English Language Teaching; Vol. 9, No. 5; 2016
ISSN 1916-4742 E-ISSN 1916-4750
Published by Canadian Center of Science and Education

Effects of Collaborative Online Learning on EFL Leaners' Writing Performance and Self-efficacy

Hung-Cheng Tai[1]

[1] Department of General Education, Chang-Gung University of Science and Technology, Chiayi, Taiwan

Correspondence: Hung-Cheng Tai, Department of General Education, Chang-Gung University of Science and Technology, No. 2, Chia-pu Rd, West Sec., Pu-tz, Chiayi, Taiwan 613. Tel: 886-5-362-8800 ext. 2543. E-mail: alextai@gw.cgust.edu.tw

Received: February 19, 2016 Accepted: April 6, 2016 Online Published: April 7, 2016

doi: 10.5539/elt.v9n5p119 URL: http://dx.doi.org/10.5539/elt.v9n5p119

Abstract

This study explored the effects of collaborative writing instruction on undergraduate nursing students' writing performance and self-efficacy beliefs within an online learning system. A single-group experimental study utilized two instruments, the NCEEC (National College Entrance Examination Center) writing grading criteria (the SRCT) and a modified writing self-efficacy questionnaire (the WSQ), was conducted. The intervention was applied in the context of a four-month freshmen semester at the beginning of a two-year vocational education program conducted in fall 2010. Two hundred and nine learners were recruited through convenience sampling from four classes at a nursing vocational university in southwestern Taiwan. Quantitative data were analyzed using descriptive statistics, repeated measures MANOVA, explorative factor analysis (EFA), and structural equation modeling (SEM). The results showed that this instructional method effectively improved the learners' writing performances and also influenced the latent structures of the learners' self-efficacy from theoretical constructs toward pedagogical meanings, with the learners' writing self-efficacy beliefs being altered by the instruction and becoming consistent with the assessment criteria. In addition, both the learners' pre- and post-test self-efficacy levels had significant causal relationships with their individual learning progressions. These correlations between self-efficacy and writing performance suggest further teaching implications.

Keywords: collaborative online writing, writing self-efficacy, structural equation modeling (SEM)

1. Introduction

Self-efficacy is an influential learning theory in which self-efficacy beliefs are defined as 'people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives' (Bandura, 1994). Being more concerned with the perceptions of individuals, a topic which had been ignored by the traditional behaviourists' viewpoint, Bandura (1997) argued that individuals create and develop self-perceptions of capability that become instrumental to the goals they pursue and to the control they exercise over their environments. There are two dimensions that must be considered when people are engaged in learning activities: their self-perceptions of their own capabilities for handling a specific task (competence) and of their control of environmental factors that may influence their learning (confidence).

Self-efficacy beliefs affect the choices that people make and the actions they take in response to their own decisions. Individuals tend to choose to undertake those tasks that they feel more confident about and to try to avoid those which they do not feel competent about (Pajares & Schunk, 2001). Beliefs about self-efficacy also help determine how much effort people invest in an activity, how long they endure when encountering obstacles, and how resilient they will be in the face of adverse situations. Researchers have claimed that the higher an individual's sense of efficacy, the greater that individual's effort, persistence, and resilience are likely to be; thus, self-efficacy exercises a powerful influence on the individual's level of accomplishment (e.g. Pajares, 2002).

1.1 Literature Review

Second language (L2) research has consistently shown that writing self-efficacy and writing performance are positively correlated (Erkan & Saban, 2011; Hetthong & Teo, 2013; Woodrow, 2011). Self-efficacy is a powerful predictor of EFL writing performance (Mills, Pajares, & Herron, 2007); highly self-efficacious students perform well in their English writing and are willing to exert more effort (Woodrow, 2011). However, educational research

also indicates that self-efficacy is not fixed and can be manipulated in the classroom (Schunk, Pintrich, & Meece, 2008). The construct of self-efficacy has four distinctive features, namely, predicted capabilities; domain, context, and task specifics; mastery criterion of performance; and fore-thought process (Wang, Kim, Bai, & Hu, 2014).

Four common ways of measuring writing self-efficacy have been proposed. The first involves assessing students' confidence that they possess specific writing skills (Pajares, 2003). In some cases, items assess students' confidence in their ability to handle key aspects of writing, such as grammar, word usage, organization, among others, successfully. These mechanical writing skills may include correctly punctuating a one-page passage or organizing sentences into a paragraph so as to clearly express a theme (Pajares, Miller, & Johnson, 1999; Shell, Colvin, & Bruning, 1995). In other cases, questionnaire items assess students' confidence in their ability to display specific skills related to writing a story. These skills could include, for example, describing the main character's feelings or clearly describing the setting (Graham & Harris, 1989). In some instruments, learners' writing skills are identified by their language teachers according to the learners' specific writing levels (Pajares & Valiante, 1997).

The second method of measuring writing self-efficacy involves assessing the confidence that students have in their ability to complete writing tasks. In this context, the writing tasks that have been discussed include writing a term paper, authoring a short fiction story, and writing a letter to a friend (Shell et al., 1995). Reliability scores for each of these scales have ranged from .85 for elementary school samples to .95 for college samples (Pajares, 2003). The third method of measuring students' writing self-efficacy is to use items asking students to provide a rating of their confidence in their language writing class. Such ratings of learner confidence often use a scale with differing levels of confidence indicated by the letters A, B, C, and D. These confidence judgments are then compared with the actual grades obtained by the students (Pajares, Britner, & Valiante, 2000). Reliability indexes for such scales have ranged from .86 to .89 with samples of middle school students (Pajares, 2003). In the final analysis, both theoretical and empirical judgments are required to evaluate the appropriateness and adequacy of a self-efficacy measure. These judgments reflect an understanding of the domain under investigation, its different features, the types of capabilities it requires, and the range of situations in which these capabilities might be applied (Pajares, 2003). In the current research, the methods used for measuring writing self-efficacy includes the first and the fourth methods noted above, as the researcher (also the teacher) was interested in knowing more about his nursing learners' confidence regarding their writing skills. In addition, since the author attempted to develop a more suitable instrument for use in the research context, the final method was opted for as well.

