Speaking and Thinking: Understanding Oral Problem Solving Efficacy in Second Language Learners

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Abstract

This article considers the implications of the thinking ability in the oral communication of second language (L2) learners. Even though the critical thinking movement is expanding throughout academia, research in second language acquisition (SLA) has been noticeably lacking in establishing the relationship between L2 oral communication and thinking. This study investigated oral problem solving in EFL (English as a Foreign Language) learners in the People’s Republic of China. The main question asks if advanced EFL learners’ problem solving efficacy will be reduced when having to solve nonverbal puzzles while speaking in English in comparison solving these puzzles while to speaking in Chinese or remaining silent. Results found that participants in silent and Chinese speaking conditions had an insignificant difference in accuracy. However, speaking in English had significant deleterious effects, reducing accuracy by 24.5% in comparison to those participants in the silent condition. A paradigm shift for oral communication in SLA is offered for pedagogy and research.

Key words: critical thinking; second language acquisition; pedagogy; debate

1. Introduction

In the United States, the critical thinking (CT) movement has been going on for three decades. California, in its landmark 1987 legislation, revamped education to require teaching of CT in all grades and made CT a compulsory general education requirement for all California community college and university graduates (Feare, 1992). This movement has fostered a proliferation of research, websites, and books to guide development of CT in reading, writing, and speaking. A simple Google search of the term “critical thinking” yielded 28 millions hits.
This movement has spread from the West to other parts of the world, including the People’s Republic of China. Phoutrides (2005) argued that problem-solving, innovation and creative thinking have also become goals for which Chinese education strives:

Since 2001 China’s Ministry of Education has been involved in a massive overhaul aimed at modernizing and improving the school system. Critical education methods are challenging Chinese students to solve problems creatively. By teaching students to engage in discourse, the government believes it can encourage more innovation thought, as well as a new generation of thinkers able to consider issues “outside the box”. (p. 154-155)

The emphasis in CT has also spread to foreign language classrooms where curricula have been developed to directly provide the skills of analysis and evaluation (Day, 2003). Yet, research has lagged behind on developing critical thinking in students in the field of second language acquisition (SLA) (Thadphoothon & Jones, 2004). Within applied linguistics, much attention has been given to accuracy of language use, comprehension, fluency, grammar, lexical precision, and overall language form. However, emphasis on CT in L2 has only been focused on recently. Since most of the CT literature in SLA deals with cognitive skills (Day, 2003), it could be postulated that researchers assume L1 logical thinking (e.g., problem solving skills) will naturally transfer to L2; or thinking abilities are not in any way affected by the language, either native or second, in which the thinking occurs.

This assumption may not be true to reality. Little is known concerning the influences unique to L2 learners that may interfere with thinking skills when they orally communicate. So, it could be that foreign language instruction may assist in the development of CT (University of North Carolina, Wilmington, 2008), but it may also be that thinking abilities that exist in L1 may not readily transfer to the target spoken language.

As a field, second language acquisition strives to research effective pedagogy for developing fluency and communication skills. L2 learners should be enabled to succeed in a variety of contexts that will require them to be able to speak—to collaborate and to solve problems—with effectiveness. This type of group work involves constructive tasks externalizing the process of analysis, planning, and synthesis (Benson, 2005).

In order to advance these learning goals primary importance should be attached to understanding the nature of the development of critical thinking skills in L2 learners, especially those required in oral communication. A step towards this understanding is to find out if speaking in L2 has a restraining effect on critical thinking. Therefore, the purpose of this research is to compare problem solving effectiveness of advanced EFL learners when asked to solve problems silently, talking out loud in L1, and talking out loud in L2.

2. Literature review

This section will provide an understanding of CT to justify the need for this research. It will then offer an explanation of how theories in SLA and educational psychology combine to support disparate development of CT in oral communication in L2 learners.
2.1 Critical thinking
There are dozens of Western definitions for CT but, at its basic level, CT can be defined as a system of thinking involving analysis and evaluation that opens any system (Paul, 2007). A core question CT asks is whether or not a set of elements and standards of thinking can be applied systematically and comprehensively to help a person achieve increased complexity in thinking across a variety of contexts.

