

Social Constructivist Approach to Web-Based EFL Learning: Collaboration, Motivation, and Perception on the Use of Google Docs

Sarah Hsueh-Jui Liu¹ and Yu-Ju Lan^{2*}

¹Department of Applied English, Kainan University, Taiwan // ²Department of Applied Chinese Language and Culture, National Taiwan Normal University, Taiwan // sarah.hjliu@gmail.com // yujulan@gmail.com

*Corresponding author

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ABSTRACT

This study reports on the differences in motivation, vocabulary gain, and perceptions on using or the Google Docs between individual and collaborative learning at a tertiary level. Two classes of English-as-a-Foreign Language (EFL) students were recruited and each class was randomly assigned into one of the two groups - individuals or collaborators. The results of the study are in line with those of previous studies in that the collaborators performed better than the individuals regarding vocabulary gain. The former was more likely than the latter to be motivated to acquire knowledge and to perceive the learning experience more positively. However, the results of this study suggest that, like many other Web 2.0 applications in support of peer scaffolding and knowledge co-construction, Google Docs plays a pivotal role in enhancing students' motivation and involvement.

Keywords

Web 2.0, Motivation, Web-based learning, English-as-a-foreign language

Introduction

Social influence is considered to have a significant impact on academic success (Schunk, 1999; Riese, Samara, & Lillejord, 2012). It postulates that if students are more able to maintain their social relationships with others in school, they are likely to perform better academically than those who are not. In second or foreign language (L2/FL) learning, there has been great interest among L2/FL researchers and educators in how learners interact with one another for knowledge co-construction or the negotiation of meaning in traditional face-to-face settings in order to enhance linguistic knowledge in the target language, e.g., Foster and Ohta (2005), and Dobao (2012; 2014).

Thanks to emerging technology or computer use for daily communication, e.g., emails and chats, socialization has inevitably become part of our everyday lives. In particular, the Internet has been one of the most important resources for strengthening students' learning experiences at the tertiary level (Lee & Tsai, 2011; Liu, Lan, & Ho, 2014); it potentially provides genuine communication to foster autonomous learning (McLoughlin & Lee, 2010). Such meaningful communication via the Internet for educational purposes has been widely researched in recent years, as it is believed that it engenders students' meaningful learning experiences and improves their motivation and engagement (Chu & Kennedy, 2011; Hwang, Wang, & Sharples, 2007; Cheng & Chau, 2013; Winke & Goertler, 2008; Cho & Kim, 2013; Razon, Turner, Johnson, Arsal, & Tenenbaum, 2012; Lan, 2014; Lee & Tsai, 2011; Cho & Jonassen, 2009). However, the relationship between motivation and collaborative learning in a specific context has remained under-explored in the conventional classroom setting (Järvelä, Volet, & Järvenoja, 2010) or in the web-based environment. Taken together, in this study, the main focus is on the impact of online text-based collaboration outside the classroom on the constructs (e.g., motivation and vocabulary gain) by examining the quantitative data of the questionnaire survey and the Google Docs log files.

Socially web-based learning in FL

Socially web-based tools have been increasingly adopted for L2 or FL learning. As such, online text chats are being utilized for examining modified interaction between less and more capable interlocutors in order for L2/FL development to occur. During a problem-solving task, a learner's non-target linguistic items that often cause misunderstanding or communication difficulty need to be corrected through employing a clarification request or comprehension check. Such corrected items provide the learner with linguistic input that learner may then use it to generate his/her output; it potentially pushes the learners' production (Yilmaz, 2011). In Collentine and Collentine's

(2013) study by adopting a corpus approach to examining learners' complex syntactic structures in Spanish in a SCMC setting, their results show that learners are likely to produce the target sentences (nominal clauses) to reply to their expert interlocutors. Their findings suggest that interaction taking place in SCMC can promote learners' syntactic knowledge in the target language. Supportive of negotiated interaction that leads to L2/FL development, Smith and Renaud (2013) have put it forward that due to network delay time that affords learners to have more time to process input and monitor their output. In their study, they employed eye-tracking technology to explore L2 learners' attention paid to lexical and grammatical features of the corrective feedback provided by their instructors during text chats. The way in which learners fixated on the target items had a great impact on their linguistic knowledge; learners who were likely to notice the linguistic items tended to acquire them. The results of their study suggest that the amount of eye fixation time significantly associated with the posttest scores (e.g., learners were asked to correct ungrammatical sentences), whereby those fixated items were more likely to be recalled by the participants compared to those which were not fixated.

Likewise, some other relevant studies provided positive results which web-based tools enhance particular knowledge attainment. Aydin and Yildiz (2014) examined whether their participants working collaboratively on writing tasks could improve the accuracy of grammatical structures in the Wikis. Due to the nature of asynchronous text chats under investigation in that study, learners were allowed to look through their chats at their disposal and more importantly to notice their linguistic errors or erroneous production; this may help them focus their attention on the linguistic aspects and might in turn improve their grammatical knowledge. In the same vein, Polat, Mancilla, and Mahalingappa (2013) examined whether L2 vocabulary attainment related to the asynchronous discussions among learners and their results reveal that those who participated in the discussion gained vocabulary knowledge significantly better than those who did not. Hence, it assumes that error correction occurs more frequently in the collaborators group than that in the individuals group as the former who attempt to understand others' messages are likely to correct or clarify meaning of the lexical errors in the production. This then will improve learners' lexical knowledge in the language.

