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Online interaction, emotions, and EFL learners' grit in collaborative writing

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This case study addresses both online interaction and the EFL students' emotions and grit in a collaborative writing project. While benefits of collaborative writing are confirmed in the literature, little is known about learners' diversified emotions and L2 grit in the process, and the connections between interactions and their affective changes. Via a ten-week online collaborative writing project, two groups ($n=6$) out of 24 students provided peer feedback and worked together on their collective drafts. An emotion questionnaire and a grit questionnaire elicited the participants' responses with their posts on emotions. Both groups showed much more positive emotions which may stimulate their motivation for task accomplishment with improved writing performance over time. The two groups demonstrated slight variations on interaction dynamics with mutuality or equality in active participation associated with their perseverance and interest on the writing tasks. Our study is among the first that examined both interactions and grit and emotions in online collaborative writing and shows success in two cases. The collaborative task design provides a chance for mutual scaffolding among peers. Future studies can design online collaborative writing tasks aiming to benefit EFL students' writing performance while fostering positive feelings and more grit.

Keywords: L2 grit, emotions, collaborative writing, online interaction

Introduction

Due to the Covid-19 pandemic leading to global lockdown, both schools and workplaces have increasingly encouraged online learning or work-from-home. With advanced technological development, online communication tools such

as Google Documents, Line, and Facebook have been used in collaborative writing to promote the benefits of text improvement (e.g., Abrams, 2019), task accomplishment (Balaman & Sert, 2017), development of interactional competence (Abe, 2020; Balaman & Sert, 2017), or mutual support among participants (Cho, 2017). Important factors identified in collaborative writing (Li, 2018; Storch, 2019) lie in writing products, process, and second language (L2) learners' perceptions where their emotions and grit play crucial roles.

L2 learners' affective factors such as "grit" or emotions are important for learning effectiveness; however, both are insufficiently documented in the literature except earlier efforts on anxiety. Diversified English-as-a-foreign (EFL) learners' emotions are suggested to be highly related to their learning performance (Sampson, 2020; Sampson & Yoshida, 2021; Yoshida, 2022). Educational psychologists also call for new research agenda of affective factors such as positive psychology to help L2 learners (Macintyre et al., 2019). Positive emotions are closely related to students' learning motivation (Sampson, 2020; Sampson & Yoshida, 2021; Yoshida, 2022). Recent literature of L2 learners' personality trait, second language grit (Alamer, 2022; Lan et al., 2021; Cheng, 2021; Teimouri et al., 2022; Wei et al., 2020) shows its immediate relevance to language learning. As a general education construct, grit is defined as "a combination of perseverance and passion for long-term goals" (Teimouri et al., 2022, p. 893). While it is believed that L2 learners' sustained efforts and passion are closely related to their achievements, little of their grit level has been examined when they engage in online collaborative writing. More research on learners' grit is called for to understand online collaborative writing.

A significant relationship between online interactions of EFL learners and their emotions has been supported in the literature (Sampson & Yoshida, 2021; Yoshida, 2020). Limited prior research has examined L2 learners' grit and emotions in online collaborative writing although the two affective factors are important for successful collaboration. There is thus an urgent need for English teachers and researchers to invest more on the diversity of language learners' emotions and grit. The current study aimed to investigate EFL learners' interactions in online collaborative writing and identify their diverse emotions and grit during the writing process via a case study approach. A case study allows close examination of L2 online collaborative writing process and relevant factors in detail.

Literature review

Research strands of online collaborative writing and L2 grit and emotions are reviewed to support the current study.

Online interactions in collaborative writing

Storch (2019) reviewed empirical studies on face-to-face and online collaborative writing published from 1994 to 2017, and highlights variables under three dimensions: (A) interaction/writing process, (B) writing products/outcome, and

(C) students' perceptions. Li's review (2018) of 21 articles on L2 online collaborative writing published from 2008 to 2017 also identifies findings under the same three dimensions. Similarly, in another review of 34 studies published from 2009 to 2019, Zhang and Zou (2021) found positive effects on learners' joint writing qualities and their perceptions. They also endorse the advantage of online collaborative writing in boosting motivation and confidence and making the learning process enjoyable.

