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The Effect of Collaborative Writing Tasks on EFL University Students' Writing Performance

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Abstract

In this study the effects of collaborative writing (CW) tasks were investigated on EFL university students' writing performance by addressing two research objectives: (a) to examine if members' contributions to CW tasks influence their writing performance in the final examination and (b) to find out among those with varied language proficiency levels who in the team contributed more texts during the CW processes. The participants were 115 students taking a writing course at a small private international university in central Thailand. Data were collected from students' pre- and post-tests and the percentage of their contributions from two CW tasks—writing descriptive and argumentative essays. Paired sample *t*-test analysis showed that academic writing performance significantly increased after engaging in two CW tasks. Furthermore, the Pearson correlation coefficient (Pearson's *r*) analysis showed that the percentage of learners' text contributions during the CW processes was positively correlated with their post-writing in their final examination. The findings further revealed that students with higher language proficiency levels were prominent. Some implications for EFL writing contexts are discussed briefly.

Keywords: *Collaborative, online writing, EFL learners, L2 writing*

Introduction

Writing is defined as a thinking process where a writer's ideas, thoughts, and learning experiences are translated into written form (Mora-Flores, 2009), and it is considered one of the most essential skills to be acquired in an academic setting, from schools to tertiary level (Wingate & Harper, 2021). Writing is an intricate cognitive activity incorporating many processes and strategies (Ahmad, 2020; Chen, 2019). Because of the perplexing nature of writing, this productive language skill is often neglected in the ESL/ EFL classroom and has a minor role in language learning instruction (Coulmas, 2013). Some researchers (e.g., Ardiasih et al., 2019; Elabdali & Arnold, 2020; Storch, 2013, 2021; Weisberger et al., 2021) have shifted their focus to collaborative writing (CW) that involves a team striving to accomplish a common goal while engaging in negotiation, coordination, and communication during the process of the creation of a shared document.

In previous studies (e.g., Chen, 2019; Qiu & Lee, 2020) it has been shown that collaborative writing (CW) practice and active involvement in a group project can enhance knowledge gains for individual writing skills. In Thailand, McDonough et al. (2018) compared the text features of paragraphs composed by EFL university students by examining collaborative work under three conditions: collaborative writing, collaborative prewriting, or non-collaboration. They found that CW resulted in more accurate texts. McDonough and De Vleeschauwer (2019) compared individual and collaborative prewriting of EFL university students in a public school in northern Thailand. They found that students who planned their work individually could improve in terms of analytic ratings, while students who planned collaboratively showed improvement in linguistic accuracy. More recently, Coffin (2020) investigated the process of implementing CW in Thai EFL classroom contexts by using multiple data sources, including document analysis, observation, questionnaires, and interviews. Both students and teachers perceived that CW practice positively influenced group work, communication, and problem-solving skills. Nevertheless, questions concerning teamwork equity remain unanswered. Therefore, the goal of the present study was to investigate whether individual members' contributions in CW tasks influenced their writing in the final examination, especially contributors who wrote more.

Literature Review

Collaborative Writing (CW)

Collaborative writing is considered an essential writing act and social process that involves a team working towards a common goal while engaging in negotiation and communication (Abrams, 2019; Storch 2013). While engaging in CW tasks, learners may come to recognize their limitations as they use linguistic resources to co-construct texts (Elola & Oskoz, 2010). Swain (2001) posited that CW projects were communicative tasks that involved members' comprehension, manipulation, co-construction of text, and peer interaction in the target language. The joint construction of text empowers learners to reflect upon language, discuss the linguistic features they are handling, and collaborate in solving language-related issues they encounter (Dobao, 2012; Kitjaroonchai & Suppasetseree, 2021a; 2021b). In a CW setting, learners need peer scaffolding to attain better writing efficacy as they exchange opinions and reflect on their writing after receiving peer feedback (Aydin & Yildiz, 2014). The benefits of CW have been examined by comparing collaborative and individual writing tasks (e.g., Chen, 2019; Elabdali, 2021; McDonough & De Vleeschauwer, 2019; McDonough et al., 2018; Teng, 2021). The advantages of CW include support through peer scaffolding and peer feedback, thinking processes, and writing styles (Teng, 2021). Learning becomes more dynamic and interactive and knowledge is absorbed, which subsequently results in individual writing development (Liu et al., 2018). In CW activities, learners are not only exposed to language input, but they also experience meaning-making through interactions with peers. This enables them to receive peer feedback on the correct use of language (Bhowmik et al., 2018).