2.2 Cultural differences in thinking
Although some authors support universal principles in CT (Paul, 2007), it is more relevant to discuss how thinking, in general, and systems of logic, specifically, are dependent on cultures. Even within what is classified as the “West”, cultural differences from world views dictate different approaches to thinking. Gudykunst & Kim (2003) document that those in the US see the world in dichotomies—simplifying the view of the world, while Europeans are less reliant on facts, induction, and operationalism. Americans stress consequences which lead to pragmatism and functionalism. Europeans think the world is composed of ideas and theories with deduction and abstraction given priority in the conceptual world.

Cross-cultural comparisons suggest that Chinese thinking and Western thinking represent value differences at their roots. Gudykunst & Kim (2003) placed individualism and collectivism as the major constructs for understanding intercultural communication differences between the West and China. These constructs indicate a tendency of those from individualistic cultures to value argumentation and standing up for oneself when involved in a task, whereas those in collectivistic cultures strive for harmony in relationships.

Nisbett (2003) compared the cognitive tendencies that are embedded in cultural differences between the West and the East. He summarized some of these tendencies in thinking: Westerners attending more to objects and Easterners more likely to detect relationships; Westerners believing in controllability more than Easterners. In terms of habits of organizing the world, Westerners prefer categories and Easterners are more likely to emphasize relationships. In terms of use of formal logical rules, Westerners are more inclined to use logical rules to understand events than Easterners. In application of dialectic approaches, Easterners are more inclined to seek the Middle Way when confronted with apparent contradictions and Westerners are more inclined to insist on the correctness of one belief versus another.

2.3 Thinking and language
Even though there is extant empirical support for differences in thinking styles between cultures, little has been done to investigate the thinking styles of bilingual persons or individuals learning a second language. Bot & Kroll (2002) admit little experimental research has been done on language production. Their assumption is cognitive processes are universal across languages and that those processes are drawn upon regardless of L1 and L2.

Regardless of the variation in specific types of cognitive styles, learners have thinking abilities in their L1. The question still persists if that L1 thinking ability is affected by speaking in an L2.
2.4 Theoretical framework
Theories in SLA and educational psychology may help to explain why L2 learners may not be as effective in problem solving when asked to use L2 in the process. Two perspectives on language learning tend to support later development of critical thinking skills: contrastive analysis and interlanguage development.

Contrastive analysis adheres to a position that L2 learners draw on their knowledge of other languages as they try to learn a new language. Spade & Lightbown’s (2002) research showed that L1 influence is subtle and evolving in L2 development and that “learners do not simply transfer all patterns from the L1 to the L2 and there are changes over time, as learners come to know more about the L2 and thus to recognize similarities between L1 and L2 that were not evident in earlier stages of L2 acquisition” (p. 124).

Conversely, interlanguage development means that errors in L2 learners may not be attributed to L1 influences (Spade & Lightbown, 2002). The movement towards interlanguage in research has led to ignoring L1 influence and focus on similarities in L2 learners. When looking at similarities and differences across languages, researchers may become involved with interlanguage pragmatics. Spencer-Oatey & Zegarec (2002) explained that researchers:

…explore how foreign language learners’ performance compares with that of native speakers. Up to now, nearly all of the studies have been cross-sectional rather than longitudinal, so unfortunately there is little information available as yet on the process or stages that learners move through in developing competence. (p. 88)

In educational psychology, Vygotsky’s general learning theory, the Zone of Proximal Development, complements applied linguistic theories by providing an explanation why thinking and the verbalizing of one’s thinking may develop later in L2 learners. Vygotsky provides that “learners internalize meanings acquired through linguistic interaction as the directive communicative speech of others is transformed into self-directive inner speech” (Benson, 2005: 39). Therefore, under this constructivist theory of knowledge, learners need to have appropriate interactions in L2 in order to develop cognitive processes. Since most beginning L2 instruction focuses on learning the language through basic language knowledge such as vocabulary and grammar, higher levels of thinking, especially in oral communication, are postponed.

