

# Theoretical Framework for Integrating Higher-order Thinking into L2 Speaking

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**Abstract**—This paper proposes an innovative framework to foster students' higher-order thinking and L2 speaking. The importance of higher-order thinking has been highlighted and reflected in L2 education. One way to engage L2 learners in thinking is to ask them higher-order questions. Empirical research has shown the effectiveness of higher-order questioning on L2 speaking and cognitive development. However, questioning behavior itself has a number of disadvantages for learning and, without addressing these issues, the effect of higher-order questioning can be limited. To employ questioning to its best effect, this paper, based on a review of the literature, proposes a theoretical framework. The metadesign of the framework, including teacher questioning, group discussion and student question generation, is used to overcome the disadvantages of questioning, while the microdesign of the framework, incorporating wait-time, question refinement and probing, is intended to tackle the technical problems of eliciting non- and restricted responses from students. This framework also helps to equip students with discussion skills in a social context and to utilize higher cognition proactively. An experiment was carried out in a university English class to validate the framework, and pedagogical implications and suggestions for applying this framework are made.

**Index Terms**—higher-order thinking, L2 speaking, questioning

## I. INTRODUCTION

Higher-order thinking refers to the mental processes of analysis, synthesis and evaluation, and is commonly used in activities such as problem solving, reasoning, thinking, assessing and concluding (Bloom, 1956). Educators and researchers (e.g., Fahim & Masouleh, 2012; Yang & Gamble, 2013) have emphasized the value of the teaching of thinking. In practice, higher-order thinking is an essential tool used to compete in the global job market. In addition, developing students' higher cognition has become a critical component of educational curriculum and a desirable goal in higher education in numerous countries, including Taiwan. To reduce the use of the traditional learning style, rote learning, equipping students with high cognitive abilities to enable them to think independently and proactively has become the goal of current educational reforms in such countries.

The value of higher-order thinking is also reflected in L2 education. For example, in HE in Taiwan, one main goal of English-language learning is to practice the four language skills, including listening, speaking, reading and writing, by using high cognitive thinking skills such as reasoning, evaluating, and problem solving to enable students to communicate and talk critically while expressing their views. Also, higher-order thinking has become a component of L2 reading texts and composition, and several textbooks have adopted it into activities designed as written or spoken exercises.

One method for engaging students in higher-order thinking is to ask them higher-order questions. However, irrespective of the debate on the effectiveness of higher-order questioning, questioning behavior itself possesses several disadvantages for learning. For example, excessive questioning behavior can cause a conversation to resemble an "inquisition" (Rowe, 1974), causing students to experience nervous tension (Steven, 1912). In addition, questioning cannot always be used to successfully elicit student responses (Wu, 1993). Moreover, conventional questioning is mainly conducted in a manner in which teachers pose questions and students provide answers, which causes passive learning behavior, whereby higher cognition is performed passively rather than proactively. Such teacher questioning behavior also reduces the number of opportunities for individual students to interact. Researchers have argued that without addressing these concerns, the effect of higher-order questioning on speaking and cognitive development is limited.

To maximize the effectiveness of questioning, the problems, including the "inquisition" effect of excessive questioning behaviour, passive learning behaviour, and insufficient opportunities for individual students to interact, must be overcome and strategies relevant to questioning must also be applied. Therefore, a highly sensitive framework design for conducting questioning is required to maximize the benefit to student learning.

Based on a review of the literature, this paper presents a theoretical framework for integrating higher-order thinking into L2 speaking, which can possibly resolve the aforementioned problems. Before presenting the framework, I discuss the literature in which theories of L2 learning and cognitive development, the teaching of thinking, higher-order questions, and a critique of higher-order questioning are described.

## II. LITERATURE REVIEW

### A. *L2 Learning Theories*

Swain (1985) argued that learners must speak to develop language competence by recognizing linguistic forms in input, testing their hypotheses regarding how the target language is used, and using language to reflect on language use. In Swain's (2000) output hypothesis, L2 speaking is considered not only as a tool to convey messages, but also as a tool for cognitive activity in a social context. From a sociocultural theory perspective, language serves as a cognitive tool that assists in the learning process, creating opportunities for students to think independently and use the target language to elaborate on their thoughts. This type of learning condition enables learners to initiate and control topics, which is one of the main characteristics of the optimal conditions for classroom language learning proposed by Ellis (1990): engaging students in thinking increases the number of opportunities to speak.