However, the previously used psychometric methods were confined to the statistical techniques available at the times. Following the advancement of statistical techniques in behavioural science, the development of the structural equation modeling (SEM) seems to have offered promising opportunities to analyse the data in a sophisticated manner (Schreiber, Nora, Stage, Barlow, & King, 2006). In the present study, this tool was utilized to dissect and compare the self-efficacy and writing performance results, and can serve as an alternative method of measuring writing self-efficacy in future research.

1.2 Research Hypotheses

Based on the self-efficacy theory, this study explored the effects of a collaborative online writing intervention aimed at enhancing the participants' learning outcomes, their writing self-efficacy, and the relationships between the two latent variables. Four hypotheses were examined:

1) The collaborative online writing teaching and learning would result in significant improvement in the students' writing performances.

2) The latent structures of the students' self-efficacy beliefs would be changed following the collaborative online writing teaching and learning.

3) The learners' pre-test writing self-efficacy levels would effectively predict their performance improvements.

4) The learners' post-test writing self-efficacy levels would be correlated with their performance improvements.

2. Research Methods

2.1 Research Design

Because all the learners were recruited into the experimental group to learn English writing skills, a single group experiment integrating a collaborative online learning system as a teaching intervention was designed. The GEPT policy encouraged all the students to participate in the AR writing teaching program without much hesitation. The subsequent instructional effects on the learners' pre- and post-test self-efficacy and writing proficiency levels were investigated.

2.2 Participants

209 nursing students, a writing instructor, and an English language teacher (the principle researcher) participated in this project. The learners, who studied in four English language classrooms, were selected via convenience sampling. They were females aged from 21 to 25 years old, with the majority being 21 years of age. Normally, they had studied English as a foreign language (EFL) for at least eight years, including for three years in their junior high schools and for four years in their five-year junior colleges. Most of the participants had never learned English writing due to there being no such class embedded in their official curriculum. The students thus could be seen as novice learners in writing before the commencement of the writing training.

As to the language teacher, he had already been teaching English at the school for more than ten years at the time of the study. Due to large population, another writing instructor who possessed qualified writing competence and experience was recruited to assist the teacher to provide corrective feedback for the writers.

The English language course was a compulsory module during the first of two total years of vocational study at a nursing university in Taiwan. The English curriculum designed by the school asked all learners to pass the fundamental level of the General English Proficiency Test (GEPT). The GEPT examination assesses learners' abilities in terms of four language skills: listening, speaking, reading, and writing. In each class, students were randomly assigned into 14 groups consisting of three to four peers each at the beginning of the sessions for the sake of conducting collaborative writing and peer review activities.

2.3 Teaching Intervention

Most of the teaching and learning activities involved in the writing instruction took place in an online writing platform (see Appendix A). The asynchronous forum of the U2 learning network (http://cu.edu.tw) was the platform in which the participants engaged in collaborative writing. All online interactions were recorded and could be tracked, and the users accessed the platform using a browser and a password. The three primary functions were: learning interaction, evaluation and information, and campus square. The learning interaction section contained functions including course login, course/syllabus announcements, course teaching and learning materials, online individual and/or group writing, and corrective feedback and/or peer review comments. It was more akin to a customized online forum where users could exchange ideas through typing directly or attaching files (e.g. MS Word).

Teaching strategies, including collaborative writing, process approach, multiple revisions, peer review activities, and a blend of direct and. indirect teacher corrective feedback, were integrated into this writing instruction. The collaborative writing strategy (Elola, 2010) was introduced to all four classes for its merits in developing linguistic and writing conventions from a socio-cultural perspective. The process approach views writing as a process of thinking and discovery which is quite different from the traditional 'product' perspective that focuses on the output of writing (Hyland, 2002). Accompanying the collaborative online writing, the multiple revisions teaching strategy (Hyland, 2003), was also applied. Learners needed to write at least three versions of composition - initial, second, and final drafts - before submitting the paper for evaluation. They received one-time feedback from an extra peer review activity between the initial and second revisions, and then received feedback from their teacher between the second and final drafts (see Figure 1).