Several other learning theories are in harmony with the assertion of difference in CT between L1 and L2, especially in oral communication. The classical conditioning theory contends that generalization means an anxiety in one situation may transfer over to another context (Ormrod, 2006). In speaking, as the brain experiences “fight or flight” responses (Lucas, 2006), it adversely affects processing information effectively and demonstration of skills that have been previously learned (Ormrod, 2006). This type of “anxiety is especially likely to interfere with such processes when a task places heavy demands on working memory or long-term memory—for instance, when a task involves creativity or problem solving” (Ormrod, 2006: 378). Triune brain theory elaborates on circumstances which “shut down” higher order thinking. When higher levels of anxiety
exist, the brain literally begins to shut down its higher-level processing. Speech anxiety leading to verbal apprehension is heightened when students perceive rejection or a loss of face because of their mispronunciations or poor grammar. Even a negative nonverbal feedback attached to the rejection may add to anxiety.

Students may also be focusing on pronunciation and lexical access. Bot & Kroll (2002: 140) wrote: “One possibility is simply that bilingual speakers are slower to access the phonology of L2 than L1 and therefore, they are slower on any production task in L2”. Additionally, automatic processes are difficult to acquire. In L2, learners must spend more attention to lower-level tasks which slow down the production process with greater number of slips because of limited attentional resources (Anderson, 1983, as cited by Schmitt & Celce-Murcia, 2002).

While both of these explanations on speed are reasonable, they do not provide explanation for inaccuracy in thinking during oral processing in L2. SLA research rarely emphasizes critical thinking development in L2 and L2 learners focus on fluency and accuracy in language usage rather than learning CT. Without specific efforts to develop oral thinking skills, it should not be assumed they will naturally transfer.

Transfer, “a phenomenon in which something a student has learned at one time affects how the student learns or performs in a later situation” (Ormrod, 2006: 269), should be a major objective for every classroom. Kasper (1992) pointed to core areas of transfer in second language research such as syntax, morphology and semantics. Since students have developed thinking skills in their L1, transfer of those abilities should be a goal in L2 instruction. Therefore, in addition to teaching students to construct grammatically correct sentences, the field of SLA must analyze L2 oral communication effectiveness so that appropriate ways to develop CT skills in learners can be evaluated.

This study tested the idea that talking aloud in an L2 would negatively affect problem solving performance. In support of Bot & Kroll (2002), this research postulated that second-year university students studying in English language at a major university in the PRC would take longer to solve problems while talking in English than talking in Chinese (Mandarin) or remaining silent. More importantly, it was hypothesized that even though participants take longer to solve problems they would be less accurate under the English talking condition than under either the Chinese talking condition or the silent condition.

3. Methodology

3.1 Research question
What effect on accuracy in problem solving tasks will talking in English have for EFL participants in comparison to talking in their native language (Chinese) or remaining silent?

3.2 Participants
Seventy-four Chinese university students (62 women and 12 men; 49 English majors and 25 law majors) at Beijing Foreign Studies University participated in the study. All participants were in their second year of undergraduate study in the School of English
and International Studies. They were enrolled in oral English classes utilizing the same textbook. All students were native speakers of Chinese (Mandarin) and had extensively studied English prior to university (9.12 years/average). Thirty-three percent of the participants also attended a foreign language high school.

### 3.3 Materials

The participants completed ten matrices from Raven’s Advanced Progressive Matrices II (Raven, 1976). The Raven’s Advanced Progressive Matrices II were used for this study because with this instrument “the task has been found to be closely linked to general intelligence…and to measure domain-free reasoning processes” (Kim, 2002). In other words, the matrices allowed a uniform analytical task to be performed. The accomplishment of this task, while not measuring CT directly, can effectively measure differences in processing efficacy. Additionally, the nonverbal nature of the instrument controlled for cultural bias inherent in language tests.