In the following, relevant individual studies are discussed as updates of the reviews above and support of the current study. Pai (2009) compared 14 EFL students' use of either asynchronous Google Documents or synchronous chats for writing revisions. She adopted Mendonça and Johnson's seven categories of negotiations (1994) to code the function of online peer feedback and found different functions in either the asynchronous or synchronous mode. Using a single-participant case study, Abe (2020) found that the changes in online interactional practices rely on a learner's ability to manage the asynchronous temporality of online talk as well as the timing of joining the task-based interaction. Abe (2021), examining three learners in online collaborative writing, found the learners mainly made announcements on the assigned topic, requested correction from others, and commented with cohesive devices on the essay during their interactions.

Designing with a group leader for two focal groups, Selcuk et al. (2021) found that the ability to plan their group writing task, the willingness to give their group member feedbacks and comments on others' writings, giving praises and motivational phrases, and writing technique supports were the key factors to make a good group leader. Furthermore, learners' self-confidence and motivation increased when they received praise or motivational phrases from the group leader. Cho (2017) compared three ESL learners writing collaboratively via either text-chat or video-chat. Mutuality and equality (Damon & Phelps, 1989) were adopted to identify the interaction patterns under the two modes. More clearly defined later in Elabdali and Arnold (2020), equality means "[L]earners' contributions to and control over tasks" (p. 1) and mutuality, "the reciprocity of the interaction" (p. 1). The mode of communication (using text- or video-chat) was an influencer of interactions since video-chat provided a more instant and direct way of communication compared to text-chat. With German learners who were writing in groups, Abrams (2019) found that more collaborated groups performed better in output quantity, content and coherence. The more a group engaged in tasks, the more output a group generated to create more meaning-making actions.

Many learning opportunities of online collaborative writing are maintained (Abrams, 2019; Balaman & Sert, 2017; Cho, 2017; Storch, 2019). Collaborative patterns of online interaction and factors explaining interactions may contribute to joint writing quality (Abrams, 2019) and students' perceptions about having effective group leaders (Selcuk et al., 2021). Successful interactions among collaborated peers resulted in better writing quality (Abrams, 2019). Other positive collaborative writing outcome includes task accomplishment as well as organizational aspects and cohesive ties in the writing (Abe, 2020;

Abrams, 2019; Balaman & Sert, 2017). These studies suggested that it is important to investigate online collaborative writing with multiple methods and data sources, and in a longer period of observation time (Abe, 2020; Abrams, 2019; Balaman & Sert, 2017).

L2 grit and emotions

L2 grit has recently attracted attention from several researchers (Alamer, 2022; Chen Hsieh & Lee, 2021; Cheng, 2021; Lan et al., 2021; Teimouri et al., 2022; Wei et al., 2020). Grit is composed of perseverance of effort and consistency of interest, and originally used for general education. To validate a 9-item questionnaire for L2 grit specifically, Teimouri et al. (2022) examined the effectiveness of grit, and its relationships with motivation, emotions, and language achievement. With data of 191 participants, they found that intended effort, L2 WTC (willingness to communicate), and attention were positively related to grit, which was positively related to joy, and negatively related to anxiety. Between two constructs under grit, perseverance of effort with five items, compared with consistency of interest (4 items), was a strong indicator of students' language measurement. Cheng (2021) found that perseverance of effort has a stronger predictive power over their learners' WTC, compared with consistency of interest. In another study, grit was found to mediate the relationship between ideal L2 self and WTC (Lan et al., 2021). Further, the link between ideal L2 self and grit was found to be moderated by shyness. To fine-tune the consistency of interest under the L2 grit scale, Alamer (2022) conducted a study and found that the autonomous single language interest can better predict L2 achievement than language-unrelated interests. Similarly, the L2 grit questionnaire was verified by data of Chinese EFL learners (Wei et al., 2020) as the findings of Teimouri et al. were established using Iranian EFL learners. Chen Hsieh and Lee (2021) reported a robot-assisted story telling study and found that students' story telling performance is strongly and positively associated with grit. While there is growing interest in L2 grit and language learning, diversified findings and validation of research instruments point to needs of examining grit in other L2 tasks and learning contexts.

To track down EFL students' diverse emotions in a classroom-based study, Sampson (2020) identified six causes for those emotions: classroom activities, other student, L2 identity, transportable identities, the teacher, and lessons. He found seven positive emotions (sense of achievement, enjoyment, gratitude, interest, admiration, excitement, surprise) and three negative ones (disappointment, sense of difficulty, and anxiety). Yoshida (2020) examined both the positive and negative emotional changes of Japanese learners in a tele-collaborative project. Enjoyment appeared the most often as positive emotion, while a sense of difficulty or frustration appeared as negative emotion. Learners' emotions were found constantly changing during the process, and both emotions could happen simultaneously. Sampson and Yoshida (2021) in another telecollaborative study found mixed emotions. The effect of online L2 text exchange

provided a more positive connection with students' own L2 self, and enjoyment was affected by the communication contexts.

