Computer-Supported Collaborative Learning among Students of Different English Proficiency, Cognitive Styles, and Genders

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ABSTRACT--- *Research have often suggested that language learners benefited greatly by the collaborative learning. However, it is still unclear whether learners with different English proficiency, cognitive styles and genders profit equally from working in an online collaborative learning environment. Therefore, the aim of this study attempts to explore the effectiveness of an inter-school online collaborative learning on students with heterogeneous English proficiency, cognitive styles and genders. Two intact classes of 78 first-year English and non-English majors from two universities participated in the study. During the one-year online collaborative learning, students were divided into 17 groups, and each group was requested to create an e-book. Instruments of the study included the Group Embedded Figure Test and student individual pre/post essays. Two English professors were requested to evaluate student pre/post essays. The results showed that English majors had significant improvement in the post-essay writing, especially in the scores of the content. Non-English majors also improved in their post-essays, but the improvement was not significant. Moreover, field dependent students wrote better in their post essay, while field independent students did not improve and their post-essay scores even declined. Furthermore, female students progressed more than male students. Some research implications were provided to conclude this study.*

Keywords: collaborative learning, English proficiency, cognitive styles, genders

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1.   INTRODUCTION

Task-Based Language Teaching has been one of the dominant approaches to language learning and teaching (Ellis, 2003; Nunan, 2004; Samuda & Bygate, 2008). Researchers of second language learning have often suggested that the use of technology in task-based collaboration activities could benefit students' foreign language learning (O'Dowd, 2007; Wilden, 2007). However, studies about inter-school online collaboration and what happens during the actual implementation of the tasks are scant. Moreover, whether the factors such as student English proficiency, cognitive styles, and genders might influence the effectiveness of the inter-school online collaboration have received little attention and thus remain under-explored.

The purpose of this study was to determine if the factors of student English proficiency, cognitive styles, and

genders would influence student learning outcomes in the inter-school collaboration project. In details, the research questions that we address are as follows:

1. Are there differences between English majors and non-English majors in students' essay gain scores?

2. Are there differences between field-dependent cognitive style students and field-independent cognitive style students in students' essay gain scores?

3. Are there differences between male students and female students in students' essay gain scores?

2.   LITERATURE REVIEW

2.1 Language Proficiency and Collaborative Learning

Various studies exploring the connection between learners' language proficiency and collaborative learning had mixed results. Some studies (e.g. Fong, 2012; Watanabe & Swain, 2007) showed that learners, regardless of their partner's proficiency level, progressed in their post-test scores when they participated in the pair collaborative writing. In the study of Watanabe and Swain, learners with different language proficiency were requested to participate in a three-stage task: 1) pair writing, 2) pair comparing their original texts and revised versions, and 3) individual writing. Watanabe and Swain found that learners achieved better post-test scores due to the peer assistance whether their peers' proficiency levels were low or high. Therefore, they concluded that proficiency differences did not necessarily influence the effect of peer collaboration on L2 learning.

However, other studies (e.g. Shokouhi & Alishaei, 2009) indicated that collaborative learning was beneficial for more proficient learners. In the study of Shokouhi and Alishaei, 30 Persian-speaking EFL Iran college students were divided into dyads with different levels of proficiency. These students had collaborative instruction and participated in the form-focused collaborative text-editing task. Results demonstrated that more proficient students had better learning achievement. Possibly, it was because that these students had better language analytic ability, learning strategies, and motivation. Moreover, Lesser (2004) also pointed out that whether the learners could successfully complete the collaborative task depended on the proficiency of the dyad members. In this study, the participants were 21 pairs of adult L2 Spanish learners from a content-based course, and they were grouped according to their proficiency levels (high-high, high-low, or low-low). These learners were demanded to produce a passage reconstruction task. Lesser analyzed the amount, type (lexical or grammatical) and outcome (correct, unresolved, or incorrect) of student writings. It was found that the learners' proficiency levels indeed influenced the quantity of quality of the student writing. Moreover, the higher language proficiency the learners reached, the better skills of problem-solving they were equipped with. Consequently, the learners with high proficiency level performed better in the collaborative writing task.

2.2 Cognitive Styles and Online Collaborative Learning

Few studies have been done on the connection between field dependent/ independent (FD/FI) cognitive styles and collaborative learning. The literature is even less when it comes to the online collaborative learning. Considering the fact that FDs prefer to work with others, while FI prefer to work alone (Witkin & Goodenough, 1977), it is reasonable to assume that a collaborative learning should be more suitable for FD learners. However, previous studies (e.g., Handal & Herrington, 2013; Oh & Lim, 2005) have indicated that online learning was a better way of learning for FI learners because they were more capable of seeking and organizing information in a hypermedia environment. On the contrary,

FDs need more assistance in such an environment. Thus, it is interesting to investigate whether an online collaborative learning leads to better learning outcomes to FI or FD learners.