Each matrix has three sets of three cells (see Appendix A for a sample matrix). The top two rows of three cells each are complete and show a pattern. The third row has a blank cell at the end. Below the cells are eight options to choose from. Only one of the eight options completes the third set, using the same pattern of first two cells. The matrices as designed begin with easy “puzzles” to solve but become progressively more difficult. In this study, ten matrices were selected (odd numbers from 1 to 19) and presented in numerical order.

### 3.4 Procedures

The participants took the test alone in a quiet place. They signed and were given a copy of the consent form. The English major participants were randomly assigned to the silent condition or talking aloud in English condition. The law majors were assigned to the talking aloud in Chinese condition. They were asked to read the answer sheet (Appendix B and C show the talking and silent condition instructions) aloud to the researcher. The researcher confirmed the participant understood the condition for the test. Each participant was shown a sample Raven Matrix (item 7 from Advanced Progressive Matrices I) and asked to solve it using the assigned condition. Those students in the talking condition were prompted to solve the puzzle while thinking aloud in the assigned condition language. After the sample was completed, the researcher showed the audio recording device and instructed the participants they would be taped to confirm they had met the conditions. Before beginning the test, the researcher informed the participant that he would not be in the same room with the participant, but would be in the hallway reading a book. This procedure was followed to minimize evaluation apprehension (Cottrell, Wack, Skeerak & Rittle, 1968, as cited by Kim, 2002). The researcher opened a binder to number 1 of ten Raven Matrices (advanced progressive II—odd numbers 1-19), started the audio recording device, told the students to begin, and exited the room. Each participant was allowed to work at his or her own pace. After a participant announced he or she had finished the test, the researcher reentered the room, shut off the audio recorder and asked if there were any questions. A participant information sheet was completed.
after the testing to minimize any priming effect. The duration of the test (as shown on the audio recording device) was recorded on the back of the answer sheet. Tests were graded for accurate answers and the grade was written on the front of the answer sheet.

4. Results

The results support the postulation that L2 students will take longer to orally solve the problems. As in the Kim (2002) study, participant gender did not have any effect and will not be discussed. The findings confirm the hypothesis that advanced EFL learners were less accurate when speaking in their L2 than students speaking in their L1 or remaining silent (see Table 1).

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<th>Table 1. Descriptive Statistics</th>
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<tr>
<td>Dependent Variable</td>
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<td>Time (in seconds)</td>
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<td>Accuracy (out of 10)</td>
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The dependent variable was the number of items answered accurately. The number of items answered correctly was subjected to a univariate analysis of variance (condition: English vs. Chinese vs. silent) (See Table 2). A planned comparison with independent f tests revealed that the participants were much less accurate when having to think aloud in English (M = 7.63, SD = 1.813, n = 24) than the participants thinking aloud in Chinese (M = 8.96, SD = .935, n = 25) and those participants who remained silent (M = 9.48, SD = .770, n = 25), f = 14.298, p < .01.

<table>
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<th>Table 2. Multiple Comparisons—Dependent Variable: Accuracy</th>
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<td>(i) group</td>
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<td>English</td>
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<td>English</td>
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<tr>
<td>Chinese</td>
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Based on observed means. * The mean difference is significant at the .05 level.

Although time was initially considered as a variable and was measured, it is not reported as a dependent variable in this study. No time limit was imposed on the participants. It was assumed that the participants thinking aloud would take longer merely from the extra expressions required for verbalizing answers. It was further assumed that English talking participants would take the longest because of factors such as lexical access speed.

5. Discussion

The instrument and conditions were identical for all participants. Participants took longer
to solve the puzzles with less accuracy when required to think aloud in L2 instead of solving the puzzles silently or solving the puzzles while talking in their native language. The Chinese talking group was 5.8\% less accurate and took 51\% more time than the silent group; however, the difference in accuracy was not significant. The English talking group was 24.25\% less accurate and took 73\% more time than the silent group and 14.84\% less accurate than the Chinese talking group, and the differences from both groups were significant.