Focusing on various types of regulation as related to learners' emotions, Zhang et al. (2021) examined six students using WeChat. Much enjoyment emerged during the learning process with constantly changing emotions. Socially shared regulation was the most common way to be applied. Chen Hsieh (2021) investigated robot-assisted and Power Point-assisted mode on EFL students' storytelling outcome and their emotions. With results from a PANAS emotion questionnaire (Ebesutani et al., 2012), the experiment group was found to experience more positive emotions and less negative emotions than the control group.

The design of classroom activities and peers' participation may stimulate positive emotions as found in the reviewed studies (e.g., Sampson, 2020), or resulting from use of technological tools (Chen Hsieh, 2021; Sampson & Yoshida, 2021; Yoshida, 2022; Zhang et al., 2021) for online collaborative learning. Among others, these studies highlight enjoyment, a motivating effect so does Chen Hsieh (2021) implementing robots for oral presentation. Language learning motivations seem to have a close link to positive emotions.

Motivation of the current study and research questions

Initial findings on L2 learners' grit and emotions were pointed out by limited studies (Chen Hsieh, in press; Sampson, 2020; Sampson & Yoshida, 2021; Yoshida, 2022). In the online learning contexts, various factors may impact learner interactions leading to various collaboration outcomes. Most prior research has focused on EFL learners' cognitive abilities in online collaborative writing, leaving affective factors such as grit and emotions untapped (Aparicio et al., 2017). While L2 grit and emotions are vital in triggering student engagement and boosting motivation, the interplay among interactions, grit and emotions in the context of online collaborative writing remains largely unexplored. Thus, more research is needed to uncover EFL learners' kinds of emotions and their grit in their collaborative writing process. The purpose of this case study is to investigate the interaction patterns while students of small groups worked on collaborative writing tasks online, and also to examine their grit and emotions in the process. A case study approach is adopted because it allows close examination of L2 learners' grit, emotions, and writing outcome in the collaborative writing process in detail. Two research questions guided our research:

1. How does the use of online discussion for writing affect EFL learners' joint writing process and outcome?
2. How is the interplay among L2 grit, emotions and interactions in the collaborative writing context? How does group interaction influence emotions and grit?

Participants

The present study recruited six focal participants out of a class of 24 EFL students (M=9, F=15) who were first-year undergraduate students from a university in Taiwan, where their first language was Chinese. Before they started the project, they signed a consent form. All the students were taking a 2-credit required writing course and were divided into 3-member groups of eight at the beginning of the project. Course assignments were designed on a process-based approach where three essay assignments were required to have three drafts for each assignment through revision and polish. All the students received a short training session before they started the teamwork designed in the course. Students formed a group out of their will by choosing their own members; thus, their English writing proficiency was not controlled under the case study design. Two groups out of the entire class were selected and closely analyzed as they provided complete data sets for our study. All six target participants in the two chosen groups were female forming Group A (Rae, Angel, and Jane) and Group B (Vanessa, Winnie, and Jessie, all pseudonyms). The course instructor made classroom-based assessment on all essay drafts mainly on clarity of meaning and accuracy of language in addition to the prompt given for each draft. Based on those criteria, she gave a holistic score out of 100.0 on each draft. Another instructor with a similar background to the current course instructor was involved to provide another score following similar criteria and rating methods. Final grades were averaged with inter-rater reliability (Cronbach's alpha coefficient) provided.

Instructional design

To examine students' groups' discussions, and their grit and emotions during the online collaborative writing, two writing assignments with three drafts in ten weeks were designed via peer interactions for participants to learn to write: exemplification and narration. After uploading drafts of exemplification, the participants used an online discussion forum to give peer comments. For narrative essays, they in groups used Google Documents (plus its online chat) to complete their first two drafts in a computer lab as it allowed collaboration and co-editing synchronously. Due to their limited English proficiency to interact and compose within a two-period class, the students were allowed to interact in their first language, Chinese.

In the first essay task, students worked on their draft 1 at home, posted it online, and then received peer (from one member of their 3-student group) and the classroom instructor's comments as well as a grade. Then, they worked on the second draft before they received feedback from two sources again, followed by the instructor's grading. Last, they worked out the third draft and obtained feedback from the same two sources. At the end, the instructor gave a final grade.