DocuViz

DocuViz, a visualization tool, was developed by a research team from the University of California, Irvine. The system displays the entire revision history in Google Docs (GD) (Wang et al., 2015; Krishnan et al., 2018). DocuViz can automatically create a visual history bar chart across different timelines, indicating authors and the amount of work contributed to their group project. The tool detects all data entered in a GD file, and provides usage statistics related to the revision behaviors of collaborators, such as the amount of peer editing or weight contributed to a final draft by each collaborator (Krishnan et al., 2018; Olson et al., 2017). The color codes give an overview of team members' sequence of contributions (e.g., Wang et al., 2015). All the visualizations produced by the system utilize the same colors and sequence. Additionally, DocuViz generates the frequency of individual member contributions. Struck-through texts and inserted texts are also shown against an individual's code.

Factors Shaping L2 Learners' Writing Performance

To reach a comprehensive understanding of L2 learners' English writing performance, we need to recognize potential factors that may shape or influence group writing performance in one way or the other. These factors include goals, language proficiency, learners' roles, and task type.

Goals

Individual goals may shape their learning behaviors in L2 writing contexts. Cumming (2012, p. 138) posited that goals are unpredictable in learning contexts, and learner motivation is observed "through behaviors that focus on particular goals, which can be articulated, analyzed, and altered." Divergent goal orientations shown by learners shape their interaction when performing a group task (Li & Zhu, 2017). For instance, collaborators who compete to display their knowledge would exhibit a prominent role and focus on self. By contrast, a collaborative pair would indicate their shared goal by supporting each other to complete the task collectively (Storch, 2013).

Language Proficiency

Learners' language proficiency is a significant factor for successful collaboration (Zhang & Hyland, 2018). Researchers have posited that a CW task among L2 learners could be more productive and successful when members are grouped with mixed-ability learners, that is, high proficiency learners working with lower proficiency partners (e.g., Dobao, 2012; Storch, 2013). Nonetheless, others have

shown that less capable partner inputs are often neglected or rejected by peers with higher language proficiency (e.g., Bahar, 2003). Thus, less capable learners prefer to work with peers with a similar level of language skills (Yim, 2017). Researchers have also reported that mixed-ability groups whose members actively participated in CW tasks subsequently developed writing skills on an individual level (e.g., Chen, 2019; McDonough & De Vleeschauwer, 2019).

Learners' Roles

In a group, members need to have a clear role or responsibility. Group members with specialized knowledge, language ability, and leadership skills may take the initiative to lead the team. Kukulska-Hulme (2004) advocated that a successful collaboration is derived from the active participation of team members with prominent roles and responsibilities. Furthermore, collective efforts became more prominent when the team had a supportive leader (Kitjaroonchai & Suppasetseree, 2021a).

Task Type

Previous studies on CW projects have indicated that task types could facilitate or shape students' interactions or collaborative dialogue. For example, Aydin and Yildiz (2014) analyzed L2 learners' writing revision behaviors on wiki-based CW tasks in three different genres: argumentative, decision-making, and informative. They found that the argumentative essay promoted more collective efforts in making corrections than the other tasks. By contrast, the informative task allowed learners to create a more apparent division of labor than the other two tasks.

While seemingly beneficial, some researchers have reported disadvantages of CW tasks. For example, Savasci and Kaygisiz (2019) found that their Turkish EFL learners who engaged in CW activities for a semester of 14 weeks did prefer individual writing over pair or group writing as they could manage their time more effectively. Additionally, Le et al. (2018) found that Vietnamese university students lacked interpersonal and teamwork skills when they were asked to participate in group work. However, there are limited studies on whether members' text contributions in CW tasks would influence writing performance in a final examination setting, especially those who are active contributors to group work. To bridge this gap, the current researcher investigated individual members' contributions while engaging in two CW tasks by addressing two research questions:

1. Do members' contributions to CW tasks influence their final examination writing performance?

2. Among those with varied language proficiency levels, who contributes more texts during the CW processes?

Research Method

Participants and Selection

The participants in this study included 115 EFL students from Asian countries (e.g., Cambodia, China, India, Indonesia, Malaysia, Myanmar, the Philippines, Thailand, and Vietnam) enrolling in a private international university in central Thailand (60 males and 55 females). With an average age of 19.2, the participants had learned English for an average of 10 years. Their English proficiency ranged from pre-intermediate to advanced level based on their performance in the university placement exam [comparable to A2–C1 based on the Common European Framework of Reference for Languages (CEFR) scale]. All the participants were first-year university students: 66 were enrolled in the Applied Grammar and Academic Writing course, a pre-requisite course before taking an English composition course, whereas 49 were in a regular English composition course.

