The Effectiveness of the Application of Computer Supported Collaborative Learning in Chinese Learning

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Abstract
Computer supported learning has become a major trend in language learning and teaching in the 21st century. However, there are still few studies addressing the application of computer supported collaborative learning in teaching and learning Chinese as a foreign language. The researchers designed a distance collaborative program in which 72 Chinese learners in the US and 27 Chinese pre-service teachers in Taiwan could complete a series of collaborative assignments via video conferencing and communicating tools. Within this designed collaborative structure, Mandarin Chinese language learners could practice the target language, and Mandarin Chinese language pre-service teachers could also practice teaching foreign students. The result of this study showed that this distance collaborative program had a positive impacts on the Chinese learners' academic outcomes. The students in the experimental group (mean=78.21) outperformed those in the control group (mean=68.37) significantly（t[42]=2.34, p=.02）Besides, it was found that students with different backgrounds and learning behaviors performed differently within this computer supported collaborative learning structure. Those students who studied Chinese less than one hour per week in the experimental group scored better on the post-test than those in the control group. It was also found that those who had Internet surfing ability had better improvement than those who did not. The overall results suggested that computer supported collaborative learning can be an effective learning model for the Net Generation.

Keywords: computer supported collaborative learning, Chinese learning, collaborative problem solving.

Introduction

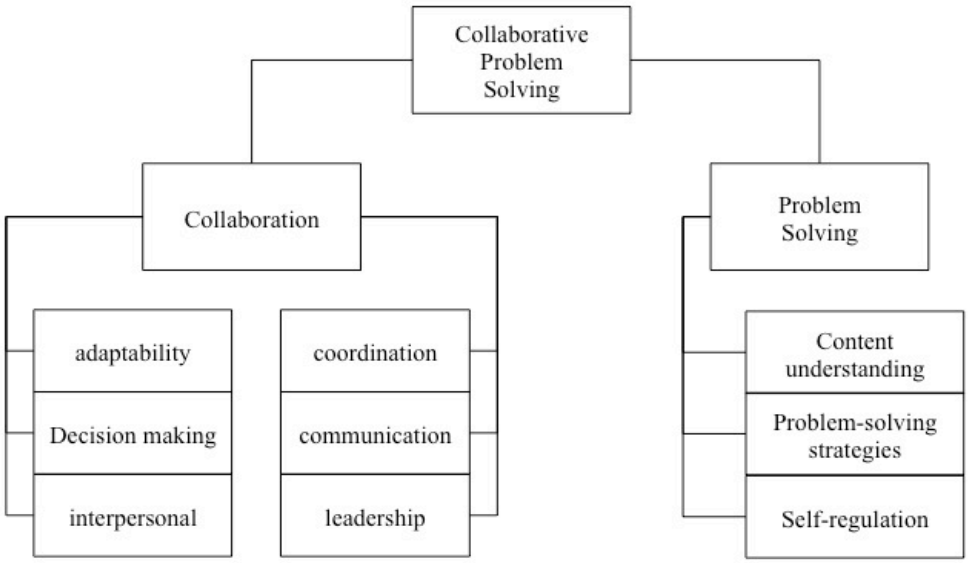
With the growth of Chinese economy, learning and teaching of Mandarin Chinese language has emerged in many non-Chinese-speaking countries as well as Chinese-speaking countries. There is the rapid growing of Mandarin Chinese language program in K-12 education in the US and teaching Chinese as second language program in Chinese speaking country. However, it is found that Chinese language learners need more Chinese language and cultural exposure to have better effect of Chinese learning. Vice versa, Chinese pre-service teachers in teaching Chinese as Second Language program need sufficient Chinese teaching exercises to foreign students to develop their teaching competence. As a result, the researchers in this study took advantage of the framework of computer supported collaborative learning to integrate these two educational main streams and needs.

The researcher tried to break through the boundary that restricts Mandarin Chinese learners and Mandarin Chinese teachers from each other via online conferencing and communicating tools. This research is one of the earliest research studying the feasibility and effectiveness of computer supported collaborative learning in a Chinese learning and teaching program. This research project will shed light on the impact of this computer supported collaborative learning on Chinese learning and teaching as well.