Inspired by some other research studies investigating whether social mediation influences L2/FL knowledge through SCMC, the vocabulary knowledge gained by the individual learners and collaborators was examined in this present study. The vocabulary gain as a type of the knowledge in L2/FL refers to the outcome of learners' performance to be measured by the recall test (Kirschner, Paas, & Kirschner, 2009), based on the L2/FL vocabulary research studies (Türk & Erçetin, 2014; Liu, Lan, & Jenkins, 2014). As a lexical recognition knowledge test, it measured receptive vocabulary knowledge in terms of whether learners remembered or recognized the words from the reading passages which were adopted in this current investigation. As such, recall tests conducted after experiments or treatments are often adopted to determine the impact of SCM collaboration on knowledge attainment, see examples of these in Polat, et al. (2013) and Smith and Renaud (2013).

Socially web-based learning and social constructivism

Socially web-based learning underlines the notion of that "knowledge should be constructed from multiple resources of the student-led collaborative learning environment" (Gale, 2003, cited in Razon et al., 2012), meaning that knowledge is co-constructed by the individuals in a group through interacting with others; hence, the collaboration is highly emphasised in order to complete a given group project or task. Initially, collaboration denotes the concept "social constructivism" (Vygotsky, 1978), collaborative interaction between interlocutors to create meaning in a dialogue as a goal-directed activity between a speaker and a hearer (Lantolf & Pavlenko, 1995). The influence of collaboration on learning has highlighted that learning is assumed to be a socially mediated process (Zimmerman, 1989; Schunk, 1999; Pintrich, 2000). However, such a process appears multi-dimensional, involving a person's cognitive, motivational, and social aspects (Pintrich, 2000). In L2/FL, collaborative learning contributes to language knowledge (Storch, 2005; Kim, 2008) by means of developing critical thinking and problem-solving skills (Nyikos & Hashimoto, 1997), as it involves the affective feelings by group members showing their interest and encouragement during negotiated interaction (Foster & Ohta, 2005).

Some previous research has investigated writing processes and perceptions of Google Docs and suggests that learners support each other in terms of linguistic knowledge and strategy use leading to a positive perception of collaboration in the web-based environment (Kessler, Bikowski, & Boggs, 2012). Those results have been corroborated by other studies. For example, Kennedy and Miceli (2013) reported on that those working with others

tended to have more positive perceptions and greater appreciation of wikis, as they were more likely to feel connected to others or to feel a sense of community.

In addition to the social aspect, an underlying construct of motivation is often observed in L2/FL learning, referring to an individual's effort and desire to accomplish the goal in the target language, as well as favourable attitudes toward learning the language (Gardner, 1985). It is the driving force of the individual to initiate learning the target language and sustain the long, tedious learning process (Dörnyei, 1998). It implies that a motivated learner strives to learn the language in order to achieve a personal goal, such as to get a better grade or to get praise from parents, as considered to be an important factor that influences the achievement of L2/FL. To date, it has been examined in relation to whether use of the social web tools enables to enhance learners' motivation and interest in acquiring the language (Yang, 2011) or course knowledge (Razon et al., 2012). In Warschauer's (1996) study, compared with those in a traditional setting, learners not only have positive attitudes towards online discussions with their peers but also are able to produce more complex lexical items or sentences than those in a traditional setting due to feeling less stressed in an online environment. Supporting Warschauer's (1996) claims, Lee and Tsai (2011) found that those students who were more interested in Internet-based learning showed a higher level of perceived self-regulated ability than those who were not.

Together with some other relevant constructs affecting skill performance, it assumes that attitudes towards technological applications has an important impact on subsequent behaviour (e.g., investing time in given activities), that is, the amount of effort learners put into learning by sharing each other's annotations relates to the usage or evaluation of a given technology and reading achievement (Hwang et al., 2007). Such a claim is further supported by Ma and Kelly (2006) who examined a number of user actions by measuring the time spent on the program, given tasks, and so on. They found that the amount of time use on the program, words reviewed in the system, and scores obtained for the exercises, are associated with learning outcomes and learner evaluation. The amount of time spent on the Internet may have an impact on the learning experience as Lee and Tsai (2011) argue that students who spent more time on the Internet were likely to have a more positive perception of the aspects of self-regulated and collaborative learning in the environment.

This can be explained in that social interaction allows a group of students to understand or see from the new perspective of others, meaning that they are likely to engage in deep processing in learning (Tsai & Tsai, 2013) and to discover the ideas of others (Storch, 2005). This is due largely to the collaborative effort required to reduce the cognitive load given the limited capacity of the working memory to process information; in turn, group members are more capable of constructing higher quality schemata in their long-term memory and of supporting a positive effect on the in-depth learning of complex tasks (Kirschner et al., 2009). However, most current empirical studies have focused on L2 learning in general without looking at specific contexts. In addition, previous studies have mostly investigated the perceptions of students' motivation or engagement, but have overlooked their learning behaviour in the web-based environment. To sum up, little is known about the interrelationship between the factors that affect students' learning on the web. Hence, there is an emerging need to provide a better understanding of such related constructs in a specific learning context. That is, this study aims to investigate the impact of social collaboration on vocabulary gain and on the constructs of motivation and perception of the web-based learning environment by adopting sociocultural and cognitive theories.