Since this study investigated the effects of CW tasks on individual final grades in writing courses, the main selection criterion was participants who completed two CW assignments on descriptive and argumentative essays. Eighty-nine participants met this criterion, while the other 26 students were excluded as they withdrew or did not complete the collaborative writing task. Of the 89 participants, 50 students were males, and 39 were females.

At the initial stage, the participants were allowed to form their own teams of three members and find peers they were comfortable working with. Forming of a group of three was recommended by

Dobao (2012), who argued that this setup would encourage teams to work effectively, as it could reduce the risk of team members slacking. However, in the present study it was decided that each team should be heterogeneous in terms of their language proficiency levels by referring to the participants' institutional placement test scores used for their admission to the university enrolment applications. It was anticipated that by including learners with varied language proficiency levels in each group, it would provide chances of peer scaffolding and enhance the learning experience.

Research Instruments

Pre-test Writing

The study topic for the pre-test writing was "All levels of education, from primary school to university education, should be free of charge." The students were required to construct a 400 to 500 words essay within a given time of 70 minutes using a Microsoft word processor on their computer and submit it to the Moodle Learning Management System operated by the university. The pre-test was administered in the second week of the research phase after the students were given an orientation prior to participating in the study.

CW Tasks

The participants in both writing courses were instructed to produce two CW essays: descriptive and argumentative essays in Google Docs (GD), spanning three weeks for each task. This was to permit small groups to engage with their members extendedly by commenting on peers' texts, proofreading, and revising texts. A valid reason for selecting these two types of essays was their distinctive characteristics. A descriptive essay fosters learners to employ adjectives that draw vivid description with sensory details for audiences, and it is perceived to be the easiest form of academic writing. An argumentative essay, on the other hand, is one of the most challenging writing types for college students (Wingate, 2012). Such a writing genre requires a writer to raise a debatable issue, state viewpoints, and support those claims with a rationale to persuade audiences. In the present research, these two writing genres (the least challenging vs the most challenging) were selected to examine learners' collaborative behaviors while performing group work.

Jacob et al.'s (1981) Composition Analytic Scoring Rubric was used, which contained five components—content, organization, vocabulary, language use, and mechanics, to assess their CW essays. The researcher assigned three controlled topics for each writing task. The short-listed topics for the descriptive essay were: (a) describing the university landmarks, (b) describing an unforgettable experience in life, and (c) describing vegetarian dishes at the university canteen.

Each team could select one of the topics to write. Likewise, the three short-listed topics for the argumentative essay were: (a) should curfews be imposed on campus? (b) Should the university cafeteria serve non-vegetarian dishes? and (c) How necessary is a college education?

Three optional topics for each writing genre were given to provide students with a choice of familiar topics. These essay topics from both writing tasks were adapted and modified from the course materials and textbooks. Furthermore, the writing topics were suitable for first year university students, for they shared universal themes applicable to all disciplines and were unbiased to a specific area of study.

Collaborative Prewriting Task

Besides engaging in two extended CW tasks (collaboration through the entire writing process from beginning to end—texts were collectively constructed, and members shared co-authorship), students were also introduced to collaborative prewriting tasks on cause-effect and exemplification essays. Students shared ideas and collaborated on essay outlines during the prewriting phase, followed by personal writing. In other words, members collaborated at the prewriting stage only.

Post-test Writing

The participants were required to compose a relay argumentative essay on the topic "All levels of education, from primary to university level, should be free of charge" using Microsoft Word. They

were required to write a 400 to 500 words essay within 70 minutes in a similar manner as they did in the pre-test writing. The identical argumentative essay was chosen to observe learners' writing improvement after engaging in CW tasks of how they employ rationale, reasons, and evidence to persuade audiences and defend their stance. Additionally, the two writing courses undertaken by the participants in the present study also highlighted argument essays as a required writing genre for students to write to fulfill the course objectives. The post-test (argumentative essay writing) was administered in week 14 of the research phase, and it was used as a part of the final examination, contributing 15% to the total score obtained in the course.