Literature Review

Collaborative learning refers to learning environments where small teams collaborate to achieve a common goal, and problem solving is "cognitive processing directed at achieving a goal when no solution method is obvious to the problem solver" (Mayer & Wittrock, 1996, p. 47). Mayer and Wittrock (2006) defined problem solving as "cognitiveprocessing directed at achieving a goal when no solution method is obvious to the problem solver" (p. 287). According to O'Neil, Baker and Chuang (2009),collaborative problem solving is defined as problem solving activities that engage the interaction of small group members to achieve a common goal. Figure 1 shows the collaborative problem solving model, which is first divided into two components: collaborative learning and problem solving.

Figure 1



The other component of the collaborative problem solving model is problem solving. O'Neil (1999) defined three requirements necessary to being a successful problem solver: (a) content knowledge—understanding something; (b) problem solving strategies—having the skills to solve problems; (c) self regulation—planning and monitoring problem solving progress. In this study, the researcher used the exams to measure students'content knowledge. Further, the learning attitude questionnaire was applied to evaluate students' problem solving strategies.

The researcher in this study adopted the Student Attitude Questionnaire(Meuschke, Dembo & Gribbons,2006) and collaborative assignments to evaluate participants problem strategies. A self-regulation questionnaire (O'Neil & Herl, 1998) was designed to assess self-regulation in problem solving.

Method

Background

One of the researchers was a professor working in a teaching Chinese as second language program in a university in Taiwan, where her students, native Chinese speakers, were trained to become Mandarin Chinese language teachers, while the other researcher was teaching Mandarin Chinese learners in middle and high schools in the U. S. In order to provide the Mandarin Chinese language learners opportunities to practice the target language, and Mandarin Chinese language pre-service teachers to exercise their teaching to foreign students, the researchers arranged a computer supported collaborative learning program, in which the pre-service teacher and Chinese learner worked as a team to solve a series of collaborative problems via online communication tools, such as Skype and emails. See the following figure 2.

Figure 2

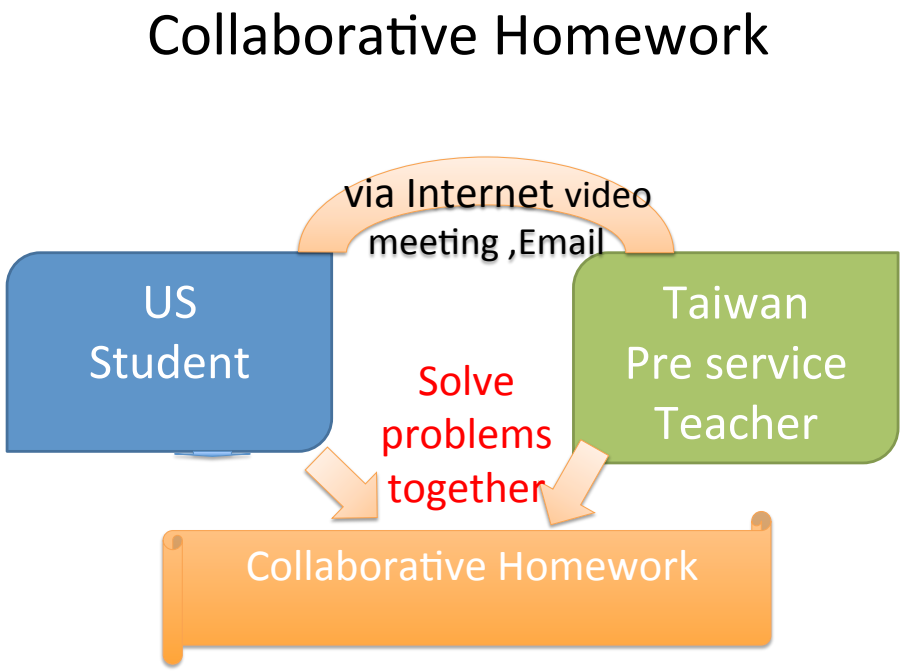


Figure 2 is the demonstration of collaborative homework.