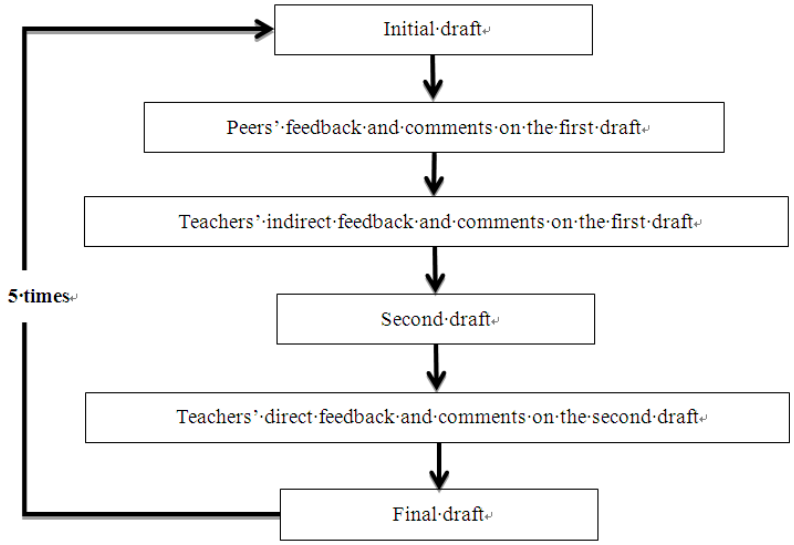

Figure 1. Five writing cycles

Peer review activities (Covill, 2010) in which every individual (N=209) in each group had to review their peers' initial writing drafts and then give feedback and comments by filling out a designed peer review form, were also implemented. Each student received three feedback forms from their group mates, and they then had to modify the compositions after reviewing these comments. To enhance the learners' peer review competence, four hours of training sessions consisting of a two-hour face-to-face lecture and another two hours of online tutorials using supplemental reading materials were supplied at the beginning of the semester (Min, 2008). The peer review form covered six aspects of the compositions – (a) content, (b) topical and concluding sentences, (c) discourse markers and transitional words, (d) spelling and vocabulary usage, (e) punctuation and capital words, and (f) grammar and sentence structures – with a checklist consisting of 35 total items used as a guideline by the reviewers to check the target compositions. The meaning and sample of each item was taught during the training sessions. For easier understanding and implementation, reviewers used a Likert scale from 1 to 5 to score each item, although they were asked to provide suggestions as much as possible to help their peer writers in revising their compositions.

The blended mode of indirect feedback with a code system and direct feedback for the learners' drafts was utilized in providing teacher's corrective feedback (Ferris & Roberts, 2001). In order to let the learners find out answers actively by themselves rather than acquiring the teacher's knowledge passively, indirect feedback indicating the learners' mistakes/errors with the aid of a code system was introduced. For instance, the teacher might mark a paper with an "S" to indicate a "spelling" error, with a "T" to indicate a "tense" error, etc. when first giving feedback to a learner. A code table, which listed the meaning of each code, was attached to the end of each file for the learners' reference. The students then had to attempt to revise their work according to the code, and search for answers from possible resources. After that, the teacher gave direct feedback on the later versions which consisted of explicit instructions about the mistakes/errors that had not been solved.

Five writing cycles – including two compositions completed before midterm examinations and three completed after – were conducted (see Appendix B). For the first three compositions, each cycle took three weeks, but then was reduced to two weeks after the students had all become familiar with the process. Every writing topic had its teaching focus on genre and grammatical features, and they were selected from mock tests used in the historical GEPT examinations. The proficiency level could be seen as consistent in terms of validity and reliability.

2.4 Measures

2.4.1 The SRCT

The Scale for Rating Composition Tasks (SRCT): Two writing tests were conducted at each pre-test and post-test. The SRCT, developed by the National CEEC (College Entrance Examination Centre), was adopted to evaluate the learners' writing performances in terms of six dimensions, namely 'content', 'organization', 'grammar', 'diction', 'mechanism', and 'holistic' (Chen, Huang, Lin, & Lin, 1993). The content section evaluates a writer's logical

development of his or her ideas, while the grammar section tests whether the students can handle grammatical rules, for example, tense or parts of speech, successfully. The organization dimension refers to the parts of a composition such as the topic sentence(s), the main body, developing sentences, and conclusion, with an especial focus on the adequacy of concluding sentence(s). The fourth dimension is about the words used and their usages, while the mechanism dimension examines the management of punctuation, capitalization, abbreviation, and spelling. These two writing papers were all evaluated by the same writing assessor, who was an experienced language teacher familiarized with the GEPT requirements.

2.4.2 The WSQ

The Writing Self-efficacy Questionnaire (WSQ): Learners' perceptions about their writing self-efficacy were measured by a questionnaire containing 15 items scored according to a five-point Likert scale ranging from 1 ('strongly disagree') to 5 ('strongly agree'). This instrument was distributed before and after the writing training and was thus used to measure any progress by comparing the learners' writing perceptions at two different times. It was combined and revised from two previous studies conducted by Jacobs, Opdenacker, and Waes (2005) and Pajares, Hartley, and Valiante (2001), and was concerned with the students' self-efficacy in terms of structuring and ending paragraphs, grammar, punctuation marks, and spelling. Higher scores illustrated a positive trend which implied the respondents' strong self-efficacy beliefs with regard to writing. In the pilot test that we completed in 2009 in the same teaching context with 102 learners, the Cronbach's Alpha coefficients of the questionnaire were .917 (pre-test) and .877 (post-test), and the internal reliability could be regarded as adequate (Nunnally & Bernstein, 1994).

3. Results

3.1 Writing Performance

To test the first hypothesis of this study – whether the learners obtained learning progress in terms of their writing performance – a repeated measure MANOVA was conducted. The results showed that the learners' outcomes improved significantly: $F(6, 200) = 5.15$, $p<.001$, partial eta squared= .134, observed power = .994. Post hoc comparison, which used the Bonferroni method for multiple comparisons adjustment, demonstrated statistically significant differences between learners' pre- and post-test performances in terms of two out of the six performance elements, namely, the content and holistic dimensions (Table 1).

Table 1. Descriptive statistics and pairwise comparisons of learners' writing performances

N = 209	Mean		S.D.		S.E.		Mean	S.E	95%	CI	Sig.
Criteria	pre	post	pre	post	pre	post	Difference		Lower	Upper	
Content	2.68	2.91	1.040	.967	.072	.067	.237***	.062	.114	.359	.000
Organization	2.63	2.74	.963	.947	.067	.066	.115	.059	-.002	.233	.054
Grammar	2.30	2.33	.945	.995	.065	.069	.038	.064	.088	.164	.553
Diction	2.39	2.36	.877	.926	.061	.064	-.023	.065	-.152	.105	.720
Mechanism	2.54	2.58	.935	.983	.065	.068	.047	.056	-.065	.158	.409
Holistic	2.50	2.60	.899	.951	.062	.066	.112*	.054	.005	.220	.040

Note: * $p<.05$ *** $p<.001$.