Data Analysis

To investigate if learners' contributions while engaging in CW tasks had an impact on their post-test writing in the final examination, DocuViz was used as a text-mining tool. It enabled the generation of data into their GD shared files and calculated the proportion (%) of text by the number of characters contributed to the final version by each person. Jacob et al.'s (1981) Composition Analytic Scoring Rubric was used. It contained elements of content (30 pts), organization (20 pts), vocabulary (20 pts), language use (25 pts), and mechanics (5 pts) to assess their pre-test and post-test writing performance. Members' contributions in the two CW tasks and their writing performance scores in the final examination are summarized in Table 1.

Table 1 *Individual Members' Contributions to CW Tasks and Their Final Grade Percentages*

Students	PTS (%)	CW1 (%)	CW2 (%)	PTSF (%)	Students	PTS (%)	CW1 (%)	CW2 (%)	PTSF (%)	Students	PTS (%)	CW1 (%)	CW2 (%)	PTSF (%)
1	65	26	29	76	31	65	61	95	76	61	66	41	57	71
2	68	41	40	75	32	54	5	15	60	62	70	63	89	79
3	62	34	30	72	33	55	46	11	67	63	65	27	18	78
4	70	89	58	75	34	60	30	26	64	64	55	25	4	62
5	64	6	10	68	35	77	75	53	85	65	77	73	82	85
6	60	8	32	65	36	64	25	47	73	66	73	28	37	82
7	62	20	26	69	37	66	78	85	78	67	64	34	5	72
8	67	21	12	73	38	75	86	88	82	68	73	82	45	80
9	48	7	21	57	39	60	9	7	65	69	55	28	19	62
10	75	52	41	82	40	72	6	4	80	70	82	33	46	90
11	55	7	17	60	41	62	14	25	68	71	54	2	12	66
12	58	78	41	64	42	66	59	32	79	72	68	33	44	75
13	60	14	42	64	43	40	28	43	51	73	73	29	21	80
14	72	93	92	79	44	66	56	45	72	74	75	34	10	84
15	65	7	8	72	45	42	4	10	51	75	43	3	6	52
16	55	16	2	68	46	50	40	45	61	76	55	19	38	68
17	64	90	75	78	47	65	50	54	70	77	54	10	12	67
18	53	5	41	62	48	47	30	16	58	78	62	30	24	70
19	62	70	74	72	49	65	20	31	71	79	72	83	90	80
20	65	32	23	69	50	40	15	5	59	80	50	18	6	68
21	74	56	54	80	51	54	42	56	65	81	37	7	5	52
22	63	95	59	70	52	58	34	34	62	82	59	13	13	68
23	66	35	18	75	53	59	9	6	65	83	60	16	9	66
24	54	22	15	62	54	65	95	63	77	84	66	26	48	78
25	45	40	27	58	55	62	5	37	70	85	65	15	10	70
26	58	60	73	67	56	76	82	75	87	86	70	59	42	77
27	54	44	72	66	57	63	14	15	70	87	68	39	59	79
28	50	5	10	60	58	82	73	73	90	88	52	31	14	68
29	65	23	3	72	59	66	5	49	73	89	57	30	27	62
30	57	10	17	69	60	58	4	10	67					

Note. PTS = Pre-test Score; CW1 = Collaborative Writing 1 (Descriptive Essay); CW2 = Collaborative Writing 2 (Argumentative Essay); PTSF = Post-test Score in Final Examination

Results

In the following section, the results of this study are presented according to the research questions. The first research question touched upon learners' contributions to CW tasks and the influence on their post-test writing in their final examination. For the first research question, Pearson's Correlation Coefficient (Pearson's *r*) was employed to analyze the data. The results of the analysis are shown in Table 2.

Table 2 *Correlation between Members' Contributions and Writing Performance in Final Exam*

	Descriptive Statistics			Correlations			
Variable	*N*	*M*	*SD*	Pre-test score	Contribution (%) (CW1)	Contribution % (CW2)	Post-test score (final exam)
Pre-test score	89	61.70	9.42	—	.505**	.474**	.943**
Contribution (%) (CW1)	89	35.24	26.65		—	.785**	.555**
Contribution (%) (CW2)	89	34.93	25.56			—	.506**
Post-test score (final exam)	89	70.40	8.65				—

Note. ** Correlation is significant at the .01 level (2-tailed); CW1 = collaborative writing task 1; CW2 = collaborative writing task 2