### B. *Theory of Cognitive Development*

Vygotsky (1978) claimed that a core mechanism for individual cognitive development is social interaction. Learning occurs in a social context in which scaffolding is applied in the zone of proximal development. Social interaction can cause sociocognitive conflicts, which substantially contribute to cognitive development. During social interaction, various perceptions, ranging from simple differences in schemata to holding completely contradictory perspectives, are developed and readjusted. Students are required to externalize their thoughts, and thus explicitly express their ideas to themselves and others. Continual commenting, justifying, and arguing provides students with opportunities to discover and fill the gaps in their knowledge structures, correct misunderstandings, recognize and resolve discrepancies in information, and subsequently readjust conflicting opinions. The process of constructing new knowledge is facilitated by verbal interaction. When the target language is used as a tool for cognitive activity in a communicative context, this learning process facilitates the simultaneous development of language and intelligence.

### C. *The Teaching and Learning of Thinking*

Thinking can be developed through experience, education, and training. According to Sousa (2001), teachers do not teach the brain to think, but thinking skills can be taught at all levels to increase learners' achievements. Thinking skills can be taught as an isolated subject or through integration with major subjects such as mathematics or English. The integration of thinking instruction into regular language instruction might be the most effective approach, as was implemented by Ayaduray and Jacobs (1997). Therefore, integrating higher-order thinking into L2 learning is both theoretically and practically suitable.

Paul (1992, p.303) demonstrated how teachers can nurture students to think independently and proactively. The main principles formulated include "rather than simply having students discuss ideas found in their texts, have them brainstorm their own ideas and argue among themselves about problems and the solution to problems," "routinely ask students for their point of view on issues, concepts and ideas," and "whenever possible give students tasks that call upon them to develop their own categories and modes of classification instead of being provided with them in advance." When students' thinking involves extended exchange of various perspectives, which provides opportunities to engage in critical thinking such as analysing, providing reasoning for certain perspectives, categorizing, problem solving, and commenting on others' thoughts, optimal learning of thinking occurs. Such cognitive opportunities can be promoted by higher-order questions, in the form of questioning or discussion-type tasks.

### D. *Higher-order Questions*

Questions can be ranked according to the level of thought required for the response. The most common hierarchy for ranking the cognitive level of questions is Bloom's taxonomy (1956), which comprises six categories of cognitive responses, namely knowledge, comprehension, application, analysis, synthesis, and evaluation. Higher-order questions are those that require students to manipulate information by using higher-order thinking, including analysis, synthesis and evaluation. Lower-order questions are those that require the use of lower-order thinking, including knowledge, comprehension and application. Lower-order thinking is a prerequisite in the process of using higher-order thinking. Bloom (1956) suggested that a person cannot apply value or judgment (evaluation thinking level) without knowing the facts, understanding the facts, being capable of applying the facts, and being able to disassemble and reassemble the facts. In general, higher-order questions can be referred to as high-cognitive, divergent, or referential questions. Lower-order questions are occasionally referred to as low-cognitive, convergent, or display questions.

Based on Bloom's framework, Morgan and Saxton (1994) formulated questions for classroom use and described the thinking skills applied at each thinking level. The following is a list of question stems (QS) and examples of questions, focusing on both the teaching of language points and texts, for each thinking level.

- *Knowledge*: Rote memory skills (facts, terms, procedures).  
 QS: Who? What? When? Where? List.... How do you say ... in English?  
 Language: How do you say '勇氣' in English?  
 Text: Who is the author of the book?
- *Understanding*: The ability to translate, paraphrase, or interpret material.  
 QS: What is meant by...? Can you rephrase...? Can you describe...? Explain... Can you clarify...?

Language: Can you rephrase this sentence?