Among the limited studies on the online collaborative learning, the study of Kuo, Hwang, Chen, and Chen (2012) indicated that this kind of learning was beneficial to FD learners only. As for FI learners, they had better learning outcomes when they solved the problem alone. In their study, 88 fifth-grade Taiwanese students in social science classes were divided into three groups. In group 1, students collaboratively participated in the web-based problem solving activities. In group 2, individual student solved the problem alone. In group 3, students were given the traditional instruction and did not participate in any problem solving activities. As a result, FDs in group 1 and FIs in group 2 had better learning outcomes. In other words, the online collaborative learning strategy (approach?) was appropriate for FDs but not for FIs.

2.3 Genders and Online Collaborative Learning

According to previous studies, female learners were more socialized in collaborative tasks (Miller, 2005), interacted with their peers more frequently (Asterhan, Schwarz, & Gil, 2012), and were more willing to seek assistance and support from peers (Seymour & Hewitt, 1997) than male learners. It seemed that female learners demonstrated more empathy, understanding, cooperation, and acceptance when they were involved in collaborative tasks (Galotti, Drebud, & Reimer, 2001). Moreover, female students stated more frequent use of collaboration as a learning strategy (Stump, Hilpert, Husman, Chung, & Kim, 2011).

As for the relationship between genders and computer-supported collaborative learning (CSCL), the findings of the related studies are still inconclusive. Some studies reported that female learners progressed after the intervention of CSCL, while male learners did not. For example, the study of Ding, Bosker, and Harkamp (2011) reported that among 96 participating secondary school students, who were randomly paired to solve some mechanics problems, only female learners in single-gender dyads significantly outperformed females in mixed-gender dyads.

Other studies (e.g. Howe & Tolmie, 1999; Underwood, Underwood, & Wood 2000) , however, showed that female and male students in the mixed-gender dyads did not collaborate well and even perceived this type of learning was an unpleasant experience. In the review study conducted by Prinsen, Volman, and Terwel (2007), the researchers found that males were more likely to dominate the discourse in Computer-Mediated Communication (CMC) and CSCL. Furthermore, in computer-supported collaborative learning environments, male learners were more active participants, and held more positive attitude toward group-work than female learners. In addition to the problem of male dominance, females tended to be more anxious of using web-based applications than males (Huang, Hood, & Yoo, 2013).

As shown in the above literature review, the roles of language proficiency, cognitive styles, and genders in CSCL were either unclear or controversial. Hence, in order to help fill the gap in our knowledge, this study attempted to investigate the learning outcomes of learners of different language proficiency, cognitive styles, and genders after they participated in a online collaborative writing project.

3. METHODOLOGIES

3.1 Subjects

Subjects came from one Freshmen English writing class of English majors at National Kaohsiung University of Applied Sciences (KUAS, N=44), and one intact Freshmen English class of non-English majors at National Kaohsiung

Marine University (NKMU, N=34). The ratio of males to females at KUAS was around 1:3, while the ratio of males to females at NKMU was approximately 3:1. The two schools' students were mixed and were divided into 17 groups. Each group had four to five students with different majors.

3.2 Instruments

Instruments include the Group Embedded Figure Test (GEFT), and a pre/post essay. The GEFT test was used to identify student cognitive style as field dependent or field-independent (Witkin, Moore, Goodenough, & Cox, 1971). The GEFT contains 18 questions, in which a simple figure is embedded in a complex one. Field-dependent learners have more difficulties in finding out the simple figure in the complex patterns, while Field-independent learners could quickly and easily identify the simple figure (Witkin et al., 1977).

The topic of the pre/post essay is *describing a person that impressed you*. Two experienced English teachers were invited to evaluate the pre/post essay using the same scoring criteria for the following five areas: content, organization, grammar, vocabulary, and mechanics. Inter-rater reliability is rather high (r = 0.81).

3.3 Online Collaborative Writing Project

The subjects were asked to create an online celebrity biography book by using the Wiki forum on the Internet during the one-year collaborative learning. Students in each group needed to collaboratively first discuss and choose the celebrity they admired, and then collect this person's information and his/her pictures. After they had finished collecting the necessary data, they began to introduce the celebrity's early life, adulthood, specific contributions, and influences on the world. Going through several drafts and editing work, group members completed the online celebrity book together. During the process, each group member was requested to contribute to the production of the online book.   However, it was under the group's own decision to assign the tasks. A final deadline was given. At the end of the second semester, groups of students presented their e-books in front of their classmates at their own school.