The descriptive statistics demonstrated that the EFL learners had improved their writing competence after a semester of English writing learning activities. In general, however, the learners' writing outcomes as measured by both the pre- and post-test scores were not satisfactory in terms of the GEPT's criteria for passing the writing skills part at the elementary level. It is normally recommended that a student score at least three to succeed in passing the writing section, yet all of the means here were less than 3. This echoes the finding of a previous study showing that vocational and technological university students have a lower passing rate for the GEPT examination (Su, 2005).

Among the six performance criteria, scores for five – the content, organization, grammar, mechanism, and holistic dimensions – exhibited an increasing trend; only scores for the diction dimension decreased after the students received the writing training activities ($M_{diction\_pre} = 2.39$; $M_{diction\_post} = 2.36$). The highest means were achieved for the content dimension ($M_{content\_pre} = 2.68$; $M_{content\_post} = 2.91$), while the lowest were obtained for the grammar

dimension ($M_{grammar\_pre}$ =2.30; $M_{grammar\_post}$ =2.33).

Additionally, learners' self-efficacy beliefs increased significantly after the writing instruction: F(15, 191) = 10.04, p<.001, partial eta squared= .441, observed power = 1.00 calculated by the method of repeated measure MANOVA. Paired sample t-tests adding all 15 items' scores into a sum showed the same results as well: t (208) = 8.75, p<.001.

3.2 Writing Self-Efficacy Latent Structure

The latent structures of the students' writing self-efficacy beliefs were strongly swayed by the instructional method, confirming our second hypothesis. Table 2 shows the results of exploratory factor analysis (EFA) extracted from the data in terms of the learners' pre-test writing self-efficacy. Two factors were identified; these two factors were named 'writing self-efficacy' (WSE), which was measured by 9 items, and 'writing self-confidence' (WSC), which was measured by the other 6 measuring items. In Table 2, factor loadings for each item are listed in terms of the component volumes, and they have been sorted in order by the regression weights.

The WSE factor refers to those perceptions the learners held regarding their *competence* when doing English writing, while the WSC factor tends to describe the students' beliefs associated with their level of *confidence* when dealing with English writing issues. These two factors match the definition of self-efficacy theory, and constitute the theoretical construct of this conventional latent trait.

Table 2. EFA of learners' pre-test writing self-efficacy

2012 pre-test		Measuring items	component	
			1	2
WSE (writing efficacy)	PRE4	I can write a coherent and well-organized paper with a good introduction, body, and conclusion	.778	.213
	PRE1	I can structure paragraphs to support ideas in the topic sentences	.771	.267
	PRE2	I can end paragraphs with proper conclusions	.767	.193
	PRE5	I can rewrite long and complicated sentences into clear and shorter sentences	.759	.205
	PRE7	I can write a strong paragraph with a good topic sentence or main idea	.727	.375
	PRE3	I can get ideas across in a clear manner without jumping from one idea to another	.686	.183
	PRE12	I can write a composition without spelling errors in English	.543	.488
	PRE14	I can write a composition without grammatical errors in English	.515	.495
	PRE13	I can use the right punctuation marks and put them in the right places in my text	.490	.327
WSC (writing confidence)	PRE8	I have methods to solve my writing block when I get stuck in writing	.049	.796
	PRE15	Even if I have possible punctuating, spelling, or grammatical errors, I am sure I can figure out solutions	.175	.705
	PRE9	I am confident about accurately paraphrasing and quoting original sources and not plagiarizing them	.314	.586
	PRE6	I am confident about writing an attractive composition with adequate variation in my word choice	.452	.577
	PRE10	I know collocation and can use it well	.491	.523
	PRE11	I focus more on the content than on correcting errors when refining my composition	.297	.302

Note: Rotation method - Varimax with Kaiser Normalization; Cronbach's Alpha = .910.

However, after the writing training, it was found that the EFL learners' self-efficacy latent structures had been altered significantly from their initial configurations. A similar EFA process was executed again with the post-test data (see Table 3), and four other factors were revealed; these factors were named 'construct self-efficacy' (CSE), 'linguistic self-efficacy' (LSE), 'mechanism self-efficacy' (MSE), and 'revision self-efficacy' (RSE). Of the four factors, CSE refers to the students' perceptions regarding to what extent they could construct and draft an English writing task, while LSE focuses on the linguistic knowledge, such as grammar and vocabulary, required for completing a writing work. MSE deals with a more detailed dimension designed for assessing learners' capability regarding the mechanisms of composition such as punctuation and spelling. RSE, on the other hand, concentrates on the learners' efficacy in handling writing revisions and/ or paraphrasing.

Table 3. EFA of learners' post-test writing self-efficacy

2012 post-test		Measuring item	Component			
			1	2	3	4
CSE (Construct Self-efficacy)	POE4	I can write a coherent and well-organized paper with a good introduction, body, and conclusion.	.808	.237	.147	.004
	POE3	I can get ideas across in a clear manner without jumping from one idea to another.	.803	-.028	.156	-.007
	POE2	I can end paragraphs with proper conclusions.	.722	.056	.065	.383
	POE1	I can structure paragraphs to support ideas in the topic sentences.	.688	.235	.137	.217
	POE5	I can rewrite long and complicated sentences into clear and shorter sentences.	.612	.345	.139	.235
LSE (Linguistic Self-efficacy)	POE14	I can write a composition without grammatical errors in English.	.094	.884	.021	.039
	POE12	I can write a composition without spelling errors in English.	.093	.778	.198	.131
	POE10	I know collocation and can use it well.	.203	.651	.198	.230
	POE6	I am confident about writing an attractive composition with adequate variation in my word choice.	.564	.583	.095	.103
	POE7	I can write a strong paragraph with a good topic sentence or main idea.	.468	.520	.195	.215
MSE (Mechanism Self-efficacy)	POE13	I can use the right punctuation marks and put them in the right places in my text.	.201	.206	.791	-.094
	POE15	Even if I have possible punctuating, spelling, or grammatical errors, I am sure I can figure out solutions.	.127	.165	.756	.153
	POE8	I have methods to solve my writing block when I get stuck in writing.	.165	.020	.590	.505
RSE (Revision Self-efficacy)	POE11	I focus more on the content than on correcting errors when refining my composition.	.110	.091	.084	.721
	POE9	I am confident about accurately paraphrasing and quoting original sources and not plagiarizing them.	.184	.285	.027	.635

Note: Rotation method - Varimax with Kaiser Normalization; Cronbach's Alpha = .878.