Method

Participants

This study involved 65 EFL students recruited from the Department of Tourism and Transportation at the chosen university, including 32 (49%) male and 33 (51%) female students. All participants were regarded as being intermediate level students; their proficiency level in English was determined by the diagnostic placement test administered before they attended the compulsory English classes taking place on campus. Two intact classes of sophomore students were randomly assigned into the collaborators group ($N = 34$) and the individuals group ($N = 31$).

Instruments

Vocabulary pre-/posttests

The vocabulary pretest and posttest were an identical version of English vocabulary test instrument, see Appendix A; they were adopted to assess the participants' vocabulary knowledge prior to the experiment and the vocabulary gain after the experiment. The vocabulary test measured the participants' receptive vocabulary knowledge. It consisted of 40 target vocabulary words chosen from the learning materials, note that 6 or 8 vocabulary words were taken from each reading article, a total of six articles in the learning materials (see the discussion in the Reading Tasks section). The vocabulary test instrument was categorised into five dimensions: (1) 5 items for a matching test, in which words were provided to correspond to their similar meanings or words in English; (2) 5 items for a cloze test for a less-than-100 words long article; (3) 8 items that required matching up their similar meanings in English; (4) 12 items for a matching test with words' meanings in Chinese; and (5) 10 items for a cloze test, where students had to supply the meaning in Chinese of the target words underlined in the short reading text.

A paper-pencil questionnaire survey

The design of the questionnaire survey was partially adapted from Pintrich and de Groot (1990), Zimmerman (1989), Gardner (1985) and Liu, Lan, and Ho (2014), including two main sections: (1) questions relating to the demographic information of the participants, e.g., age, gender, and major; and (2) statements regarding two constructs of the perception of motivation and of using Google Docs. All items were rated on a five-point Likert scale, 1 = "strongly disagree," 5 = "strongly agree," with higher scores implying more positive perceptions. In the first construct, a total of 20 closed-ended items in Appendix B were divided into three sub-components: (1) 11 items for motivational beliefs, (2) 5 items for self-efficacy, and (3) 4 items for test anxiety. As a result, all the items of this study had a good internal consistency as shown by the Cronbach's Alpha coefficient value of .906.

The other construct regarding perception of learning on Google Docs, based on Davis (1989) and Liu, Lan, and Ho (2014), consisted of four sub-components with a total of 16 closed-ended items rated on a five-point Likert scale as stated in the preceding paragraph. Each sub-component subsumed 4 closed-ended items as shown in Appendix B. The first sub-component dealt with the effects of Google Docs on learning, the second was related to attitude towards learning on Google Docs, the third was concerned with ease of use, and the last was related to the extent to which the participants were engaged in the learning activities on Google Docs or whether they liked or disliked the learning tasks. All the closed-ended items were computed to test the internal consistency, and this resulted in a substantial value of Cronbach's Alpha, which was .941.

Reading tasks

There were six articles as the reading tasks made available on Google Docs over the eight-week out-of-class period. They were mainly short reading articles adapted from the participants' textbook (Stempleski, Morgan, & Douglas, 2011) and online resources. Each reading article was less than 300 words in length with accompanying three or five comprehension questions. There were 20 questions in total as shown in Table 1. For instance, the second reading article, "Eco-tourism" talking about types of activities that people undertake during an eco-tour, consisted of four questions, e.g., "What does this article talk about?"

Table 1. Contents of the reading articles on Google Docs

Topics	Contents	Post-reading questions
Cities	Relating to the cities that people live in and this helps students to get familiar with English vocabulary words, such as shops and places.	<ul style="list-style-type: none">• What is the main idea of this article?• What are the advantages and disadvantages living in cities?• Can you describe the city where you live? Do you like it? Why?
Eco-tourism	Describing what the eco-tourism is about and what types of activities people undertake	<ul style="list-style-type: none">• What does this article talk about?• Is it a good idea to take an eco-tour?• What types of activities does this article mention?

	during an eco-tour.	<ul style="list-style-type: none"> Do you prefer eco-tours or conventional tours? Why?
Personality	Regarding some positive and negative personalities of individuals, such as generous and selfish.	<ul style="list-style-type: none"> Please describe types of characters do people have in this article. What are positive and negative traits? Why? What types of personalities are you?
Movies	Talking about different movie types, including horror and action ones.	<ul style="list-style-type: none"> How many types of movies are mentioned in this short text? What does a remake movie mean? What kinds of movies do you prefer to watch? Why?
A memorandum	Concerning a message in relation to the HR policy that was sent to all supervisors of the company.	<ul style="list-style-type: none"> What does the memorandum intend to mean? According to this text, when will the new HR policy become effective? In this article, what employment benefits will new employees have?
Fast food	Talking about the impact of fast food on the health of people.	<ul style="list-style-type: none"> What does this article talk about? What are the advantages and disadvantages having fast food? According to this article, what are the most health issues when people have fast food? Do you like fast food? Why?

Google Docs and log data

Google Docs provides a number of tools similar to those in the Microsoft Office suite including spreadsheets, word processing, and presentations etc., allowing multiple users to edit or to work on the same document at the same time or at different times (Thomas, 2011), note that the participants of the present research were only allowed to use the word processor on Google Docs to complete the learning tasks. Revisions to a document are kept in the system making it possible for users to retrieve earlier versions; such an application is deemed to be useful for collaborative work or knowledge co-construction and for the enhancement of engagement among learners (Dekeyser & Watson, 2006; Thomas, 2011).