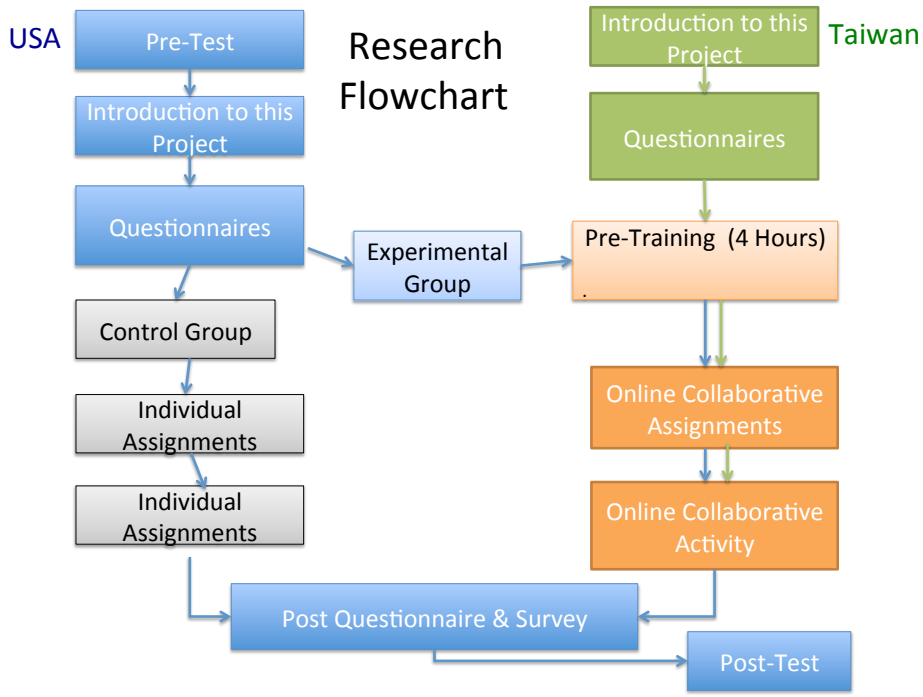
This research, which involves international collaboration between Chinese pre-service teachers and learners, is one of the earliest research studying the effectiveness of computer supported collaborative learning in the field of Chinese language learning. This program had 27 pre-service teachers who enrolled Teaching Chinese as Second Language course in a university in Taiwan and 72 teenagers who took Chinese courses in middle school and high school in the U.S from 2011-2012. There were 24 teenagers assigned in the control group and 48 in the experimental group. Every teenager in the experimental group worked with a pre-service teacher from Taiwan to complete a series of collaborative assignments via Skype video conferences, while students in the control group individually completed their computer-based assignments.

The Method Flowchart

Before this study, there was a pre-test applied to 72 American students recruited in this study. At the beginning of this study, the researchers introduced this study to both American students in Minnesota and pre-service teacher in Taiwan. Then the pre-test questionnaires including background questionnaire, learning attitude questionnaire and so on were administrated to participants in the USA and Taiwan. 48 American students were recruited in the experimental group, which is consisted of 21 students of level 1 and 27 students of level 2. All the participants in the computer supported collaborative learning program which included the experiment group and pre-service teachers had a pre-training about how to apply the video meeting software, schedule the video meeting with the partner and so on. The students in the experimental group would have to work with 27 pre-service teachers in Taiwan to complete the

collaborative assignments and activity. The method flowchart is as followed in Figure 3.

Figure 3



The blue line- American students
The green line-Taiwanese pre-service teacher
This is a figure of research flowchart

Data Collected

The researcher would compare American students' final exam grade in the 1st semester with final grade in the 2nd semester and related pre-post questionnaires to study to the effectiveness of this computer supported collaborative learning program. Teacher's log included teacher's observation on this program would be studied and further interview would be conducted.

Results and Discussion

The following section is organized with the research questions in this study.

Research question one: is this distant computer supported collaborative learning program effective?

Comparing the academic performances of control group and those of experimental group, we found that the average of pre-test for control group was 83.29 (SD=11.63) and that for experimental group was 82.46 (SD=11.88). Apparently, these two groups had similar performance on pre-test. After the intervention was applied on the

experimental group, the post-test scores for both groups were 68.37 (SD=17.37) for control group and 78.21 (SD=10.02) for experimental group respectively. The independent sample t-tests were performed to compare the post-test scores and the significant difference was found. (t[42]=2.34, p=0.02) Therefore, the students in experimental group out-performed those in control group on their test scores. This indicated that our intervention could improve students' academic performances.