Text: What is the main idea of this article?

- *Application*: The capacity to transfer knowledge from one setting to another.

QS: What would happen if...? If you were...? What is a new example of...? How is...related to..?

Language: Can you fill in the blanks with the correct form of the words given?

Text: If you were the character in the story, what would you do?

- *Analysis*: The ability to discover and differentiate the components of a larger whole.

QS: Why? What conclusions can you draw about...? What is the difference between... and...?

Language: Can you figure out the grammatical rule for the present perfect tense?

Text: Why is it important to make students support their inferences and conclusions?

- *Synthesis*: The ability to combine components into a coherent whole.

QS: How could we...? What would happen if...? What is a possible solution to...?

Language: Can you make a sentence with the word sympathetic?

Text: Can you create a new ending for the story?

- *Evaluation*: The ability to judge the value or use of information by using a set of standards.

QS: Which is better? Would you agree that...? What is your opinion...? Is it a better solution to...?

Language: Can you identify which paragraph delivers the message more clearly? Provide reasons.

Text: Is it a suitable travelling package for senior citizens? Why?

Further understanding the criterion used to determine the level of questions applied in the classroom context is crucial. It is argued that higher-order and lower-order questions are context dependent and influenced by the objectives or expected learning outcomes of the lesson. If the answer to the question is not taught by the teacher and is discovered by the students themselves, then this question is defined as a higher-order question, even though the question appears to be a lower-order question. Conversely, if the answer to the question is taught by the teacher and students simply recall information to answer the question, then this question is identified as a lower-order question, even if it is a higher-order question in nature. Thus, the cognitive level of questions used in the classroom context is determined by both the learning context and the question.

#### E. A Criticism of Teacher Questioning Behavior

Teacher questioning benefits both the speaking and cognitive development of L2 students. However, to properly design a theoretical framework that integrates higher-order thinking into L2 classrooms, a critical review of the impact of teacher questioning behavior on learning is essential.

Teacher questioning using higher-order questions can develop L2 students' length of utterance and syntactic complexity (Godfrey, 2001). Nevertheless, considering the type of speech occurring in such questioning behaviour is necessary. Rowe (1974) emphasized that a high frequency of questioning behavior causes conversation to resemble an "inquisition" rather than a reasonable conversation. Such question-only teaching provides students with opportunities to speak, but does not offer students the opportunity to voice a concern proactively or to explore beyond the topic presented by the teacher. The optimal conditions for classroom language learning, as proposed by Ellis (1990), include allowing learners to initiate and control topics. Moreover, question-only teaching or learning might not be practical for a classroom with students who demonstrate varying learning styles. Dillon (1979) argued that a variety of teaching techniques can readily be substituted for questioning, without reducing the effect on achievement. This hypothesis influenced the design of the theoretical framework in which teacher questioning is not used as the main technique for developing students' higher cognition.

Student conversations should not resemble an "inquisition"; instead, student conversation must be reasonable; for example, the types of conversation that occurs in a social context. The ability to communicate in a social context is essential for language development as stated in Vygotsky's (1978) social constructivism and Swain's (2000) output hypothesis. Students' speaking proficiency is not determined solely by the amount of output produced, but also by a satisfactory command of spoken language (the use of language) in a social context.

Questioning can cause negative attitudes among students, as demonstrated in Tan's (2007) study of teachers' questioning behaviour, in which higher-order questioning behavior had negatively affected university students. Students disliked being repeatedly questioned with higher-order questions. They stated that they were unable to manage such questions because thinking in depth in front of the class was difficult and they felt embarrassed. Steven (1912) also argued that high rates of teacher questioning can cause students to experience nervous tension. Consequently, these negative attitudes can inhibit learners from using the target language and thinking critically. Therefore, the influence of questioning behavior on students' performance and attitudes must be considered when conducting questioning exercises in class. To reduce students' learning anxiety, a low-stress environment must be provided for students to use the target language and conduct higher-order thinking, and this can be achieved by promoting group work. The aforementioned studies have all advocated a similar framework design: a social context with a low-stress environment for integrating higher-order thinking into L2 learning is required.