An example of the log files that recorded the revised texts done by the participants is illustrated in Figure 1, the top, showing the drop-down menu in Chinese, including “File,” “Edit,” “Format,” and etc. In the top right area, there are two main tools: the one on the left indicates an annotation tool while the one on the right allows users to share the same document. In this current study, the function of the sharing tool was activated in the group of collaborators whereas such a tool was not activated in the group of individuals.

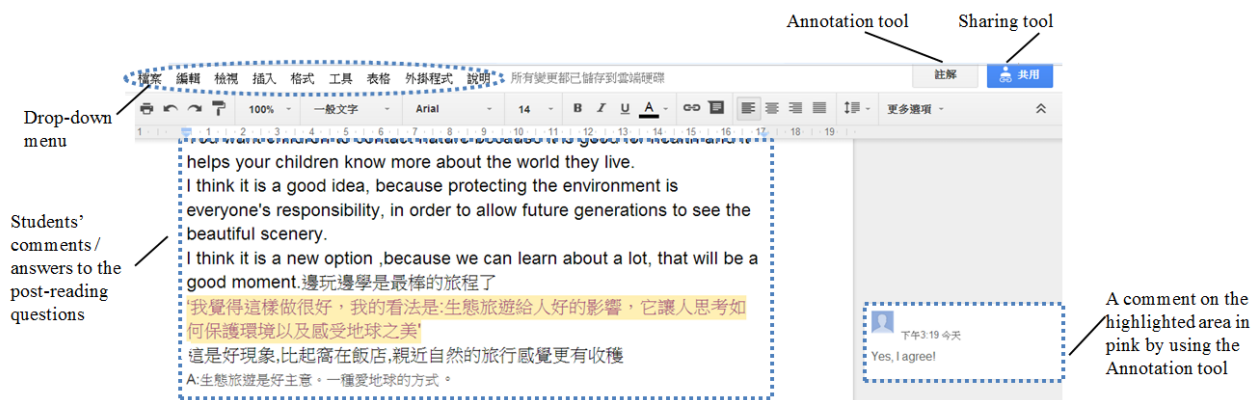


Figure 1. An example of the log file on Google Docs

In the above figure, the central area showed the students' revised work, which contained answers to the comprehension questions of the reading text.

Log data containing the text corpus regarding lexical items used by the collaborators and the individuals were further analysed. Three types of lexical errors identified in this current research were based on the classifications of Lyster (1998) and McDonough and Sunitham (2009). Type 1 referred to words with incorrect spellings “stomachach” and “supplier” in italics as shown in Table 2. Type 2 errors were misused words, for example, a learner was confused of the word “confirm” and “conform.” The last type was that expressions relating to the target words were not appropriate. Note that messages written in Chinese were eliminated.

Table 2. Types of lexical errors

	Types of errors
Type 1	“... people got <i>stomachach</i> because they eat too much junk food” “[McDonalds] ... a food <i>suplier</i> ...”
Type 2	“I’ll feel <i>scary</i> if I travel by myself.” “... the manager <i>conforms</i> the message that ...”
Type 3	“ <i>Probation periods will be observed the suitability and attitude...</i> ” “ <i>All the preservative used in our food, they reduce our resistance</i> ”

Repair initiation occurs when a learner’s production contains lexical or grammatical errors that hamper understanding of the intended meaning, where the interlocutors initiate negotiation by using comprehension or/and clarification checks. In Example 1, S25 was confused about “impulsive” and “compulsive” when she tried to describe her friend’s personality (in Task 3), where S21 not only employed a strategy (asking for help) but also gave a comment on the turn of S25. Finally, S24 provided the correct form “impulsive” to the misused word “compulsive” though she was unsure of the word usage as used a dictionary to help her check the word.

<Example 1>

S25: my best friend...when she goes shopping... because cannot control herself. She just buys a lot of things she doesn’t need, she is some kind compulsive
 S21: ... what’s compulsive? I think she’s too crazy.
 S24: maybe... impulsive? Let me check my dictionary.
 S24: it (dictionary) said... should be impulsive, do you guys agree?
 S25: I guess you’re right.

Research questions

- Are there any significant differences in the variables of vocabulary gain, motivation, and perception of web-based collaborative learning between the collaborators and the individuals?
- Do the collaborators have higher levels of engagement and participation in the web-based environment than do the individuals?

Procedure

The 8-week experiment was conducted to examine the effects of collaboration on the participants’ vocabulary gain by the collaborators and the individuals working in the web-based environment. In accordance with the data collection procedure, two classes were randomly assigned into the experimental (collaborators) and the control (individuals) groups. Note that the introductory sessions for two groups were arranged separately at the university computer lab. The vocabulary pretest was then administered to the participants, which they took about 20 minutes to complete. Following this, they were instructed to register for Google Docs accounts; the collaborators, who were sub-divided into ten small groups of 3 or 5, were allowed to edit and share the same documents, whereas the individuals worked on their own to edit or revise a given document. The learning materials were designed to be supplementary to the compulsory English class where the students and the researcher met once a week, two hours each time in a face-to-face classroom setting. In order to encourage the participants to accomplish the given tasks, they were informed that the completion of the work was worth 5% of their total grade for this course. It is worth noting that the teaching methods and materials used were identical for both groups of students in class.

There were six different learning materials in this experiment. However, in order not to overwhelm the participants with six learning activities given altogether at the same time, one learning material was uploaded onto Google Docs every nine or ten days. The vocabulary posttest and the questionnaire survey were administered to the groups in the last week and collected in the presence of the first author of this paper. The log data that recorded the changes to documents made by the participants were gathered at the end of the experiment and computed further for statistical analysis.

