because everyone will get older and older. Beauty doesn't last forever, just 10 years or 20 years." The statement was provided with reasons and was coded [B] high-level elaboration.
Lower-order question	Questions which received low-level elaboration	[C]	S1: "Do you agree?" S2: "I disagree." The question "Do you agree?" received a low-level elaboration and was coded [C] lower-order question.
Higher-order question	Questions which received high-level elaboration	[D]	S4: "Why do you think being supportive is important?" S5: "Because when we do something that we haven't done it before, we have a friend to support us, to encourage us, we might be successful. That's why it is important to choose a friend who is supportive." The question "Why do you think being supportive is important?" received a high-level elaboration and was coded [D] higher-order question.

藉由高等思考法促進外語口語能力及思考表現

陳美惠

本研究探討高等思考法在外語口語能力及思考表現的效果。實證研究發現，高等思考詰問法之教學在外語口語輸出量、文法複雜性、及高層次思考具有正面影響。但是，有些研究者指出，詰問法之教學並不能真實地促進外語口語能力及思考的發展。思考教學的使用在全球各地與日俱增，此導致一場辯論：此教學是否適用於外語教室，特別是亞洲學生。為了能真正地促進學生之外語口語能力及思考表現，本研究在臺灣的一所大學實施 12 週之高等思考法教學。本研究結果顯示，此思考法對外語口語能力及思考表現有顯著及正面的長期效應，這指出亞洲外語學習者可經由訓練而做批判性及獨立性之高等思考。本研究並指出高等思考教學法之價值：擴大外語學習及學習動力。

關鍵字：外語口語、高等思考、高等思考詰問法

作者現職：實踐大學高雄校區博雅學部語言中心助理教授

通訊作者：陳美惠，email: meihuichen@mail.kh.usc.edu.tw