Teacher questioning using higher-order questions also benefits the cognitive development of L2 students (Godfrey, 2001). However, researchers must question whether teacher questioning behavior genuinely facilitates thinking. In this type of question-only teaching, higher cognition is demonstrated by students in a passive manner; students think only

when the teacher asks a question. Teacher questioning causes students to become passive by depriving them of opportunities to think independently and critically, engage in further exploration, solve problems, and inquire about various topics; such behavior limits student contributions to the learning process (Fairclough, 1989). Wu (1993) also discovered that higher-order questioning does not necessarily encourage students to think and communicate effectively in the L2 classroom. To allow students to think proactively and independently, opportunities for students to dominate the conversation, ask one another about their thoughts, and comment on others' opinions are necessary.

Question generation is one component of teaching students to use higher-order cognitive functions independently. From the late 1980s, the research conducted in the field of higher-order questions in L1 classrooms shifted from teacher questioning to training students to ask high cognitive questions, and this trend affected research in the field of higher-order questioning in L2 classrooms. Alcon (1993) was the first to study the process of teaching students to generate higher-order questions in a foreign language, and discovered that the process promoted the type of verbal interaction that facilitates students' understanding and written production of the foreign language. This indicates that question generation can be used to foster students' higher cognition by allowing students to use higher cognition proactively to gain the required information and critically review the information received.

Overall, teacher questioning enables L2 students to speak more frequently and with higher syntactic complexity, and promotes cognitive enhancement. However, teacher questioning does not provide opportunities for students to think proactively or autonomously, and the conversation resulting from questioning resembles an "inquisition" rather than a reasonable conversation. Additionally, teacher questioning can negatively affect students. To address these problems, the metadesign of the present framework incorporates a social context for learning and student question generation in addition to teacher questioning.

#### F. *Strategies Relevant to Questioning*

Wu (1993) demonstrated that teacher questioning cannot always be used to elicit responses successfully from L2 students because of insufficient wait time, or because the question posed is unclear to the students. Therefore, the microdesign of the framework focused on questioning techniques for facilitating the elicitation of sophisticated utterances and a large quantity of student output.

*Wait time.* Most studies distinguish between postquestion and postresponse wait time. According to Rowe's (1980) operational definition, postquestion wait time is the time between a teachers' question and a student's response, and postresponse wait time is the time between a student's response and another student's response or the teacher's resumption of speech. Postquestion wait time enables students to form an answer and respond, and postresponse wait time enables other students to reflect on the ideas contributed or present their own opinions. Higher-order thinking is more cognitively challenging than is lower-order thinking; therefore, the wait time demand for processing information by using higher-order thinking is higher than that of lower-order thinking.

Several studies of L1 and L2 classrooms (e.g., Godfrey, 2001) have reported that increased wait time is associated with higher-order questions. Tobin (1987) claimed that the extended wait time facilitates the learning of higher cognition by providing teachers and students with additional time to think. By contrast, Tan (2007) indicated that when wait time is insufficient, L2 students hardly engage in conversation, or they fail to provide a response to the question. Therefore, to encourage high cognitive responses, adequate wait time is essential.

Having considered the value of wait time for cognitive development and student interaction, I incorporated a minimum 10 seconds for postquestion and postresponse wait time in the framework design. However, the wait time provided should be flexible. The exact wait time required also depends on the classroom culture and the extent to which students are familiar with performing high cognitive thinking and can fluently use the L2 to express their ideas. Researchers have suggested that students who are unfamiliar with higher-order thinking or possess low speaking proficiency require a longer wait time, however, there is also evidence to suggest that the amount of wait time required reduces as students' higher-order thinking skills and speaking proficiency improve. Therefore, teachers can adjust wait time according to the situation.