The analysis indicated moderate positive correlations between the percentages of students' contributions in CW tasks to their post-test writing scores. The positive correlation between the percentage of contributions in CW1 and their post-test writing score was ($r\ (87)$ = .555, p < .01), and the percentage of contributions in CW2 to their post-test writing score was ($r\ (87)$ = .506, p < .01). This finding implied that learners who contributed more texts while co-constructing their essays likely performed better in their post-test writing. The other strong positive correlations shown from the analysis included learners' pre-test score and their post-test scores, which was (r (87) = .943, p < .01), and the percentage of contributions in the first and second tasks ($r\ (87)$ = .785, p < .01). This finding indicated that students' pre-test scores had a strong positive correlation with their post-test scores, and those members who produced more texts in the first task were also found to direct their teams and dominate the group work in the second task. Their writing behavior remained stable. Data were analyzed further used a simple linear regression to examine if students' percentage of text contributions could predict their post-test score. The results are shown in Table 3.

Table 3 *Summary of Simple Linear Regression Model* (*N* = 89)

Predictor	***r***	***R^2***	***R^2* Adjusted**	***F***	***β***	***SE***	**B**
Percentage of contribution (CW1)	.555	.308	.300	38.634	.555	0.029	.180
Percentage of contribution (CW2)	.506	.256	.247	29.894	.506	0.031	.171

Note. Dependent variable: Post-test writing score; Predictors: Percentage of contribution in CW tasks

As seen in Table 3, a significant regression equation was found (F (1, 87) = 38.634, p < .01) with an R^2 Adjusted of .300 for CW1 on students' post-test writing score, and (F (1, 87) = 29. 894, p < .01) with an R^2 Adjusted of .247 for CW2 on students' post-test writing score. These findings implied that the percentage of text contribution in CW1 explained 30%, and the percentage of text contribution in CW2 predicted 24.7% of learners' post-test writing scores. From these findings, it was concluded that students' contribution to texts during the CW processes primed them to perform better in their post-test writing in the final exam.

In order to address the second research question, mean scores of the heterogeneous groups were compared based on students' perceived level of English proficiency (e.g., pre-intermediate, intermediate, upper-intermediate, and advanced levels). The results are shown in Table 4.

Table 4 *Mean Scores of Heterogeneous Groups*

Students' perceived level of English proficiency	*n*	Pre-test score Mean	*SD*	Mean of contribution to CW1 (%)	*SD*	Mean of contribution to CW2 (%)	*SD*	Post-test score Mean (final)	*SD*
Pre-intermediate	27	52.14	7.28	22.29	19.22	24.26	18.95	61.22	5.22
Intermediate	36	61.66	4.75	26.97	19.99	28.52	22.01	70.11	4.06
Upper-inter.	22	70.45	3.93	60.81	25.38	55.00	24.67	79.22	3.26
Advanced	4	78.50	4.04	56.5	27.08	54.25	34.23	86.50	4.12

A one-way analysis of variance (ANOVA) test was used to analyze the mean scores of heterogeneous groups, and the Bonferroni Post Hoc Test to investigate significant differences between groups concerning their level of English proficiency to their contributions to CW tasks. The results of the ANOVA test are shown in Table 5.

Table 5 *Analysis of Variance of Heterogeneous Groups and Their Contributions in CW Tasks*

Score Contributions	Group Comparisons	*SS*	*df*	*MS*	*F*	Sig.
Text contribution in CW1* (%)	Between Groups	23185.68	3	7728.56	16.70	.00
	Within Groups	39332.87	85	462.74		
	Total	62518.56	88			
Text contribution in CW2* (%)	Between Groups	14904.69	3	4968.23	9.91	.00
	Within Groups	42610.91	85	501.30		
	Total	57515.60	88			
Post-test writing score*	Between Groups	5028.35	3	1676.12	91.15	.00
	Within Groups	1563.09	85	18.39		
	Total	6591.44	88			

Note. * The mean difference is significant at the .05 level

The one-way ANOVA test revealed significant differences ($p < .01$) between groups regarding percentage of text contribution in CW task 1, percentage of text contribution in CW task 2, and percentage of text contribution to students' post-test writing score. However, it was not possible to identify the particular differences between pairs or groups means that were significant. The Bonferroni Post Hoc Test was used to explore differences between multiple group means further, as it is a common post hoc test used with small sample sizes. The results are shown in Table 6 on the following page.