Table 1 Pre-test and Post-test scores

Pre-test Score (out of 100)		Post-test Score (out of 100)	
Control (N=24)	83.29（11.63）	Control (N=24)	68.37（17.37）
Experimental (N=21)	82.46（11.88）	Experimental (N=20)	78.21（10.02）

（）standard deviation

Research question two: if this program is effective, will the students of specific background\ traits benefit more from this computer supported collaborative learning environment?

Before our study is carried out, the researchers conducted a background information questionnaire to access students' demographic information and learning behaviors. Both demographic information and learning behavior were used to form the subgroups among the students. (e.g. Has learned Chinese for less than one year versus for more than one year.) The researchers investigated if any of these subgroups showed differential academic performances or not. The factors associated with subgroups could be regarded as the potential confounding factor and these confounding factors may influence the effectiveness of computer supportive collaborative learning. It is important to note that the groups were formed based on the questionnaire before the intervention is applied.

First, the researchers used the percentage of differences between experimental group and control group defined by (Experimental – Control)/ Control x 100%. The advantage of this statistics is that the value would be invariant toward the different difficulties between pre-test and post-test. Therefore, we first calculate the percentage of differences for all subgroups derived from our questionnaires. The subgroup with large percentage of differences will be studied in more detailed. The selected and significant results were described and discussed below.

The students with less than one hour study time are benefited the most from this study.

Before the study is conducted, the researchers found that 56.9% of students are studying Chinese less than one hour a week. The students were divided into two groups, less than one hour/week study time and more than one hour/week study time. Coupled with pre-test and post-test, there would be four possible combinations. The percentage of differences for these four subgroups are:

Table 2 Percentage of differences for subgroups based on study time.

	Percentage of differences
Study time less than 1 hr/wk, Pre-test	0%
Study time less than 1 hr/wk, Post-test	22%
Study time more than 1 hr/wk, Pre-test	-6%
Study time more than 1 hr/wk, Post-test	-6%

Table 3 Statistics for subgroups based on study time.

Study time less than 1 hr/wk, Pre-test (out of 100)		Study time more than 1 hr/wk, Pre-test (out of 100)	
Control (N=12)	83.64（10.79）	Control (N=12)	82.95（12.9）
Experimental (N=18)	83.23（12.67）	Experimental (N=3)	77.88（3.45）
Study time less than 1 hr/wk, Post-test (out of 100)		Study time less than 1 hr/wk, Post-test (out of 100)	
Control (N=12)	65.28（17.64）	Control (N=12)	71.46（17.29）
Experimental (N=18)	79.40（9.79）	Experimental (N=2)	67.5（4.71）

The numbers in parenthesis are standard deviation.

The subgroup, study time less than 1 hr/wk on Post-test, has the largest percentage of difference. Using independent two-sample t-test, we found that the post-test scores of experimental group with less than 1 hr/wk study time was significantly larger than those of control group with less than 1 hr/wk study time. ($t[28]=2.52$, $p=0.02$) Moreover, there is no significant difference between these two group of students on pre-test scores. One possible explanation for this result is that our study requires students to perform online video chat. Such requirement promoted students to study more before the online video chat was carried out. The pressure and motivation from talking with another person naturally increases students' study time. Researchers also had in-depth conversation with selected students and they all reported the increased study time on Chinese for preparing the online video chat.

The students who used facebook benefited from this study.

Based on background questionnaire, we found that 68.1% of students use facebook, 47.2% use e-mail and 15.3% use messangers. Therefore, based on students' online activities, we group the students into facebook users and non-facebook users. Similarly, coupled with pre-test and post-test, there will be four subgroups.

Table 4 Percentage of differences for subgroups based on online activities.

	Percentage of differences
Facebook users, Pre-test	3%
Facebook users, Post-test	26%
Non-facebook users, Pre-test	-8%
Non-facebook users, Post-test	-1%

Table 5 Statistics for subgroups based on online activity.

Facebook users, Pre-test (out of 100)		Non-facebook users, Pre-test (out of 100)	
Control (N=15)	81.03 (11.52)	Control (N=9)	87.07（11.45）
Experimental (N=13)	83.51 (11.7)	Experimental (N=7)	80.39（12.92）
Facebook users, Post-test (out of 100)		Non-facebook users, Post-test (out of 100)	
Control (N=15)	62.94（15.45）	Control (N=9)	77.41（17.40）
Experimental (N=13)	78.97（11.04）	Experimental (N=7)	76.79（8.41）

The numbers in parenthesis are standard deviation.