*Question refinement.* Question refinement is used when students do not understand the question posed. This strategy provides students another opportunity to comprehend the question and, thus, provides additional opportunities to speak. Question refinement is divided into several categories, including repetition, paraphrasing, and simplification. Repetition involves repeating a question without replacing any words. Paraphrasing refers to the process of expressing a question in another manner by changing or simplifying the wording. Simplification is used when a question is too complex to answer in one step; simplification often involves dividing a question into simpler questions and answering each one separately. According to Wu (1993), simplification is the most effective of these strategies assisting L2 students in responding to questions which they consider complicated and difficult to answer.

*Probing.* Probing is a questioning strategy that teachers use to scaffold or mediate students' thinking, which facilitates the elicitation of student responses. Probing refers to the process by which a question is followed up by one or more supplementary questions that enable the teacher to elicit additional responses from a student. For example, when a teacher poses the question "Do you think this is a good movie?" and the student replies with the answer "Yes," a probing question can follow, such as, "Why do you think it is a good movie?" or "Can you give me some reasons?"

Using higher-order questions alone might not guarantee responses involving explanations or logically reasoned evidence; therefore, probing can be used to resolve this problem. Probing has two primary functions. One is to enable

the teacher to search for the reasoning underlying the student's response. In Wu's (1993) study of L2 classroom interaction and teacher questions, students' responses were generally restricted, regardless of the types of question that elicited them. However, it was discovered that when the teacher probed for students' reasons, students produced longer and syntactically more complex answers compared with their original answers. The other function of probing is to assist teachers in expanding students' ideas. Students occasionally produce ideas that are worth further exploration. Smith and Higgins (2006) state that when students present ideas and a teacher does not facilitate the expansion of those ideas, or analyse the reasoning behind the ideas, a shared and coconstructed sense of the meaning is lost, even if the question is open or higher-order question. By contrast, teachers can expand students' ideas by using the probing strategy to provide students with increased opportunities to elaborate their ideas and beliefs, which are valued. Gall (1970) suggested that follow-up questioning of the student's initial response substantially influence student learning. Therefore, probing is essential to the framework design. Probing questions should be mainly higher-order questions, but occasionally lower-order questions can also be applied.

### III. THEORETICAL FRAMEWORK

The innovative framework discussed in this paper draws on previous research to develop a three-stage strategy for the promotion of L2 students' cognitive performance and their L2 speaking proficiency. The framework is intended to provide educators with a clear model for learners to respond to and produce higher-order questions while providing educators with a clear pedagogic tool to lead students towards understanding and then achieving higher-order language skills.

From a social constructionist perspective, the L2 language plays the following roles in this framework. First, language is used initially as a means of communication between teachers and students and among students. Second, language is considered as a psychological tool, or a tool for thought. Third, in a second-language classroom, language is the target of learning. Therefore, the target language functions as a communication tool, a medium for cognitive activity, and the learning objective.

#### A. Components of the Framework

The metadesign of the framework for integrating higher-order thinking into L2 speaking consists of three main parts: teacher questioning, group discussion, and student question generation. Teacher questioning, the first part, contains the following elements: teacher modelling and questioning strategies (i.e., wait time, question refinement, and probing). Teacher questioning is used in a teacher-led setting to model the tasks used in group discussion. Modeling is an essential part of the implementation of the tasks and is used to demonstrate to the students useful methods for using language and methods for answering higher-order questions, and equip students with the communicative skills required in group discussion, such as commenting on and agreeing or disagreeing with other students' opinions. Smith and Higgins (2006) indicated that facilitating classroom interaction required increased emphasis on the manner in which teachers react to students' contributions to questions. Therefore, to promote classroom and group interaction, the use of communicative skills is essential. However, numerous communicative activities have focused on facilitating student speech, rather than on providing students with the means to interact. Researchers have argued that a communicative context cannot be created without the means to interact, even if group discussion is conducted. Therefore, this framework includes teacher modeling for facilitating student interaction. Group discussion, the second part of the framework, is used to create a social context for learning, and is a method for decentralizing classroom communication to encourage students to participate in interaction. Group discussion also provides a low-stress environment to reduce the anxiety students feel when using the target language and to facilitate higher-order thinking. In group discussion, thinking tasks containing higher-order questions are conducted. Students can apply the interaction skills learned in the teacher-led setting to use their higher cognition proactively to solve problems, express their opinions on various topics, and comment on others' opinions. The third part of the framework is student question generation, in which students are equipped with question generation skills to engage them to probe for necessary information in group discussions. Teaching approaches that encourage thinking promote the scaffolding of students' thinking, rather than a directive role for the teacher.