Results

Vocabulary gain

The first research question is to determine the difference between the groups in terms of the variables of vocabulary gains, levels of motivation, and perception of web-based collaborative learning. The vocabulary pre-/posttests were administered to the participants prior to and after the experiment. To determine the impact of collaborative learning on vocabulary knowledge, the independent samples *t*-tests was first used to test the difference in the mean scores of the vocabulary pretest between the groups. Results shown in Table 3 indicate that the participants' vocabulary knowledge did not differ significantly between the collaborators ($M = 21.94$, $SD = 7.64$) and the individuals ($M = 22.00$, $SD = 6.67$, $t(53) = .03$, $p > .05$, $r = .05$). The independent samples *t*-test was further used to test the difference in the mean score of the vocabulary posttest between the groups. Although the collaborators had a higher mean score ($M = 29.79$) than did the individuals ($M = 27.29$), the mean difference was non-significant between the collaborators ($SD = 7.37$) and the individuals ($SD = 7.92$, $t(62) = 1.26$, $p > .05$, $r = .16$).

Table 3. Results of the independent samples *t*-tests for vocabulary gain between the groups

	Collaborators		Individuals		<i>t</i>	<i>p</i>	Effect size (<i>r</i>)
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Pretest	21.94	7.64	22.00	6.67	0.03	.97	.05
Posttest	29.79	7.37	27.29	7.92	1.26	.21	.16

The above statistical results show that the difference in the pretest between the collaborators and the individuals was not significantly associated, which means that both groups' vocabulary knowledge was similar before they participated in the experiment. In the posttest, the two groups' vocabulary knowledge did not differ significantly ($p > .05$). Such results are in line with those found by Nassaji and Tian (2010) and Storch (2005). However, to have examined the difference in the mean scores of the pretest and the posttests within a group, the results suggest the mean score of each group reached a significance level ($p < .00$); the collaborators had gained more vocabulary knowledge than had the individuals as the mean difference 7.85 of the former group was greater than the mean difference 5.29 of the latter group.

Furthermore, the frequencies of lexical errors and repair initiations were calculated and compared between the collaborators and the individuals group. In Table 4, the former resulted in more lexical errors ($N = 78$) and more instances of repair initiation ($N = 42$). The frequency of repair initiations differed significantly ($p < .05$) between the collaborators ($N = 42$, 54%) and the individuals ($N = 1$, 5.9%). Of these, the collaborators group had more repair instances of Type 2 ($N = 37$) than those of Type 1 or 3, while Type 3 repair had resulted in zero repair instance. The individuals had only one repair instance of Type 1. The findings indicate a tendency that the collaborators were more likely to repair the lexical errors than were the individuals.

Table 4. Frequency of lexical errors and repair initiations

	Collaborators group		Individuals group	
	Repair initiation	Total errors	Repair initiation	Total errors
Type 1	19 (79%)	24 (100%)	1 (25%)	4 (100%)
Type 2	23 (62%)	37 (100%)	0 (0%)	6 (100%)
Type 3	0 / 0 (%)	17 (100%)	0 (0%)	7 (100%)
Total	42 / (54%)	78 (100%)	1 (5.9%)	17 (100%)

Motivation

The construct of motivation was measured by a questionnaire survey which contained 20 closed-ended questions rated on a 5-point Likert scale, with “1” indicating “strongly disagree” and “5” indicating “strongly agree.” In Table 5, the mean difference in the construct between the collaborators ($M = 3.76$, $SD = 9.35$) and the individuals ($M = 3.37$, $SD = 7.12$) reached a significance level [$t(53) = 2.17$, $p < .05$] with a small effect size ($r = .28$). The construct was sub-divided into three sub-components, namely, motivational beliefs, self-efficacy, and test anxiety. First, the collaborators had a higher level of motivational beliefs than did the individuals as shown by their respective mean scores of 3.69 and 3.36. The mean difference shown in Table 5 suggest that the level of motivational beliefs differed significantly between the groups [collaborators, $SD = 5.36$, individuals, $SD = 4.54$, $t(53) = 2.68$, $p < .01$] with a medium effect size ($r = .35$).

Similar to the first sub-component, the collaborators had a higher level of self-efficacy than did the individuals. The level of self-efficacy was significantly different between the groups, whereas the collaborators ($M = 3.88$, $SD = 2.67$) perceived themselves as more capable than did the individuals ($M = 3.45$, $SD = 2.73$, $t(53) = 2.90$, $p < .005$). This accounted for a medium effect size ($r = .37$). Finally, those who worked collaboratively had lower test anxiety ($M = 2.94$) than did those who worked individually ($M = 3.03$). The collaborators had a slightly lower degree of test anxiety than did the individuals, as the difference was non-significant between the two groups ($p > .05$). Nonetheless, the small effect size ($r = .13$) explains 1% of the total variance (Field, 2009).

Table 5. Results of the independent samples *t*-tests for the construct of motivation and its sub-components

	Collaborators		Individuals		<i>t</i>	<i>p</i>	Effect Size (<i>r</i>)
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Motivation	3.76	9.35	3.37	7.12	2.17	.042*	.28
Motivational beliefs	3.69	5.36	3.36	4.54	2.68	.010**	.35
Self-efficacy	3.88	2.67	3.45	2.73	2.90	.005**	.37
Test Anxiety	2.94	2.20	3.03	3.34	-.43	.668	.13

Note. * $p < .05$. ** $p < .01$. *** $p < .001$.