In the second essay task, participants used Google Documents to compose

the first and second drafts and chatted in Chinese with group members in the lab. They obtained feedback from another group and the instructor on their first drafts. As students indicated they were not satisfied with the quality of the first draft being an in-class timed piece, the instructor held grading till the second draft. The data collection ended after they collaborated to complete the second draft in the computer lab. The third essay task was designed as the first task, but their data were not included for analysis due to the large volume of posts and chats. Questionnaire responses were included in the two focal groups over the semester, as was the third draft of the second task.

Research instruments

An L2 grit questionnaire adopted from Teimouri et al. (2022, their Appendix 1, p. 916), and a PANAS emotion questionnaire (Chen Hsieh, 2021; Ebesutani et al., 2012) were used as the research instruments. The L2 grit questionnaire had nine items made up of two constructs: perseverance of effort (item 1, 3, 5, 6 & 9) and consistency of interest (item 2, 4, 7, & 8, see below for illustrated items). The participants responded to the nine items on the Likert 5-point scale (1 means “not like me at all”, and 5 “very much like me”). For interpretation of results, those for the consistency of interest are opposite, that is 5 meant “not like me at all.” Items 1 and 4 are illustrated below.

1. I am a diligent English language learner (perseverance of effort).
4. I think I have lost my interests in learning English (consistency of interest).

For participants to show their emotions, the 10-item PANAS questionnaire (Chen Hsieh, 2021) was adopted (positive emotions: “Happy, Cheerful, Proud, Joyful, and Lively”; negative emotions: “Sad, Scared, Miserable, Afraid, and Mad”) on a 5-point Likert scale. To respond with “1” meant “not much or not at all” and 5 “a lot.” At the end of the questionnaire, there was an open-ended section which allowed participants to express their emotions in their own words. This served as the last post in the project.

Self-reports were commonly used in studies of learners’ emotions (Dewaele, 2013), useful to investigate kinds of emotions and their intensity. In addition to giving feedback through four posts soon after they finished each draft, our participants were asked to write three posts to keep track of participants’ experiences and their emotions on the interactions and collaboration. Two of them were given after they finished the first essay assignment, and the last post was the open-ended part of the PANAS questionnaire.

Data collection and analysis procedures

During the ten weeks of the writing course, data was collected through asynchronous posts, essay drafts and their scores (from two raters), two-round chat records in Google Documents from the six focal participants, and responses of two questionnaires from the 24 students in the class as benchmarking.

Besides word counts of the six participants' interactions and emotions (quantity measures of 7 posts and 2 chats), we coded the function of the interaction content and emotions they used to understand what they did with all those words in the discussions. For interaction coding, each sentence in the four posts and each turn in chats were coded with one function. Table 1 shows the coding scheme of interaction functions adopted from Pai (2009, originally from Mendonça & Johnson, 1994) and the example taken from our study. They originally had seven functions to describe their data. After the coding of our own data, we adjusted them and devised a coding scheme of 11 functions as shown in Appendix A by adding four functions (the original "evaluation" function was divided into positive and negative, and three new functions of "Observation, Comment and Response" were added). When we coded the six participants' emotions in their three posts, four of the ten emotions in the PANAS questionnaire did not appear but the other five major emotions (with a frequency equal or higher than three times) emerged. Thus, the coding scheme with seven positive emotions and four negative ones (11 kinds altogether) is listed in Appendix B with the example taken from the current study.

The coding process worked as follows: the second author coded all the data sources, and about one sixth of the coding results were randomly chosen and double-checked by the first author using the same coding schemes. The average disagreement rate across all posts and two-round chats was 2.0% (the total disagreed functions between the two authors divided by the total functions and emotions checked by them). A final discussion between the two coders led to the confirmed results.

Results and discussion

Writing outcome

To investigate the six students' writing outcomes, their word counts, and the writing scores were analyzed. In both groups, the average word counts for each draft increased gradually from 215.5 to 268.0 words between two essays. Over time, they all wrote longer across drafts mostly. With an inter-rater reliability of 0.89, the average writing scores of the two groups were not much of a difference. Yet, the scores rose gradually as their experiences in writing increased over time. Both groups had clear progress in their writing quality (from 76.7 to 84.5 points/100.0) regarding the lengths and scores of the six participants' writing outcome in the ten-week project.