#### B. Explanation of the Framework

*Part I: Teacher questioning.* The framework for integrating higher-order thinking into L2 speaking, as shown in Fig. 1, is based on the concept of using questions to incorporate higher-order thinking. Teacher questioning is applied at this modeling stage. The teacher first poses a higher-order question, followed by a minimum 10-s postquestion wait time to enable learners to understand the question, form an idea, and determine the answer; the teacher allows at least 10 seconds wait time for the student to answer before restating or redirecting the question. Three possible types of response can occur after the wait time: a non-response, a restricted response, or an elaborated response. Nonresponse means that the student provides no answer. A restricted response is a response that answers the question but consists of a very short utterance and lacks sufficient explanation or logically reasoned evidence. An elaborated response refers to a response consisting of an explanation or logically reasoned evidence, and involves a longer utterance and higher cognition than does a restricted response. An elaborated response corresponds to the thinking levels of analysis, synthesis, and evaluation in Bloom's (1956) taxonomy.

After posing a higher-order question, an elaborated response (S1 A response) might occur directly, with the student providing a response comprising an explanation and logically reasoned evidence. However, if a restricted response (S1 B response) occurs, the teacher must use probing by asking an additional question to search for possible reasons to provide the learner with another opportunity to speak and to guide the learner to provide more specific details than those presented in the original response. After probing, wait time is required. After probing and wait time, the learner might be able to produce an elaborated response, or might fail to produce one. However, the literature indicates that learners are more likely to produce a more sophisticated response when the probing strategy is used. It is also possible that non-response can occur after posing a higher-order question. If the students do not respond to the question, the teacher can refine the question posed by repeating, paraphrasing, and simplifying the question. Then the wait-time is provided to allow students to think about the question and figure out the answer. If the student is unable to answer the refined question, then the teacher might ask another question. The teacher can also redirect the question to the class to elicit a response, which can help the student learn by demonstrating how to answer that question.

After an S1 A response is elicited, the teacher can perform two possible actions. One possible action is that using probing and wait time to expand upon the student's ideas, thereby allowing the student to elaborate on the information or ideas (S1 C response). The other possible action is commenting on S1 A response and providing a 10-s postresponse wait time to allow the other students to model and reflect on the previous response, or elaborate on their opinions and ideas (S2 response). Another student can then reflect on the previous responses or provide new opinions and ideas (S3 response). The procedure from S1 A response to S1 C response to S2 response to S3 response creates the "interaction space" among students, thereby enabling the students to communicate freely and challenge each other's ideas. Within this interaction space, sociocognitive conflicts might occur, which can prompt students to think critically and reconstruct their knowledge.

*Part II: Group discussion.* After modeling the discussion skills, students subsequently engage in the second part of the framework, the group discussion. Students model the interaction pattern in group discussions by providing their own opinions, commenting on others' thoughts, or probing for further information (the students' probing techniques at this stage might not be fully cultivated and this skill is trained at the following stage). The discussion is interactive, which facilitates the use of more elaborated utterances and higher-order thinking. At this stage, the teacher acts as a facilitator and scaffolds the discussion in groups. Wait-time is applied by students in group discussions; they should allow at least 10-s wait time for other students to respond to the question before restating or redirecting the question. Yet, students who respond to the question or comment are not confined to the wait-time required since it can restrain students' speed of thinking; students can elaborate as soon as they figure out the answer to the question or responses to other students' comments in group discussion under the specific condition that they do not interrupt others.