3.3 Pre-Test Writing Self-Efficacy and Performance

The learners' writing self-efficacy beliefs had strong causal relationships with their writing competence improvements, which supported the proposed third hypothesis. Figure 2 illustrates the SEM identifying the causal relationship between learners' pre-test self-efficacy and their levels of progress in writing learning (r=-.162; SE=.069; p=.019). This model suggests that learners' perceptions of their writing self-efficacy could predict their writing learning performances, although in a negative direction. In other words, the higher a student perceived his or her self-efficacy to be, the less improvement in performance he or she would experience after a period of learning activities. For those learners who felt confident about their writing capability, their learning outcomes would not improve significantly. In contrast, the less confident they were in their abilities at first, the more improvement they experienced in their writing outcomes.

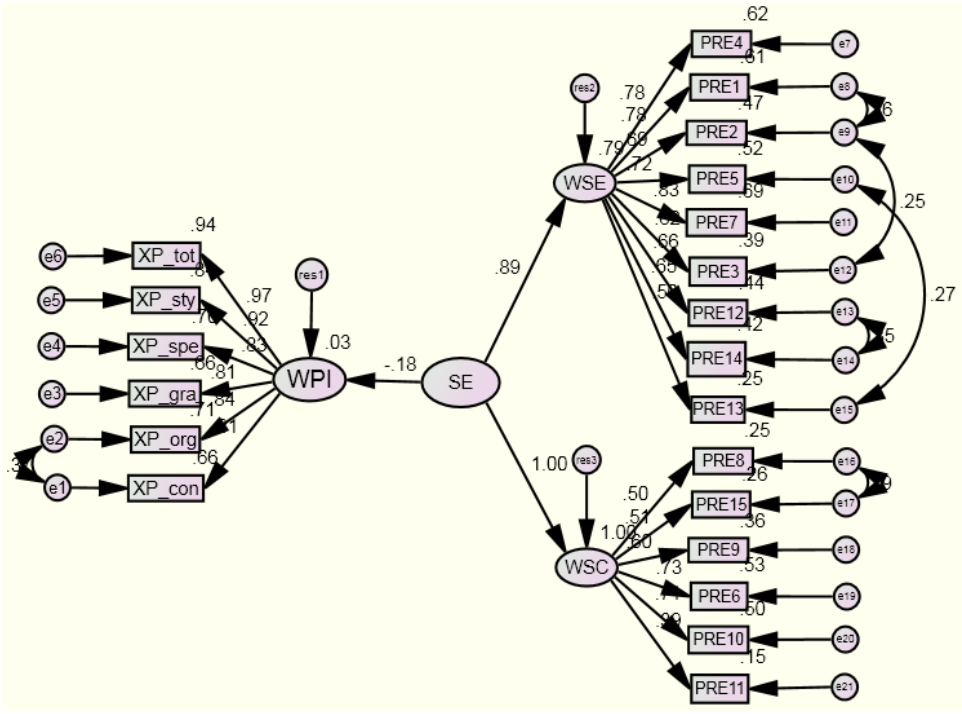

Figure 2. SEM between pre-test writing self-efficacy and performance improvement (CFA 2nd order)

In addition, prior to constructing the SEM model, a first order CFA model was established and modified according to its modification indices and items meaning correlations until it reached a satisfactory goodness-of-fit (χ^2=267.808; df=180; p<.001; CFI=.967; RMSEA=.048). After completing the first-order CFA model, a second-order CFA model which combined the two efficacy beliefs into a higher latent variable – self-efficacy – was formed and tested (χ^2=257.098; df=175; p<.001; CFI=.966; RMSEA=.047). Since the target coefficient (T=.96) was close to 1, it was recommended that the second-order CFA be chosen instead of the first-order CFA (Marsh & Hocevar, 1985). The SEM model-fit statistics indicate a very strong goodness-of-fit with the data (χ^2=268.048; df=181; p<.001; CFI=.967; RMSEA=.048), and the standardized regression weights of all the paths are shown in Table 4.

Table 4. Standardized regression weights of SEM models (Pre- and Post-test)

Pre-test			Estimate	Post-test			Estimate
WSE	<---	SE	0.888	WPI	<---	SE	-0.288
WSC	<---	SE	1	CSE	<---	SE	0.891
WPI	<---	SE	-0.178	LSE	<---	SE	0.879
PRE4	<---	WSE	0.784	MSE	<---	SE	0.684
PRE1	<---	WSE	0.78	RSE	<---	SE	1
PRE2	<---	WSE	0.686	POE4	<---	CSE	0.698
PRE5	<---	WSE	0.719	POE3	<---	CSE	0.584
PRE7	<---	WSE	0.832	POE2	<---	CSE	0.727
PRE3	<---	WSE	0.624	POE1	<---	CSE	0.768
PRE12	<---	WSE	0.66	POE5	<---	CSE	0.73
PRE14	<---	WSE	0.645	XP_con	<---	WPI	0.813
PRE13	<---	WSE	0.495	XP_org	<---	WPI	0.842
XP_con	<---	WPI	0.813	XP_gra	<---	WPI	0.812
XP_org	<---	WPI	0.842	XP_spe	<---	WPI	0.834
XP_gra	<---	WPI	0.812	XP_sty	<---	WPI	0.918
XP_spe	<---	WPI	0.834	POE6	<---	LSE	0.792
XP_sty	<---	WPI	0.918	POE10	<---	LSE	0.638
PRE8	<---	WSC	0.502	POE12	<---	LSE	0.573
PRE15	<---	WSC	0.513	POE14	<---	LSE	0.611
PRE9	<---	WSC	0.6	POE7	<---	LSE	0.769
PRE6	<---	WSC	0.728	POE8	<---	MSE	0.61
PRE10	<---	WSC	0.708	POE15	<---	MSE	0.646
PRE11	<---	WSC	0.393	POE13	<---	MSE	0.619
XP_tot	<---	WPI	0.971	POE9	<---	RSE	0.501
				POE11	<---	RSE	0.379
				XP_tot	<---	WPI	0.971