This experiment suggests talking in an L2 has a significant deleterious effect on the accuracy of problem solving. Even though the participants could be considered fairly advanced EFL learners, they could not think as well when having to speak in English. It was also observed during the tests that some participants under the talking in L2 condition had problems finding the right words to express their thoughts. When reviewing the tapes of the English talking group, it was interesting to note there were long gaps of silence when the participants found it so difficult to solve the puzzle that they had to stop talking in order to focus their thinking. And yet, even in these “semi-silent” situations, they took a longer time to solve the puzzles with less accuracy than the silent participants.

It can be concluded from the findings that if advanced L2 learners have difficulty with problem solving in an oral format, perhaps a paradigmatic shift may be in order to increase CT in oral L2 instruction.

There are many implications to consider both for education and for research. Educators should be aware that speaking aloud may have a negative affect on EFL students’ cognitive processing. An L2 student may have a strong command of the language and have conversational skills, but if teachers require difficult cognitive tasks to be performed orally, higher level thinking may be required and impact accurate measurement of a student’s true mastery of a language. Or perhaps it is the other way around and students are just as intelligent in their L1 and L2, but they just appear less intelligent in L2. In some cases, giving extra time to process information and collect thoughts will help EFL students to perform better. It may be that educators need to find more exercises to develop oral problem solving, so that students will have the ability to use their target language more effectively. This may all be a matter of increased automaticity to put less strain on working memory. It may also be a necessity to construct the patterns of thought in the L2 to affect transfer. Since a specific link between L2 oral communication and thinking has not been established, more research on pedagogies will be required to determine the most effective strategies for developing CT.

Action research may be appropriately employed to provide the needed synthesis of teacher and researcher to identify problems and find solutions. Benson (2005: 182) wrote that action research is “often considered the most accessible form of research for teachers, because its goal is the solution of problems encountered in everyday practice”. Benson (2005) also stresses the need for more research to uncover the importance of individual control over cognitive processes:

The nature of the autonomous learner’s psychological relation to the learning process is often described in general attitudinal terms or in terms of capacity for “detachment”, “critical thinking”, “creativity”, and so on… I have argued that it may also be described more precisely as a capacity to control cognitive processes that are both observational and central to the
learning process. Current research suggests that attention, reflection, and the development of metacognitive knowledge are among the most important processes on which further research is needed. (p. 98)

In addition to increased investigations, researchers need to exhibit more care in the variables they are testing. Often SLA research reports on the “thinking aloud” conditions in studies, assuming equivalence to silent thinking skills. Although speed is assumed to be slower, links are not drawn to accuracy in orally solving a problem in the L2. This oversight could invalidate SLA research that asks participants to think aloud when participating in a study. Rarely is CT (or the lack of) listed as a variable, even though this may actually be what the research is testing. Students may have language skills, but may not be able to process problem solving in an oral format. This might be the actual issue for future research: the delineation between language skills and thinking skills in EFL teaching.

Since research confirms the ability for L1 reasoning may not readily transfer to oral communication in L2, longitudinal studies should be undertaken to investigate teaching oral thinking skills through activities such as debate. Although foreign language instruction is relatively new in the investigation of CT, debate has long been accepted for its effectiveness in developing CT in the U.S.

In surveys conducted by Williams, McGee & Worth (2001), specific justification for debate was given, provided that “the development of critical thinking skills presents a strong, agreed upon benefit that can be understood by current students, prospective students, and other publics” (p. 205).

A meta-analysis involving CT improvement in communication skill training and debate conducted by Allen, Berkowitz, Hunt & Louden (1999) reviewed 19 studies. Overwhelmingly, the studies demonstrated oral communication, especially forensics (e.g., competitive debate), produced better CT:

The most important outcome of the present meta-analysis is that regardless of the specific measure used to assess critical thinking, the type of design employed or the specific type of communication training skill taught, critical thinking improved as a result of training in communication skills. The findings illustrate that participation in public communication skill building exercises consistently improved critical thinking. Participation in forensics demonstrated the largest improvement in critical thinking scores whether considering longitudinal or cross-sectional designs. (p. 27)