The post hoc comparisons using the Bonferroni test revealed significant differences in the average percentage of text contributions to CW tasks across the four groups. For example, the mean of percentage of text contributions in CW task 1 for students in upper-intermediate level ($M = 60.81$, $SD = 25.38$) was significantly different ($p < .01$) from the same mean for students in the pre-intermediate level ($M = 22.29$, $SD = 19.22$), and students in the intermediate level ($M = 26.97$, $SD = 19.99$). The mean of percentage of text contributions in CW 2 for students in upper-intermediate level ($M = 55.00$, $SD = 24.67$) was significantly different ($p < .01$) from the mean of percentage of text contributions in CW task 2 for students in the pre-intermediate level ($M = 24.26$, $SD = 18.95$), and students in the intermediate level ($M = 28.52$, $SD = 22.01$). Furthermore, the mean scores of the post-test for students across the four groups were significantly different. For example, the upper-intermediate students' writing mean score ($M = 79.22$, $SD = 3.26$) was significantly different ($p < .01$) from the pre-

intermediate students' score (*M* = 61.22, *SD* = 5.22), or the intermediate students' mean score (*M* = 70.11, *SD* = 4.06) was significantly different ($p < .01$) from the pre-intermediate students' mean score (*M* = 61.22; *SD* = 5.22).

Table 6 *Bonferroni Post HOC Tests: Multiple Comparisons between Groups*

Bonferroni Dependent Variable: Contribution %; Post-test writing score			Mean Diff. (I-J)	*SE*	Sig.	95% CI	
						Lower Bound	Upper Bound
Contributions in CW1 (%)	Pre-intermediate	Intermediate	-4.67	5.48	1.00	-19.47	10.12
		Upper-inter.	-38.52*	6.18	.00	-55.21	-21.83
		Advanced	-34.20*	11.52	.02	-65.34	-3.07
	Intermediate	Pre-intermediate	4.67	5.48	1.00	-10.12	19.47
		Upper-inter.	-33.84*	5.82	.00	-49.57	-18.12
		Advanced	-29.52	11.34	.07	-60.15	1.10
	Upper-intermediate	Pre-intermediate	38.52*	6.18	.00	21.83	55.21
		Intermediate	33.84*	5.82	.00	18.12	49.57
		Advanced	4.31	11.69	1.00	-27.27	35.90
	Advanced	Pre-intermediate	34.20*	11.52	.02	3.07	65.34
		Intermediate	29.52	11.34	.07	-1.10	60.15
		Upper-inter.	-4.31	11.69	1.00	-35.90	27.27
Contributions in CW2 (%)	Pre-intermediate	Intermediate	-4.26	5.70	1.00	-19.67	11.13
		Upper-inter.	-30.74*	6.43	.00	-48.11	-13.37
		Advanced	-29.99	12.00	.09	-62.40	2.41
	Intermediate	Pre-intermediate	4.26	5.70	1.00	-11.13	19.67
		Upper-inter.	-26.47*	6.06	.00	-42.84	-10.10
		Advanced	-25.72	11.80	.19	-57.60	6.16
	Upper-intermediate	Pre-intermediate	30.74*	6.43	.00	13.37	48.11
		Intermediate	26.47*	6.06	.00	10.10	42.84
		Advanced	0.75	12.17	1.00	-32.13	33.63
	Advanced	Pre-intermediate	29.99	12.00	.09	-2.41	62.40
		Intermediate	25.72	11.80	.19	-6.16	57.60
		Upper-inter.	-0.75	12.17	1.00	-33.63	32.13
Post-test writing score	Pre-intermediate	Intermediate	-8.88*	1.09	.00	-11.84	-5.94
		Upper-inter.	-18.00*	1.23	.00	-21.33	-14.68
		Advanced	-25.27*	2.30	.00	-31.48	-19.07
	Intermediate	Pre-intermediate	8.88*	1.09	.00	5.94	11.84
		Upper-inter.	-9.11*	1.16	.00	-12.25	-5.98
		Advanced	-16.38*	2.26	.00	-22.49	-10.28
	Upper-intermediate	Pre-intermediate	18.00*	1.23	.00	14.68	21.33
		Intermediate	9.11*	1.16	.00	5.98	12.25
		Advanced	-7.27*	2.33	.01	-13.57	-0.98
	Advanced	Pre-intermediate	25.27*	2.30	.00	19.07	31.48
		Intermediate	16.38*	2.26	.00	10.28	22.49
		Upper-inter.	7.27*	2.33	.01	0.98	13.57