Web-based learning

The construct of the perception towards Google Docs learning was first tested to obtain the mean scores of the collaborators and the individuals. The results of “perception” (which represents “the perception of web-based learning”) shown in Table 6 suggest that the former group had a higher mean value ($M = 3.7$, $SD = 11.17$) than did the latter group ($M = 3.2$, $SD = 11.59$) as the mean difference reached a significance level [$t(57) = 2.79$, $p < .007$]. This accounted for a medium effect size ($r = .34$). Moreover, this construct was comprised of four sub-components, e.g., “effects” (which represents “effects of Google Docs on learning”) and “attitudes.” Overall, the mean scores of collaborators’ perceptions for the sub-components appear to be more positive than those of individuals; the highest mean value ($M = 3.9$) was loaded in “ease of use,” indicating that the collaborators more frequently agreed that Google Docs was easy to use than did the individuals ($M = 3.1$). This is followed by the “task design,” which represented the learning activities on Google Docs; the collaborators ($M = 3.6$) found the learning activities more interesting and useful than did the individuals ($M = 3.1$).

The independent-samples *t*-tests was used to compare the mean scores of the four sub-components between the collaborators and the individuals. The statistical results in Table 6 show that apart from the first component “effects,” the mean scores of the three sub-components differed significantly between the groups as the significance values were between .010 and .000. Initially, the collaborators had a higher mean score as stated previously ($M = 3.9$, $SD = 2.01$) in the “ease of use” compared to the individuals ($M = 3.1$, $SD = 1.81$, $t(51) = 3.81$, $p < .00$), and this resulted in a medium effect size ($r = .47$). However, it is worth mentioning that although the mean scores of the “effects” were not significant between the groups, the sub-component had a noticeable effect size ($r = .25$) whose value was greater than the small effect size ($r = .10$).

To answer the second research question regarding the difference in engagement and participation between the groups, the number of attempts made by the groups was calculated; the collaborators group had 87 attempts in total, indicating that each participant had 2.56 trials on average whilst the individuals had 22 in total, meaning that each

participant had less than 1 trial. In Table 7, the differences in the mean scores between the groups were then computed using the independent samples *t*-tests. As a result, the mean scores of the collaborators group ($M = 2.56$, $SD = 3.86$) and the individuals group [$M = .71$, $SD = 1.46$, $t(63) = 2.51$, $r = .30$] were different at a significance level ($p < .015$) with a medium-effect size value.

Table 6. Results of the independent samples *t*-tests for the construct of perception of web-based learning and its subcomponents

	Collaborators		Individuals		<i>t</i>	<i>p</i>	Effect size (<i>r</i>)
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Perception	3.7	11.17	3.2	11.59	2.79	.007**	.34
Effects	3.5	2.52	3.2	2.54	1.89	.064	.25
Attitudes	3.5	2.30	3.2	2.60	2.67	.010**	.33
Ease of use	3.9	2.01	3.1	1.81	3.81	.000***	.47
Task design	3.6	2.60	3.1	2.87	2.72	.009**	.34

Note. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 7. Results of the independent samples *t*-tests for the attempts by the groups

	Collaborators		Individuals		<i>t</i>	<i>p</i>	<i>r</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Attempts	2.56	3.86	.71	1.46	2.51	.015*	.30

Note. * $p < .05$. ** $p < .01$. *** $p < .001$.

The above results indicate that collaborators made more attempts than did individuals. In particular, the difference in the number of attempts between the groups had yielded a statistically significant association ($p < .05$). However, the mean values (2.56 and 0.71) were divided by 8 weeks to see students' participation every week; this gave mean values of 0.32 for the collaborators and 0.08 for the individuals, indicating a low rate of both groups' participation. Overall, with these analyses, the collaborators were more actively engaged in the given tasks than were the individuals. To further compare the trials made by the groups over the eight-week period, a graph chart was generated (see Figure 2).

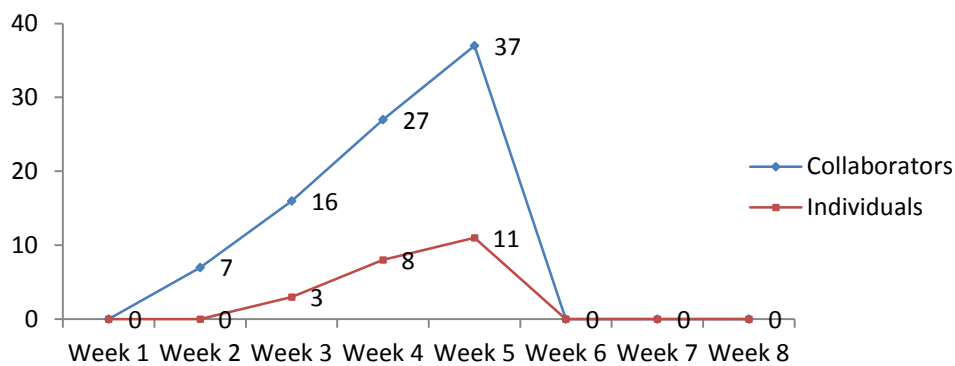


Figure 2. Number of attempts on a weekly basis

In the above chart, the frequency patterns of the two groups were quite similar, in that the two lines gradually rose after the first week but fell drastically after the sixth week. Particularly, the contributions made by all the participants reached the peak level in Week 5, resulting in 37 trials in the collaborators group and 11 trials in the individuals group. The results suggest that the former participated in the vocabulary learning tasks more often than did the latter during the eight-week experiment; both groups made more contributions in the middle of the experiment than in the initial and final weeks.