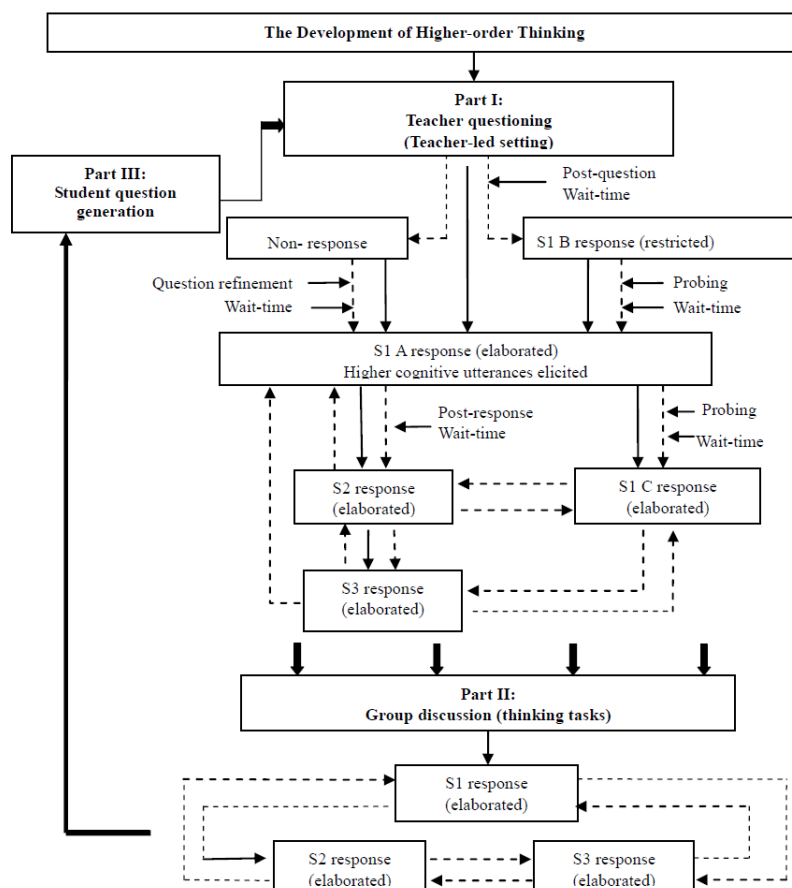


Figure 1. Theoretical framework for integrating higher-order thinking into L2 speaking

*Part III: Student question generation.* As students gradually develop their higher-order thinking, L2 speaking, and discussion skills by socially engaging in discussions, they can begin to practice question generation. Teachers can provide the students with several selected practice passages and instruct the students to apply the question stems (Morgan & Saxton, 1994) to generate questions. Students can ask for clarification using lower-order questions and most importantly, probe for the related information such as the reason underpinning a statement or the solution to a problem using higher-order questions. The appropriateness of the question generated can be justified and refined in a teacher-led setting, thus enhancing students' probing strategies and the skill of question refinement. Students are then encouraged to implement the skill and strategies when conducting Part I and Part II of the framework.

#### IV. VALIDATION

Part I and Part II of the framework was validated in first-year university-level English classes in Taiwan by conducting a twelve-week intervention while Part III is an ongoing research. This intervention aiming to foster the speaking and higher cognition of L2 students included thinking tasks designed with higher-order questions in two steps: Part I (teacher questioning in a teacher-led setting) and Part II (group discussion) of the framework. Two classes of non-English majors were recruited with one class receiving the intervention and the other as a comparison class. Thinking tasks were designed based on the textbook content. Four types of thinking tasks were developed and used in this study, including *5Ws* (Butterworth & O'Conner, 2005), *Odd One Out* (Leat, 1998), *Make-Up-A-Story*, and *Guess What I Say*. Each type of task provided opportunities to exercise particular higher cognition and was developed for three different topics, totaling 12 tasks in which links to related sentence patterns and vocabulary were provided (for an example of the thinking tasks, see Appendix A). Students' group discussion data were collected to explore the effect of the intervention on L2 speaking and thinking performance. Students' thinking performance was analyzed based on an adaptation of the classification systems of Ayaduray and Jacobs (1997), King (1990), and Webb (1989) while L2 speaking proficiency was evaluated using the public version of IELTS speaking-band descriptors. The result show strong evidence that thinking tasks conducted with Part I and Part II of the framework exert statistically significant positive effects on L2 speaking proficiency and higher-order thinking performance and the effects are long-lasting (Chen, 2015).