Fine (1999, as cited by Bellon, 2000) discovered competitive debate also strengthened several dispositions such as perseverance, ability to remain focused, work ethic towards challenging goals, and a “heightened capacity to hang in and struggle—often in the face of disappointment and defeat” (p. 166). Additionally, Fine found “debaters were more likely to speak out because they feel they have something to say and because they feel more articulate in saying it” (p. 166). She further discovered students achieved openness to the world and others, developed better social skills and connected with academic subjects in meaningful ways.
6. Conclusion

Although CT is widely accepted as a primary goal of education, the findings of this research support that we can not assume that inherent thinking skills in native languages will naturally transfer to second languages. SLA should strive to meet the full needs of FL students. These students not only need the rules and grammar of other languages, but also the ability to think, speak, and solve problems in their L2 as readily as their L1.

Acknowledgment

This research is part of a larger project conducted at Beijing Foreign Studies University, sponsored through a Fulbright-Hayes grant. The grantee’s home institution is: Speech Department, Irvine Valley College, 5500 Irvine Center Drive, Irvine, CA 92618. Correspondence can be directed to grybold@ivc.edu.

References


Appendix A

Appendix B  Puzzle Answer Sheet: Instruction for Talking Condition

In this test you will be asked to complete a set of 10 puzzles. Pick the best answer for the pattern. Please do not put your name on this answer sheet. During the time you are solving the puzzles, please talk out loud in English about what you are thinking. You will be audio-taped to verify that you have talked through the entire test.

After you have answered a puzzle, turn the page and go on to the next puzzle. Please do not go back to any puzzle once you have answered it. When you have completed the last puzzle, let the administrator know you are finished by saying “I am finished.”
Appendix C  Puzzle Answer Sheet: Instruction for Silent Condition

In this test you will be asked to complete a set of 10 puzzles. Pick the best answer for the pattern. Please do not put your name on this answer sheet. During the time you are solving the puzzles, please do not talk during the test. You will be audio-taped to verify that you have remained silent through the entire test.

After you have answered a puzzle, turn the page and go on to the next puzzle. Please do not go back to any puzzle once you have answered it. When you have completed the last puzzle, let the administrator know you are finished by saying “I am finished.”

(Copy editing: Anthony R. Zak)

(...continued from p. 49)

7. 我经常对自己的英语学习进步情况进行评价，从而找出薄弱环节和改进的措施。
8. 我每周都对自己的基础英语学习情况进行反思和评价。
9. 我能对自己小组的任务完成情况进行评价。
10. 如果我在英语学习中出现语言错误，我能自己纠正。
11. 我有自己的英语学习目标。
12. 我经常对自己的口头汇报情况进行反思和评价。
13. 我能按照自己确定的目标和制定的计划进行英语学习，并能选择合适的学习资料。
14. 我能根据自己的英语学习进步情况，调整自己的学习计划和目标。
15. 在英语学习中遇到困难，我会尽最大努力去克服。
16. 我根据自己的实际情况，为自己的基础英语学习制定了近期计划。
17. 在英语学习中，我能说明完成某项任务的过程和方法，并能就此进行自我评价。
18. 我经常根据自己的英语学习进步情况，调整自己的学习目标和计划。
19. 我能对自己的基础英语学习情况进行评价。
20. 我制定了非常适合自己的基础英语学习计划，以便合理地安排学习时间。
21. 我主动和老师和同学交流学习英语的体会和经验。
22. 在英语学习中，我能够注意到自己的错误，并以此为戒，争取做得更好。
23. 我能根据自己基础英语学习的具体任务设计合适的自我评价方案。
24. 我制定的基础英语学习计划切实可行。
25. 我经常按照自己确定的目标和制定的计划进行英语学习。
26. 我主动拓宽学习英语的渠道，选择合适的英语学习材料。
27. 我经常对自己基础英语的任务完成情况进行评价。
28. 我能制定自己的基础英语学习计划。
29. 我积极参与课内外英语学习活动。
30. 我经常评价自己的学习效果，总结有效的学习方法。

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