Discussion

This study examined the experience of collaborative and individual learning in relation to the dimensions of vocabulary gain, motivation and the perception of web-based learning. First, the findings of this study as derived

from the statistical analyses in the preceding section confirm that, compared with the individuals group, the collaborators group was found to have a better vocabulary gain in the posttest. The lexical knowledge gain was further examined by looking into the text corpus of the learners and the results indicate a significant difference in the error repair instances between the groups. Results such as these align with those found in Hwang et al. (2007). It can be explained that although the collaborators had more lexical errors, they had more repair instances and this is assumed to have their lexical knowledge enhanced through negotiated interaction between the collaborators. Second, the collaborators had higher levels of motivational beliefs and self-efficacy and a lower level of test anxiety, as well as a more positive perception towards learning on Google Docs. Apart from the “test anxiety,” all the sub-components differed significantly between the groups ($p < .05$). To some extent, results such as these corroborate some previous studies found in traditional settings, e.g., Pintrich and De Groot (1990), and in web-based environments, e.g., Lee and Tsai (2011).

Regarding the vocabulary knowledge gain which did not differ significantly by the two groups, among many other possible explanations, there are two main ones which may help explain such results. First, it might be attributed to the insufficient period of experiment undertaken to demonstrate the effect of treatment on the lexical knowledge development. Second, according to the study by Kirschner et al. (2009), their findings suggest that due to the limitations of working memory group learners were likely to perform better in the transfer test whereas the individual learners tended to do better in the retention test. With that assumption, the pre-/posttest that this study adopted were retention rather than transfer tests which required the participants’ working memory (remembering linguistic discrete items); thus, the difference in vocabulary gain cannot be distinguished between the collaborators and the individuals group. These findings, hence, suggest investigating further by utilizing different types of tasks, such as using vocabulary recall tests and textual inference tests altogether, to compare the knowledge gain between individual and group learners. In addition, the sub-component “test anxiety” was unlikely to play a pivotal role in influencing both groups of students’ perception of using the web tool collaboratively and individually though the collaborators group appeared to have a slightly lower level of test anxiety than did the individuals group.

Moreover, the results also reveal that the collaborators were participating more actively in the web learning than were the individuals, whereby more students in the collaborators group than in the individuals group practiced the learning activities and this resulted in a significant difference in the attempts between the individuals and the collaborators. Such an assumption is in support of findings regarding social mediation derived from the relevant literature and previous investigations, suggesting that an individual’s cognitive ability and social competence affect his or her learning outcomes or academic performance, e.g., Nokelainen et al. (2005), John-Steiner and Mahn (1996).

As Figure 2 shows, the number of attempts that the participants made indicated the participation or engagement in learning in the web-based environment as it demonstrates that both groups had a low rate of participation as each student in both groups had less than 1 attempt every week, compared with the study by Lee (2012), who reported that each participant in that study posted 3.36 online messages every week and students posted more messages on the due-date, the last day for posting messages. Such students’ learning tendency in that study happened in this study as the participants of this current study practiced the learning tasks on Google Docs more frequently in weeks 4 and 5 than in any other week due to the final exam of the course they undertook, which took place at the end of June, which happened to be in week 5 of the experiment. Hence, the two groups of students were motivated extrinsically rather than intrinsically to study the given learning materials although the collaborators group had a higher level of motivation than did the individuals groups. This can be explained in that students in both groups, as intermediate EFL learners, had a similar level of proficiency in English as well as motivation. Despite this, compared with the individuals, the collaborators made more efforts and contributions to learning during the 8-week experiment, e.g., attempts of using Google Docs. This seems to be consistent with the findings of some other studies, such as Razon et al. (2012), which claim that collaboration influences the behaviour of the collaborators, including motivational resources and participation.

Conclusion

This study set out to examine the participants’ learning experience in the web-based environment by adopting the sociocultural theory that social mediation affects students’ learning and perceptions of the constructs (e.g., motivation). The present study is inherently limited by the small sample size as it lacks generalizability to the population. This is further confined to the analyses of quantitative data, such as statistics. That is, the log files

collected from the use of Google Docs, which contained language usage by the participants, merit further investigation in order to track whether they improve the lexical or grammatical knowledge in English over time. Furthermore, further research is needed to look at online collaboration qualitatively, in terms of how learners interact with each other during problem-solving tasks or whether the interaction has some impact on the knowledge gain. Finally, the present study has some pedagogical implications: collaborative learning needs to be implemented in classroom settings by a means of designed learning activities as the learners may transfer the learning behaviour to new environments. Among many other benefits, students will be more capable of thinking critically if they work collaboratively rather than working individually. Hence, it is suggested that usage of the web-based applications has an important role to play when learners are out of the classroom as it promotes collaborative learning which will in turn increase learners' motivation and engagement in learning.