Quantity and functions of online interactions

As for students' interactions, the word counts of the four posts for asynchronous discussion and the Chinese word counts of two-round chats in Google Documents for synchronous chats were calculated.

The lengths of posts from the six students fluctuated due to responses to different drafts. The total word count of Group B (1158 words, 96.5/per draft

on average) was slightly more than that of Group A (1092 words, 91.0). In the average word counts of chats, the length of Group A (1241.5 words) was four times longer than that of Group B (282.5 words). While the interaction amount of Group B in the asynchronous posts slightly exceeded that of Group A's (1158 vs. 1092 words), Group A talked much more in synchronous chats. Overall, both groups were similarly active in the asynchronous interaction mode, while Group A was far more active in the synchronous interaction mode.

Table 1 shows the results of the interactions coded in the posts with the numbers of the functions, and the percentage of them out of the total as coding of the two groups' data yielded different totals. Those codes which did not appear in the posts were not shown as the scheme covered functions of both posts and chats.

Table 1. Functions of the interaction coded from posts

	Q	E	S	EV+	EV-	G	Ob	CM	O	Total
Group A	0	6	15	11	2	4	28	11	0	77
	0.0%	7.8%	19.5%	14.3%	2.6%	5.2%	36.4%	14.3%	0.0%	
Group B	1	12	19	25	2	3	17	6	1	86
	1.2%	14.0%	22.1%	29.1%	2.3%	3.5%	19.8%	7.0%	1.2%	

The top three functions for both groups are suggestions, positive evaluations, and observation (in Group A, the comment function yielded equal percentage as positive evaluation) with variations of specific ranks. To fulfill the "observation" or "suggestion" function (rank 1 of Group A) in doing peer reviews, both groups pointed out certain text-related aspects before they commented on other areas or did positive evaluation. Such phenomena showed that they were very much on-task, focusing on giving feedback to their peer's drafts. That is, they were deeply engaging in collaborating to accomplish the tasks. As for giving evaluations, the use of "positive evaluation" (14.3%/29.1%) in both groups exceeded those of "negative evaluation" (2.6%/2.3%). Both groups provided more positive feedback toward their peers than negative ones while commenting on the group member's drafts. Via an asynchronous mode, the functions of "chat" were rarely used in their posts.

When we compared the functions the two groups used, Group B generated more varieties of functions (all 9 kinds) than Group A (they yielded 0 in 2 cells). We noted that Group B produced more words, and the top function is positive evaluation (29.1% of all), followed by "suggestion" (22.1%) and "observation" (19.8%). In doing positive evaluations, Group B gave praise and motivational phrases in their peer feedback (such as "*Overall, I consider the draft is pretty good.*") and these may raise the group members' self-confidence and motivation (Selcuk et al., 2021).

Table 2 shows the results of the interactions coded in the two-round chats while the students were writing an essay collaboratively as a group to brainstorm ideas for the first drafts. In the second-round chat, they worked together

to revise the first draft after receiving feedback from another group. Students were adding more details to the first drafts completed in round 1, correcting some grammatical mistakes and taking some of the advice given by the teachers or classmates.

Table 2. Functions of interactions coded from chats

Round 1	Q	E	S	G	C	CM	R	O	Total
Group A	23	6	22	2	3	9	28	12	105
	21.9%	5.7%	21.0%	1.9%	2.9%	8.6%	26.7%	11.4%	
Group B	13	0	21	0	2	6	13	0	55
	23.6%	0.0%	38.2%	0.0%	3.6%	10.9%	23.6%	0.0%	

Round 2	Q	E	S	EV+	G	C	Ob	CM	R	O	Total
Group A	24	3	7	1	4	9	4	16	16	4	88
	27.3%	3.4%	8.0%	1.1%	4.5%	10.2%	4.5%	18.2%	18.2%	4.5%	
Group B	16	1	5	0	0	6	1	8	9	1	47
	34.0%	2.1%	10.6%	0.0%	0.0%	12.8%	2.1%	17.0%	19.1%	2.1%	

As can be seen in Table 2, both groups yielded top three functions similarly in the first-round chat: questions, suggestions, and responses. In the second-round chat, suggestions dropped, replaced by comments, but the other two stayed. While writing an essay collaboratively with group members, communicating with others about the content of the essay via raising questions, giving suggestions or responses was the main contents of the chats. Taken the two-round chats together, “questions” appeared more frequently in both groups, when compared with those in the posts. This feature highlights the synchronous temporality of online talk where involved members can respond immediately to questions raised by another, compared with asynchronous posts where “questions” rarely appeared (see Table 1).