3.4 Data Collection and Data Analysis Procedures

This study was implemented from the fall semester in 2011 to the spring semester in 2012. In the first week of the first semester, students wrote a pre-essay. Afterwards, students participated in the collaborative writing projects and took the GEFT. At last, students wrote the post-essay on the last week of the second semester.

To answer the first research question, the researchers used the pair t-test. The ANOVA test was used to answer the second question. Next, an independent t-test was applied to answer the third question.

Student cognitive styles were identified by the result of the GEFT. The researchers used the mean scores +-0.5 SD scores as the cutoff score. As a result, students whose scores were 16-18 were field independent (FI), 0-13 were filed dependent (FD), and 14-15 were field neutral students (FN).

4.   RESULTS AND DISCUSSION

Q1: Are there differences between English majors and non-English majors in students' essay gain scores?

As table 1 presents, both English majors and non-English majors had improvement in the total scores of their post-essay. For the English majors, they improved in all of the areas of the essay. The content score and the total score

even achieved the significant difference level (p<0.05).

As for non-English majors, except the grammar scores, students improved in most of the areas such as content, organization, vocabulary, and mechanics. However, the difference between the pre- and post-essay scores was not significant.

This result might imply that a collaborative project is more beneficial for students whose English proficiency levels are above intermediate. A partial explanation for this may lie in the fact that English majors dominated over non-English majors while they were creating the group e-book together. Although non-English majors might contribute a lot at the initial stage of brainstorming, English majors might feel much responsibility in writing, editing, and revising the group e-book at the later stages. Therefore, there might be fewer opportunities for non-English majors to practice English writing. Consequently, the English improvement of non-English majors was insignificant. In contrast, English majors learned how to develop the content of a paper when they brainstormed with the peers. Another possible reason could be that non-English majors had less English instructions comparing to English majors. In fact, non-English majors had only a two-hour Freshman English class weekly when they participated in this study. In contrast, the majority of the classes that English majors took were English related courses. In other words, the frequent access to English might help English majors have better English writing skills.

Table 1: Student pre-essay and post-essay score difference (Pair t-test)

Score		English Majors (N=44)				Non-English majors (N=34)				ALL (N=78)			
		Mean	S.D.	t	p	Mean	S.D.	t	p	Mean	S.D.	t	p
Content	Pre	2.71	0.80	-2.68	0.01*	1.36	0.59	-0.51	0.61	2.12	0.98	-2.37	0.02*
	Post	3.03	0.81			1.42	0.79			2.33	1.13		
Org.	Pre	2.57	0.83	0.35	0.72	1.17	0.60	-0.17	0.86	1.96	1.02	0.16	0.86
	Post	2.53	0.80			1.19	0.66			1.95	0.99		
Grammar	Pre	2.02	0.82	-1.83	0.07	0.98	0.53	0.06	0.95	1.57	0.87	-1.30	0.19
	Post	2.21	0.78			0.97	0.64			1.67	0.95		
Voc.	Pre	2.10	0.65	-1.10	0.27	0.97	0.47	-0.80	0.42	1.61	0.80	-1.36	0.17
	Post	2.19	0.70			1.06	0.57			1.70	0.86		
Mech.	Pre	1.22	0.43	-1.73	0.08	0.69	0.29	-1.40	0.16	0.99	0.46	-2.22	0.02*
	Post	1.35	0.40			0.77	0.33			1.10	0.47		
Total	Pre	10.64	3.34	-2.27	0.02*	5.19	2.35	-0.76	0.44	8.26	3.99	-2.21	0.03*
	Post	11.65	3.39			5.58	2.91			9.01	4.38		

Q2: Are there differences between field-dependent cognitive style students and field-independent cognitive style students in students' essay gain scores?

The results of the ANOVA test were mixed. Table 2 shows that there was significant difference between FI and FD students at KUAS, and FD students had better achievement than FI students (p<0.05). However, although FI students seemed to improve more than FD students, the difference was not significant. Moreover, when all students were put

together, FI students even showed a regression in their writing achievement, while FD students progressed.