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Appendix A

Vocabulary pretest and posttest (Adapted from Stempleski, Morgan, & Douglas, 2011)

Vocabulary test

A. Match each word in the box with its meaning.

skip	expire	gym	chief	work out
------	--------	-----	-------	----------

- | | |
|----------------------|-------------------|
| 1. health club _____ | 2. main _____ |
| 3. terminate _____ | 4. exercise _____ |
| 5. miss _____ | |

B. Read the short text and complete the information with the words in the box.

messy	laid back	selfish	reserved	bright
-------	-----------	---------	----------	--------

Jessica and Joan are sisters and they are friendly. Although they are very _____ (intelligent), they are very different. Jessica is very organized as she knows where everything is in her apartment. Someday, she wants to own her company. Joan is very careful with her money. In fact, she's a little bit _____ - sometimes she doesn't like to share. Jessica is somewhat _____. She has two or three close friends and doesn't go out a lot. Joan's apartment is kind of _____: there are dirty dishes in the sink and magazines all over the floor. Joan enjoys her job and she has a very _____ (relaxed) attitude about life and work.

C. Select each word that best describes its meaning in English.

- | | |
|----------------|---|
| 1. talent | |
| 2. ability | <input type="checkbox"/> take a chance |
| 3. contest | <input type="checkbox"/> short performance |
| 4. audition | <input type="checkbox"/> new ideas |
| 5. appear | <input type="checkbox"/> not public |
| 6. risky | <input type="checkbox"/> competition |
| 7. achievement | <input type="checkbox"/> accomplishment |
| 8. creative | <input type="checkbox"/> without thinking carefully |
| 9. private | <input type="checkbox"/> show up |
| 10. impulsive | |

D. Select each word that best describes its meaning in Chinese.

- | | |
|----------------|-------------------------------|
| 1. preserve | <input type="checkbox"/> 緊急事件 |
| 2. probation | <input type="checkbox"/> 肌肉發達 |
| 3. employee | <input type="checkbox"/> 肥胖 |
| 4. muscular | <input type="checkbox"/> 適用期 |
| 5. scared | <input type="checkbox"/> 保留 |
| 6. emergency | <input type="checkbox"/> 簡漏 |
| 7. stomachache | <input type="checkbox"/> 發燒 |
| 8. rough it | <input type="checkbox"/> 優質的 |
| 9. obesity | <input type="checkbox"/> 經銷權 |
| 10. gourmet | <input type="checkbox"/> 員工 |
| 11. fever | <input type="checkbox"/> 胃痛 |
| 12. franchise | <input type="checkbox"/> 害怕 |

E. Read the short text and choose the best meaning that describes the text.

The movie *Shutter*

In this (1) hit from Thailand, Tun, a (2) photographer, and his girlfriend, Jane, are driving home on a lonely (3) country road one night. Suddenly, they see a girl in the road.

This movie was a (4) remake of a Thai movie with the same name. It was first (5) released in the United States and Canada. The (6) critics thought it would (7) flop, but it did well and made over \$45 million (8) worldwide.

The main (9) characters are Jane and her husband, Ben. They move to Tokyo for Ben's new job. One night, they are in a car accident on a country road. They (10) hit a young girl and drive into a tree. When they wake up, they look for the girl but they can't find her. Was the girl really there?

- | | | | | |
|-----------|---------|---------|--------|----------|
| 1. _____ | a. 撞 | b. 拍 | c. 打 | d. 電影 |
| 2. _____ | a. 探險家 | b. 攝影師 | c. 科學家 | d. 哲學家 |
| 3. _____ | a. 鄉村小道 | b. 高速公路 | c. 省道 | d. 政府建的路 |
| 4. _____ | a. 翻拍 | b. 重做 | c. 製造 | d. 電影 |
| 5. _____ | a. 釋放 | b. 主角 | c. 上演 | d. 電影 |
| 6. _____ | a. 導演 | b. 影評 | c. 演員 | d. 觀眾 |
| 7. _____ | a. 賣座 | b. 不賣座 | c. 表演 | d. 公演 |
| 8. _____ | a. 地區 | b. 全世界 | c. 美洲 | d. 歐洲 |
| 9. _____ | a. 攝影師 | b. 導演 | c. 觀眾 | d. 演員 |
| 10. _____ | a. 打 | b. 撞 | c. 拍 | d. 看見 |

Appendix B

Questionnaire survey

Motivation

Items

Motivational beliefs

I like learning new things from a learning task.
What I am learning about this course is important for me.
I like doing English tasks.
I like explaining to others about what I know.
I think that better English skills will help me to get a better job.
I enjoy doing English tasks by myself.
I accomplish tasks without looking at the answers first.
I like brainstorming for English practice tasks.
I like to take challenging English tasks.
I'll get a good grade.
People will respect me if I'm good at this subject.

Self-efficacy

Compared with others, I think I'm a good student.
I think that I can do well in this class.
I know a great deal about this course.
I am confident in English learning.
I have good study skills.

Test Anxiety

I am upset about the questions that I cannot answer during a test.
I am feeling uneasy and upset before taking a test.
When taking a test, I tend to think about how poorly I am doing.
I tend to worry about tests before taking one.

Perception of learning on Google Docs

Items

Effects of Google Docs on English learning

Google Docs is an effective tool for learning English.
Google Docs helps me English learning tasks effectively.
Google Docs is an effective tool for learning English.
I think that using Google Docs has a great impact on English learning.

Attitude

Google Docs helps me accomplish my English tasks.
Using Google Docs increases my English ability.
I like to use Google Docs for learning.
I like using Google Docs.

Ease of use

Google Docs is easy to use.
I find it easy to use Google Docs after I was first taught how to.
I became familiar with Google Docs by learning how to use it
It is easy to remember how to use Google Docs

Learning tasks

Learning tasks increase my interest in learning English
Learning activities improve my English ability.
Learning activities are helpful for learning English.
Learning tasks are helpful for increasing knowledge in English.