Although a correlation between WPI (writing performance improvement) and SE (self-efficacy) was identified, by which factor in the SE latent causing this inference is still unclear. Another SEM model, which also showed a fair model fit (χ^2=347.210; df=182; p<.001; CFI=.938; RMSEA=.066), based on the first-order CFA structure was fabricated. It indicated that the WSC (writing self-confidence) factor was the main factor inducing this predictive relationship (r=-.233; SE=.067; p<.001).

3.4 Post-Test Writing Self-Efficacy and Performance

Consistent with the second hypothesis, the collaborative online writing instruction changed the pattern of self-efficacy factors forcibly, a result which leads to the question of whether post-test self-efficacy had a causal relationship with writing performance. Figure 3 shows the SEM model which set the post-test self-efficacy (SE) as the independent variable and set the writing performance improvement (WPI) as the dependent variable. The cause and effect relationship between the SE and WPI was again shown to be in a negative direction (r=-.262; SE=.071; p<.001), which confirms the fourth hypothesis inferring that the higher the learners' perceived their writing efficacy to be, the less they would gain improvement in their writing skills.

The model fit statistics show a fairly good data-model-fit (χ^2=262.692; df=181; p<.001; CFI=.967; RMSEA=.047). The standardized regression weights of all the paths are shown in Table 4. The same step consisting of a first-order CFA model check and modification was conducted as well.

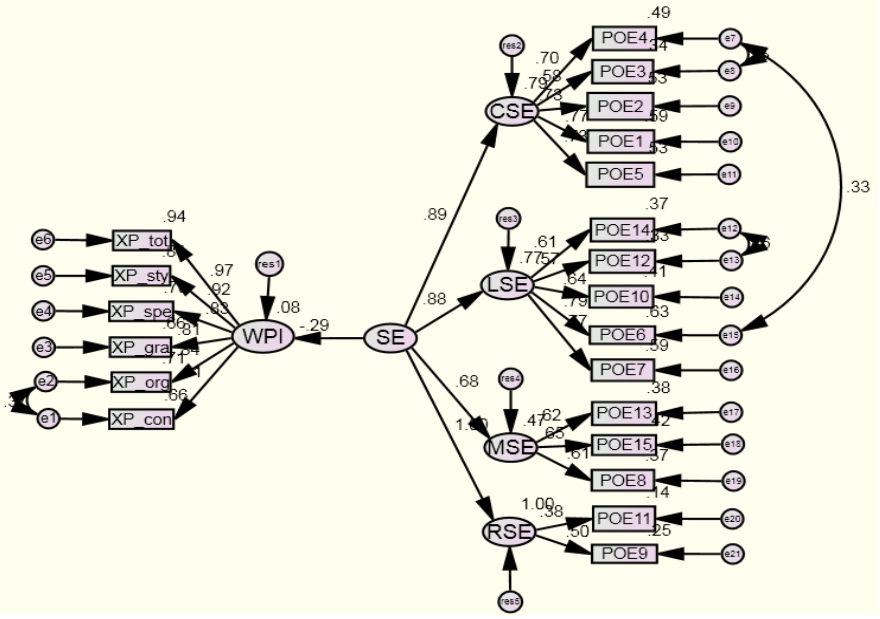

Figure 3. SEM between post-test writing self-efficacy and performance improvement (CFA 2nd order)

A similar analysis procedure was conducted to remove the second-order latent variable (i.e., SE) in order to further understand the factor(s) resulting in this SE-WPI association. The first-order SEM model still shows a suitable model-fit with its data (χ^2=257.098; df=175; p<.001; CFI=.966; RMSEA=.047), and indicates that the RSE factor was the crucial one in causing the association (r=-.926; SE=.285; p=.001). It can be inferred, therefore, that the higher the revision efficacy that the learners sensed in their writing efforts, the lower the improvement on their writing competence.

Finally, at the stage of CFA, the normality of the data was assessed by screening the skew and kurtosis. The results met the relevant criteria and thus the data set could be seen as one meeting the assumption of normality. The Mahalanobis distance of the observations was also filtered, and two data (NO. 43 & 89) could thus be identified as outliers, although we opted not to delete them as they did not result in a serious flaw for this model.

4. Discussion

After a semester of writing instruction, the learners' writing performances had improved significantly, especially in terms of the content dimension. This progress was determined by comparing the pre-test and post-test writing outcomes, and it could be mainly attributed to the effect of the collaborative online writing teaching and more practice. Nonetheless, given such a limited amount of time, resources, and quality input, it was not reasonable to expect mastery of every dimension of a language output skill such as writing. Linguistic knowledge including grammatical rules and vocabulary usage were probably the most problematic dimensions to comprehend (Schoonen & Gelderen, 2003), and this was reflected in the survey results. Content drafting and formation of a composition, on the other hand, could be trained and improved more easily since the EFL learners had sufficient schematic knowledge in their minds already (Hyland, 2003). Guidance about the assessment criteria and content drafting strategies was introduced repeatedly, and could boost the learners' competence in delineating the outlines in a comparatively shorter time.