This result probably suggests that a collaborative project is a more suitable learning task for FD students, but it might not be appropriate for FI students. This is in agreement with Kuo, Hwang, Chen, and Chens' study (2012) results, showing that collaborative learning strategy is proper for FD learners but not for FI learners. The more likely explanation rests in the nature of the FD and FI working preference. In general, FDs prefer to accept knowledge reprocessed by others and they also like group projects. In contrast, FIs tend to generate and structure their own knowledge and they prefer to work individually (Handal & Herrington, 2013).

Table 2: Students' writing achievement difference among three cognitive styles (ANOVA)

Score		KUAS (N=44)					NKMU (N=34)					ALL (N=78)				
		N	Mean	S.D.	F	p	N	Mean	S.D.	F	p	N	Mean	S.D.	F	p
(Post-Pre)	FI	14	2.73	2.73	3.25	0.04*	17	0.32	3.06	0.22	0.80	31	-0.07	2.90	2.00	0.14
essay	FD	22	2.82	2.82			12	0.14	1.90			34	1.26	2.64		
	FN	8	2.93	2.93			5	1.20	4.87			13	1.32	3.60		

* p<0.05, Tukey Post Hoc test shows that the difference between FI and FD is significant at 0.05 level

Q3: Are there differences between male students and female students in students' essay gain scores?

Table 3 reveals that all female students had better writing achievement than males, whether they were NKMU or KUAS students. The male students at NKMU did not show improvements after the one-year collaborative learning. Instead, their post-essay scores even declined. Therefore, a collaborative project might be more suitable for female students. This result may be explained by considering that females tended to be more engaged in the collaborative group project, and interacted more frequently with their team members (Asterhan, Schwarz, & Gil, 2012). Moreover, as previous studies revealed, females had better social strategies in collaborative problem-solving tasks because females were more considerate, empathetic, and cooperative than male counterparts (Galotti, Drebud, & Reimer, 2001; Miller, 2005; Zohar, 2006).

In sum, previous studies have shown the positive effect of the collaborative learning in a normal classroom, and the present study enhances the previous studies' findings by providing a much more detailed examination of students with different English proficiency, cognitive styles, and genders in a computer-assisted collaborative learning environment. Since all of the collaborative writing and dialogues in this study were conducted on the Internet, the collaborative learning process differed from that in a normal classroom where students discuss face-to-face, get their ideas down on paper, and submit their group project on paper. In this study, students searched Internet information, brainstormed, and discussed their ideas with their team members on computer. Additionally, all of the writing, editing, and revising work were completed through the instrument of computers. With the assistance of word-processing functions on computer, students could easily produce their group e-book. Another merit of online collaboration was that students were more willing to express their ideas in the internet discussion board even when they disagreed with their classmates. In contrast, students usually avoid giving negative comments in the face-to-face situation; consequently, the dialogue exchange among students might be less in the quantity or more superficial in the meanings. Considering the fact that the youth are used to communicate with peers on line in their daily life, the computer supported collaborative learning is supposed to

be a familiar learning environment for younger generation.

According to Krashen (1982), when the learning tasks are familiar to students, students' affective filters are lower and they will become less anxious. As a result, they are able to learn better. In our study, we found that English majors, field-dependent students, and females had better learning achievements, which might be explained by the fact that these students, with either higher English proficiency or better social skills, were more accustomed to the collaborative writing tasks. First of all, English majors had more English writing training and practices than non-English majors in school. Writing to peers in English might be rather easy to English majors, but threatening or awkward to non-English majors. Next, since field-dependent and female students tend to have sophisticated social skills, they are more capable of coping with the challenge of interacting with strangers. As a result, they would perceive such a learning experience in a more positive way.

Table 3: Students' writing achievement difference among two genders (independent t-test)

Score		KUAS (N=44)					NKMU (N=34)					ALL (N=78)				
		N	Mean	S.D.	t	p	N	Mean	S.D.	t	p	N	Mean	S.D.	t	p
(Post-Pre)	M	12	1.00	3.67	-0.00	0.99	25	-0.03	3.18	-1.39	0.17	37	0.30	3.33	-1.23	0.22
essay	F	32	1.01	2.71			9	1.55	1.93			41	1.13	2.55		

5. CONCLUSIONS

In conclusion, an online collaborative project might be an effective approach to assist college students in their English writing skills, especially for students with intermediate or above English proficiency level, FD cognitive styles students, and female students.

The conclusion needs to be treated with caution, however, since there were some inconsistent or mixed findings in this study. For example, it is still unclear why the positive correlation between individual student essay gain scores and FD students existed among KUAS students only. More research which explores the task-based e-learning in a variety of settings and other factors (e.g., free writing tasks, instructor's attitude) contributing to the learning outcomes will be needed.

6. ACKNOWLEDGMENT

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