Based on the intervention, some pedagogical implications and suggestions for adjusting and using the framework are provided:

##### Pedagogical Implications of the Framework

1) Students who are accustomed to a passive learning style, such as the grammar-translation method, can be taught to use higher-order thinking proactively in L2 classrooms; furthermore, students are able to apply the discussion skills learned in a teacher-led setting to group discussion, where higher-order thinking is proactively conducted.

2) To design cognitively challenging tasks, students' familiarity with the topic is essential.

3) Thinking tasks can be both linguistically demanding and manageable to students. Therefore, to ensure the accessibility of language use, links for assisting students in identifying related sentence patterns and vocabulary should be provided. This can further assist students in elaborating their ideas.

Suggestions for Implementation of the Framework

1) A wait time longer than the 10-s wait time suggested in the framework at the beginning of the instruction might be required, particularly if the students are not familiar with performing higher cognition tasks in English. However, the wait time decreases as students become more familiar with expressing their thoughts in English.

2) Students must be encouraged to elaborate on their opinions. If students are not able to use complete sentences, phrases or segmented sentences can be accepted. During the discussion, the focus is mainly on meaning expression, rather than on form. Regarding expression using segmented sentences, the teacher and students can work together at the end of the lesson to compose a correct or more accurate sentence to convey the idea expressed. This reduces the stress and motivates students to speak.

3) At the beginning of instruction, if few students volunteer to answer the questions, the teacher can select students to answer. After increasing students' confidence in expressing their opinions, students begin to actively respond to the questions.

4) Teachers are not encouraged to use numerous higher-order questions within a given period, (e.g., in one lesson), because as the number of higher-order questions increases, interaction among students decreases.

5) Teachers and students must avoid interrupting others to maintain the space for thinking.

6) Before teaching question generation, students are not restrained from using questions to probe for necessary information in group discussion.

## V. CONCLUSION

The value of higher-order thinking has been emphasized by educators and researchers, and is also reflected in L2 education. One method for engaging students in thinking is to conduct higher-order questioning. However, questioning behavior itself possesses several disadvantages for learning. Without addressing these concerns, researchers cannot determine the exact benefits of higher-order questioning. Therefore, a questioning framework that overcomes the disadvantages of questioning behavior and fosters higher-order thinking is required.

Based on a review of the literature, this paper presents a theoretical framework for incorporating higher-order thinking into L2 speaking. The metadesign of the framework consisted of three main parts: teacher questioning, group discussion, and student question generation. The microdesign focused on questioning techniques (i.e., wait time, question refinement, and probing). Teacher modeling conducted at the teacher questioning stage was the most essential because students learn to conduct higher-order thinking and acquired the skills necessary for discussion. Group work involving thinking tasks was applied to create a social context for learning and provide students with a low-stress environment to enable them to conduct higher cognition proactively, and thereby allow them to control the topic and dominate the conversation. Student question generation, the third part of the framework, provided opportunities for students to foster their higher cognition and learn the skills for probing for further information.

Validation of Part I and Part II of the framework was conducted in university-level first-year English classes while Part III of the framework is an ongoing research. The result showed that using thinking tasks conducted with Part I and Part II of the framework was effective in fostering students' L2 speaking proficiency and thinking performance. A number of pedagogical implications and suggestions for implementing this framework were provided, which can enhance the benefits of the framework. Finally, the framework, arguably, can be applied to all levels of L2 learning; teachers can adjust the complexity of questions or probing techniques according to student level. Also, it can be used not only in L2 learning but also other subject fields like Chinese or math, which helps develop student speaking ability and cognition.

## APPENDIX. 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 in 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. Appearance, characteristics, and occupation are the three most important criteria for me when choosing an ideal mate.
2. My partner must be handsome because ...
3. My partner should be considerate. He needs to be able to ....
4. I agree with you, but.....
5. I agree/disagree with you because ....

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