However, the students' writing accomplishments did not achieve the level sought by the GEPT examination in general. Learners and teachers in nursing vocational and technological institutes in Taiwan have found that learning to write in English is essential should passing the GEPT be made a requirement for graduation. In the nursing university of science and technology examined in this research context, a GEPT policy has been implemented for more than eight years, and it requires four language skills – listening, reading, speaking, and writing - to achieve the standard at each level. It has thus been a main goal for the teachers and learners to accomplish the fundamental level, which is designed for beginners, for their English language teaching and learning. It should be noted that according to investigations completed by the school, less than 20% of students had met the criteria by the time they entered the school. This is similar to the average figure for the vocational and

technological college students nationwide (Su, 2005).

One crucial issue causing this phenomenon could be the learners' incompetence in terms of their writing ability. According to one GEPT report, examinees who took the elementary level test from 2002-2007 obtained the lowest average score in the writing part (79.53), with the average scores for the three other skills of listening (100.67), reading (100.85), and speaking (82.45) all being higher. Similarly, the pass rate for the writing section was also the lowest at only 49%; in comparison, the pass rates for the listening, speaking, and reading sections were 65%, 78%, and 57%, respectively (GEPT, 2007). Writing has thus become a bottleneck for examinees seeking to pass the overall language test. Consistent with this, one previous study found that not only students but also teachers perceive learning and teaching writing to constitute a tough task to be conducted in the classroom (Lai & Chung, 2005).

As to the learners' writing self-efficacy, the exploratory factor analysis (EFA) conducted with the measuring instrument demonstrated a significant difference between the pre-test and post-test data. This finding seems to have not yet been explicitly reported in the past research in this area, and it could be an important contribution to the literature suggesting that a mediation effect (Preacher, Rucker, & Hayes, 2007) may have possibly occurred between the two latent variables, i.e., the writing self-efficacy and proficiency levels. The pre-test data matches the hypothetical structure of self-efficacy theory which contains the two factors of confidence and competence (Bandura, 1997), and can thus be interpreted as providing confirmation of the theory. After the teaching and learning activities, the latent structures of the learners' self-efficacy beliefs had been completely altered to become more relevant to the writing assessment criteria. This result echoes the research by Zimmerman and Cleary (2006) in that the self-efficacy construct is domain-, context-, and task-specific and can be manipulated (Woodrow, 2011). The teaching intervention, which played the role of mediator, had undoubtedly influenced the learners' self-efficacy and, thus, their performance as well. This finding partially corresponds to one assumption of self-efficacy theory, in which learners' perceptions regarding their competence and the controllability of the environment around them are strongly correlated to their persistence and resilience in learning and thus can predict their academic achievements (Hetthong & Teo, 2013; Woodrow, 2011). Rooting from this change, the third and fourth hypotheses attempted to identify the relationships between the change of self-efficacy and learning improvement.

The establishment of the structural equation modeling (SEM) allowed for identification of the relationships between the two latent variables – writing self-efficacy and performance improvement – and illustrated that the learners' initial writing self-efficacy levels effectively predicted their performance improvement, and that their post-test self-efficacy levels were highly correlated to their writing performance improvements, too. According to the pre-test model, the students' perceptions of their own confidence in writing rather than their actual competence could predict their writing improvement. Before the commencement of writing training, these novice writers had little experience in doing writing, so their beliefs about competence may not have reflected their real capabilities. At this stage, the level of self-confidence had relatively stronger power in predicting their learning outcomes, and is supported by the previous research (Erkan & Saban, 2011; Woodrow, 2011). The less confidence a student had regarding writing, the greater the effort that student might have contributed to the learning activities during the instructional process, thus inducing a relatively high level of improvement in English writing skills acquisition.

The post-test model demonstrated a similar negative causal relationship; however, it illustrated a different perspective than the pre-test model following the change of the latent structures resulting from the teaching intervention. Unlike the pre-test model, the post-test model indicated that learners with higher self-efficacy performed worse after receiving the instruction. As literature suggested that self-efficacy is a predictor and also a forethought process (Wang et al., 2014), the latent variable should be measured prior to the instruction. The change of learners' latent structure brought on by the learning activities might have influenced their perceptions, especially without feedback from the writing examinations in this research context.

The model shows that the influential effect mostly came from the students' revision competence, which was relevant to the perceptions about their ability to correct and modify writing compositions. It implies that the higher the degree to which a writer believed that he or she could better revise the compositions, the lower the level of improvement that he or she performed on the tests. Due to the fact that the pre-test and post-test writing compositions were composed on examinations that happened in the classrooms, students could not search for revision support from books, peers, friends, the Internet, etc. As such, we speculated that the more dependent a student was on using learning support to help improve the quality of his or her writing during the five writing cycles, the less likely that writer was to perform well on these examinations.

Finally, two issues may be addressed as limitations of this research. First, while the trend of recent studies on the

application of technology in language teaching is welcome, this research did not thoroughly investigate the effects of the online environment. Second, the innate feature of the quantitative research method may have restricted the scope of this study. In addition, the design of the study, with a single experimental group used to test the effects on the participants' writing performance and self-efficacy, is not very convincing. However, as the GEPT policy requires learners to acquire the English writing skills in the teaching context, and due to ethical issue concerns about the nursing students' learning needs, we nonetheless opted for a single experimental design. Further studies, however, could adopt a quasi-experimental design to further testify the proposed hypotheses.