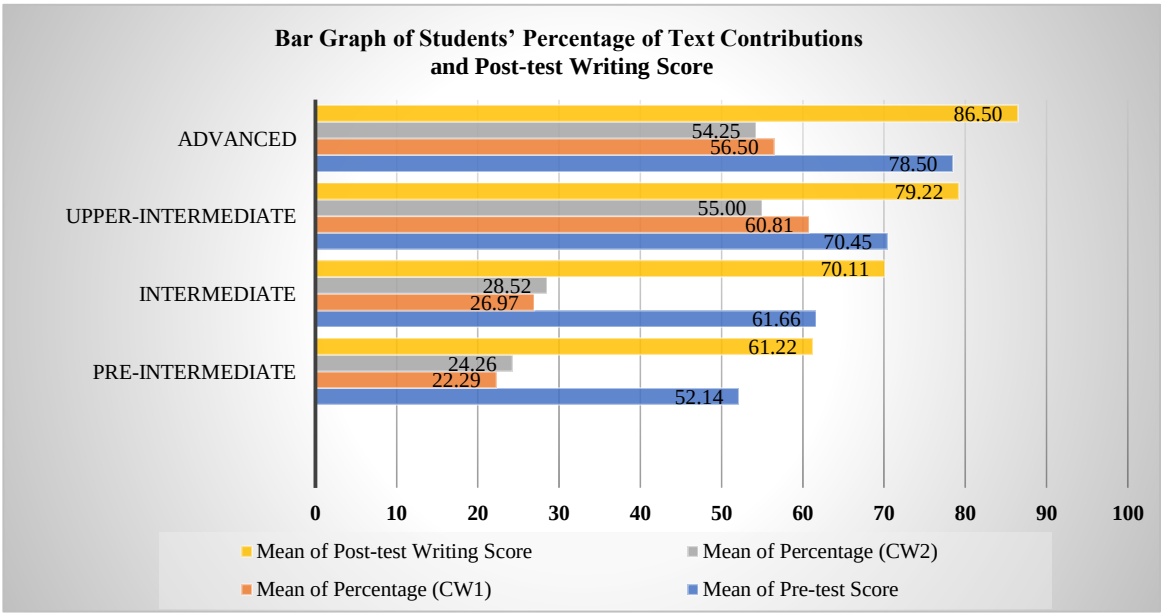
Note. *The mean difference is significant at the .05 level; CI = Confidence Interval.

The results suggest that students with a higher level of language proficiency contributed more texts during the CW processes and produced better writing quality in their post-test. This is further demonstrated in Figure 1 (please see next page), which shows the percentage of students' text contribution in the CW tasks and their pre-test and post-test writing scores.

It was found that students with higher language proficiency were the prominent authors who made significant contributions to their group essays. Their contributions to group tasks were

statistically more significant than their peers who possessed lower language proficiency. Hence, it can be posited that learners' language proficiency is a significant factor in collaborative projects as it shapes group members' CW behavior, contributions, and interactive efforts.

Figure 1 *Bar Graph of Students' Percentage of Text Contributions and Post-test Writing Score*



Discussion

The findings of this study revealed that students' text contributions while engaging in their CW essays positively influenced their post-test writing. In other words, the more students actively participated in the CW processes, the higher their writing scores, which has been reported in other studies (e.g., Bhowmik et al., 2018; Chen, 2019; Dobao, 2012). As illustrated by McDonough et al. (2019) and Chen (2019), students in a CW classroom may scaffold each other through negotiation, which introduces linguistic resources and ideas that can help improve their writing quality. This might be due to the experiences that students gain through knowledge internalization found in the process of writing (see also Qui & Lee, 2020).

Although this study demonstrated a positive effect of CW on students' essay writing, it is acknowledged that data was analyzed based on the 89 out of 115 students who contributed to both writing tasks, while the records of the other 26 who did not participate were not analyzed. Furthermore, the study followed a pre-experimental design in which data was collected from one group. As a result, it cannot be claimed fully that changes or improvements were the tangible outcomes of the intervention. To observe the effects of the treatment over a broader range, it would be necessary to increase experimental validity and reliability, and strengthen the assertions of research findings regarding CW in EFL classroom settings where learners were on different levels of linguistic ability. Future researchers may consider using both experimental and comparison groups.