The subgroup, facebook users on post-test, has the largest percentage of differences. Using independent two-sample t-test, we found that the post-test scores of facebook users in experimental group was significantly larger than those of facebook users in control group.

The students who used skype benefited the most from this study.

Based on background questionnaire, we found that 56.3% of students use any form of video conferencing software. Among these students, 63.9% of them have used skype prior to this study. Therefore, based on students' prior experience on skype, we group the students into skype users and non-skype users. Similarly, coupled with pre-test and post-test, there will be four subgroups.

Table 6 Percentage of differences for subgroups based on prior experience on skype.

	Percentage of differences
Skype users, Pre-test	4%
Skype users, Post-test	20%
Non-Skype users, Pre-test	-6%
Non-Skype users, Post-test	9%

Table 7 Statistics for subgroups based on online activity.

Skype users, Pre-test (out of 100)		Non-Skype users, Pre-test (out of 100)	
Control (N=13)	82.10（13.62）	Control (N=11)	84.71（9.21）
Experimental (N=10)	85.27（12.35）	Experimental (N=11)	79.92（11.41）
Skype users, Post-test (out of 100)		Non-Skype users, Post-test (out of 100)	
Control (N=13)	68.46（18.42）	Control (N=11)	68.26（16.94）
Experimental (N=10)	82.33（10.79）	Experimental (N=10)	74.09（7.59）

The numbers in parenthesis are standard deviation.

The subgroup, skype users on post-test, has the largest percentage of differences. Using independent two-sample t-test, we found that the post-test scores of skype users in experimental group is significantly larger than those of skype users in control group. ($t[21]=2.25$, $p=0.03$) This is probably due to the fact that skype is the primary video conferencing software used in this study. There will be less technological anxiety for the skype users than non-skype users. However, proper training on all students before the study is carried out could reduce this confounding effect greatly.

Research question three: will the experimental group develop different learning behaviors in computer supported collaborative learning environment?

Based on the teacher's log, observation and follow-up interviews, the researchers found that this distant study enhanced the experimental group's social network with classmates and teacher. Before this study, the students interacted with the teacher only in the class and via email. After this study, the students in the experimental group interacted more frequently with the teacher via more communication tools such as email, skype and FB.

As for the students' relationship with the tutors in Taiwan, at the beginning of this study, experimental group students had anxiety to interact with the target Chinese language speakers in the dyads. However, after this intervention, students were impressed by the tutors'teaching enthusiasm and would like to work with the tutors in the future.

The researcher found that due to this collaborative assignments, the students in the experimental group automatically work together as a study group to preview the content of collaborative assignments before working on the collaborative problems with the tutor in Taiwan. Furthermore, it was found that such a Chinese-study-group decreased students' anxiety of facing the Chinese native speaker, enhanced students' social network with the classmates and increased students motivation to study Chinese. Such a Chinese-study-group had never occurred in this Chinese program in high school. Before this intervention, students in the Chinese program completed the

Chinese assignments alone with the computer. Chinese study group is a surprising results stimulated by the collaborative learning design in this study.

Conclusion

Based on the results of this study, the computer supported collaborative learning has positive impact on Chinese language learning. This finding is consistent with the previous literature, in comparison to individual learning with computer, the collaborative learning with computer has better academic performance(Lou&Abrami, 2006; Lou, Abrami, &d'Apollonia, 2001). Students of specific background\traits can benefit more from this distant collaborative learning structure. The collaborative learning structure could better the academic performance of those who studied less than one hour a week. It was found that students mastered video conference or social network software have better academic performance under the computer supported collaborative learning environment.

Implication

According to the results of this study, the pre-service teacher and student in different cities working in a dyad is feasible and academically effective. This distant collaborative learning model can be a solution to the current problem, which the Chinese learners and pre-service teachers are in the different countries.

In this study, it is found that students that have higher literacy of video conference or social network software can have better academic performance under the computer supported collaborative learning environment. Therefore, to increase the pre-training courses is needed to enhance the effectiveness of future application of CSCL.

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