5. Conclusions and Suggestions for Future Research

Although this study consisted of a single-group experiment without comparison groups to examine the effectiveness of this pedagogy, this collaborative online writing approach did prove its feasibility and that it could serve as an alternative way of verifying the self-efficacy theory. The first hypothesis demonstrated the efficacy of this blended teaching method, which was shown to have enhanced the learners' performance and self-efficacy within a semester. The fact that the writing cycle was performed online might contribute to both aspects, and the face-to-face mode might have more influence on the learners' self-efficacy beliefs. The second hypothesis indicated that the consequences of this pedagogy could effectively alter the learners' latent structures of self-efficacy. As to the third hypotheses, the learners' self-efficacy beliefs were relevant to their writing improvement, and this finding supplied further evidence that this collaborative online writing teaching method was helpful to increase both learners' competence and self-efficacy perceptions simultaneously. For English language teachers, then, this instructional system with multi-disciplinary pedagogical meanings seems worthy of recommending.

However, it was noted that another possible conclusion may be that in a well-constructed process-oriented writing programme incorporating multiple revisions, post-test self-efficacy plays a lesser role because participants re-orient their learning efforts in order to satisfy the assessment requirements of such a programme which makes it very difficult for students not to improve writing content and composition skills. The vocabulary and grammar aspects are less likely to be affected as they received less direct attention in this approach compared to the content and organization of ideas and the text.

A number of potential options for further research can also be suggested. First, the validity and reliability of the writing self-efficacy questionnaire used in this study can be further tested through various EFAs and CFAs in order to increase the questionnaire's quality. Second, self-efficacy beliefs are accompanied by other latent traits such as apprehension (Singh & Rajalingam, 2012), motivation, and gender issues. As such, the use of measurements containing more latent variables to construct a more comprehensive SEM model may be worth considering. Third, the writing training period could be extended until the post-test performance exhibits statistically significant improvement over the pre-test results. In addition, the relationships between learners' post-test performances and self-efficacy beliefs may need to be further identified after the intervention achieves the expected outcomes. Finally, qualitative research aimed at investigating nursing learners' subjective perceptions on a deeper level in order to determine the mechanisms by which learners' self-efficacy beliefs are changed during the teaching process is suggested.

Acknowledgments

This paper, as part of a research project, was funded by Chang-Gung Memorial Hospital (CMRPF6D0031), and a grant to the researcher' sponsored by the Institute of Humanities and Social Sciences of the Ministry of Science and Technology in Taiwan. Ethical approval was granted by the Institutional Research Board (IRB101-3241B) of Chang-Gung Memorial Hospital. Participants were properly informed and signed the consent form prior to the beginning of the study. They were clearly aware of their rights to withdraw from the activities at any time during the teaching intervention, and none withdrew from the study. All research procedures complied with the code of ethics regulated by the IRB. Finally, special thanks go to the teaching assistances that assisted in the writing instruction.

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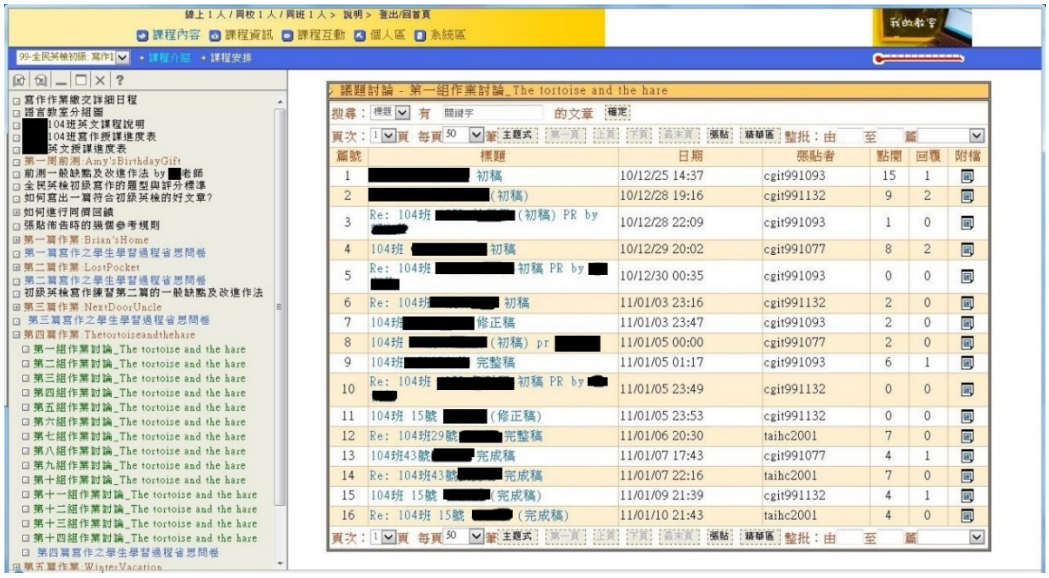
Appendix A

Writing Teaching Platform – U2 Learning Network



Appendix B

Writing teaching schedules and tasks

Week	Writing tasks	Topic
1	Introduction to English writing (genres, paragraph, topic sentence, development, concluding sentence, etc.).	**Pre-test: Amy's birthday gift**
2	Introduction to GEPT writing: (assessment criteria, sample compositions, common errors, etc.).	
3	**Task 1: descriptive genre (present tense)**	**Brian's Home**
4	Peer review activities	
5	Teacher feedback	
6	**Task 2: narrative genre (past tense)**	**Lost Wallet**
7	Peer review activities	
8	Teacher feedback	
9	Mid-term exam	
10	Multimedia session	
11	**Task 3: narrative genre (present tense)**	**Next Door Uncle**
12	Peer review activities	
13	Teacher feedback	
14	**Task 4: Story telling (either present or past tense)**	**Tortoise and Hare**
15	Peer review activities & teacher feedback	
16	**Task 5:Writing a letter (future tense)**	**Winter Vacation**
17	Peer review activities & teacher feedback	
18	Final exam	**Post-test: Dream to be a police man**