Regarding the second research question: Among those with varied language proficiency levels, who contributes more texts during the CW processes? The findings align with previous studies (e.g., Bahar, 2003; Dobao, 2012; Kitjaroonchai & Suppasetseree, 2021a; Storch, 2013). These investigators found that students' language proficiency shaped the behavior of members in small group CW. Students with a good command of English were more proactive in producing texts. More capable language learners would direct their group in collaborative efforts to obtain a good grade. Prominent writers in CW tasks would express the overriding and competing goal of demonstrating their skills and knowledge in the topic being discussed (Li & Zhu, 2017). On some occasions, their control over group work impeded less capable peers from withdrawing from the team for fear of degrading the quality of group work.

Aside from language proficiency and individual goals, learners' roles and task type also play an essential role in learners' contribution towards CW tasks. Kukulska-Hulme (2004) reported that small groups would exhibit more collective contributions when the team had a relationship-focused leader who valued individual contributions. Effective collaboration needs a democratic leader who engages members in CW processes before reaching mutual agreement within the team. On the contrary, a team with a task-oriented leader who does not pay much attention to other members' contributions will result in low teamwork engagement. Moreover, instead of promoting collaboration, the members may develop negative attitudes toward group work if they experience unpleasant moments (Elabdali & Arnold, 2020; Kitjaroonchai & Suppasetseree, 2021b). Therefore, a successful CW team needs a proactive and supportive leader who can communicate effectively and build rapport to assist the members that need help with language issues (Li & Zhu, 2017). Furthermore, the types of tasks students collaborate could frame their contribution. Writing tasks on a familiar topic encourages team members to express ideas more spontaneously and in a more engaging manner. Yim (2017) asserted that when a familiar topic is assigned to small groups, group members would start to negotiate with each other and formulate ideas and share linguistic resources. Contrarily, an unfamiliar essay topic presented to team members would affect their collaboration, and individuals might abstain from participation due to lack of information (Aydin & Yildiz, 2014).

In sum, the course instructor in a CW classroom needs to provide guidelines to help students develop positive character traits, including stimuli to encourage learners to communicate with teammates in a friendly manner and be open-minded to support each other. A successful group must embrace different cultural values and personalities individuals hold (Storch, 2013; 2021).

Conclusions and Implications

Findings from this study revealed small groups' CW tasks had a positive effect on L2 writing skills. Students who contributed actively during the CW processes in both tasks could produce better writing quality and obtained higher scores in the final examination. The increase in post-test writing scores in the final examination was found at all language proficiency levels—pre-intermediate, intermediate, upper-intermediate, and advanced. The finding implies that knowledge collectively constructed and shared among group members can be absorbed and manipulated to support individual writing development (Liu et al., 2018). Even learners with less language ability who contributed little could still benefit from CW tasks when they were receptive and open-minded to receiving feedback or comments from more competent peers.

Some implications can be drawn from the present study data. The first implication is that writing instructors need to integrate CW tools, such as GD, or other collaborative platforms available in the modern day, to support group writing projects. A reason for this is these digital tools make it possible for learners to interact with each other freely across time, boundary, and distance. Additionally, collaboration reduces learners' anxiety and the achievement gap between high and low achievers; it further develops a sense of camaraderie and promotes engagement and productivity. On top of that, learners can develop interpersonal skills that are useful for future professionals when working with superintendents or colleagues from diverse cultural backgrounds.

The second implication is the usefulness of employing data visualization tools to monitor team collaboration behaviour. DocuViz was used in the present investigation. It is a data visualization tool that can automatically create a visual history bar chart across different timelines, indicating the how much work individuals contributed (Krishnan et al., 2018; Wang et al., 2015). It raises learners' awareness and allows an overseeing of their collaborative behaviour. The tool can boost productive collaboration among team members and minimize the free-rider problem if an individual contribution is considered to reward team performance. Based on the findings of this study, it is suggested that success in L2 writing involves:

- active participation in group writing
- positively engaging in interaction and negotiations
- cheerfully learning from knowledgeable peers who lend a helping hand to less-abled partners

Lastly, as diversity increases in the EFL classroom, writing instructors are challenged to become more conscious of cultural knowledge and practice norms. The increase in cultural diversity in the school provides opportunities for both teachers and students to develop cross-cultural communication skills and learn about each other's differences, practices, and values. Therefore, teachers need to consider the essence of cross-cultural collaboration by integrating technological tools available today to support CW and prepare students to build successful intercultural relationships, which is crucial in the workplace today. As known, diversity often brings with it considerable skills, talents, and broad experiences.

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