To sum up, during the synchronous Google Docs writing, the interactions between both groups in the two chats were mainly made up with asking questions and giving and receiving responses and suggestions. When we compared total words of chats between the two groups, Group A talked much more (1241.5 vs. 282.5 Chinese words) with much more functions coded and more varieties than Group B (who yielded 0 in 5 cells of the two chat rounds). Group A seemed to be more engaging by generating more output when they collaborated on the second essay task using the synchronous mode for communication. In other words, Group A may be more collaborative in the synchronous mode.

L2 grit and emotions

In order to examine students’ grit and emotions, the grit questionnaire and the PANAS questionnaire were given to all the twenty-four students in the class. Three post assignments were devoted for students to write on their emotions. The class result of the grit questionnaire (n=24) showed that the average of the

whole class' perseverance of effort is 3.20 (out of 5.00) and consistency of interest is 2.36 (1 shows the most interest, while 5 suggests no interest at all). Most of the students agreed with that "I am a diligent English learner" and "nothing can stop them from making progress in learning English" (Q1 & 6); therefore, these two were ranked on the first place (3.33). The last rank was "losing interest in learning English" (Q4) with the lowest score 2.00 (for "not much like me"). This shows that the students maintained consistent interest in English learning during the ten-week project. Compared with the result of the entire class, Group A in our study showed more perseverance as well as interest in learning English (3.60, 2.17) than Group B (3.20, 2.50). The differences should be taken with caution as no statistical analysis was conducted given the nature of the case study with six participants involved.

In the PANAS questionnaire (tapping 10 kinds of emotions), the average rating of positive emotions of the class (3.70 out of 5.00) was more than twice as much as that of negative emotions (1.79). Our top five ranked emotions were all positive ones out of ten kinds. The top three rankings were feeling Happy (3.92), Cheerful (3.83), and Joyful (3.71). As for negative ones, feeling Afraid (1.92) was the most frequent negative feeling, while Mad (1.54), the lowest.

Another window to understand the two groups' emotions was in their posts. Coding results of the two groups' posts for their emotions in Table 3 show that the positive emotions were 26 instances, and the negative emotions were ten. While both positive emotions and negative emotions appeared and co-existed, the total number of positive emotion instances were more than double that of negative ones, being evenly distributed among the six participants.

Table 3. Numbers of the coded emotions from posts

		Group A	Group B
Positive emotions	Happy	2	5
	Cheerful	0	1
	Proud	3	0
	Joyful	1	1
	Thankful	5	2
	Sense of accomplishment	3	0
	Motivated	0	3
Totals of each group		14	12
Totals of 2 groups		26	
Negative emotions	Sad	0	1
	Afraid	1	0
	Lack of confidence	1	4
	Confused	1	2
Totals of each group		3	7
Totals of 2 groups		10	

Altogether, we found 11 kinds of emotions with seven positive and four negative emotion types, compared with the range of 7 to 10 kinds found in previous

studies (Sampson, 2020; Sampson & Yoshida, 2021; Yoshida, 2020). The frequency of feeling “happy” and “thankful” were ranked on the top of all emotions. Both groups show thankfulness toward mostly their peers, or toward the teacher or the teaching assistants. They expressed their gratitude toward their peers for correcting grammar, providing ideas, and helping themselves with the writing. Feeling motivated was also highlighted as they meanwhile experienced a sense of achievements and being proud by their accomplishments of completing English essays.

Between-group differences

Some between-group differences were highlighted via qualitative analyses. While the numerical evidence supports more positive emotions than negative ones in our participants, they did show some occasional negative emotions through posts. The frequency of “lack of writing skills” was ranked on top of all the negative emotions as illustrated below.

When I write the essay, I feel a little bit unconfident and frustrated. Because I am bad at writing the essay, I think my essay is too colloquial and I am not sure whether my sentence structure and grammar are all correct. And it always took me a while to finish it. (from the 6th post, Group A, Angel, errors uncorrected)

To connect such anxiety with limited writing expression being EFL first-year college students, Rae in Group A used fixed phrases repeatedly when giving feedbacks to their peers in the asynchronous mode (see one member’s example in Appendix C with interactions coded in context), while each of the members from Group B had their own writing styles without resorting to fixed phrases.

In the synchronous mode, there seemed to be a leader and two supporters guiding their peers and completing the essay in Group A. The leader suggested and generated the main direction of the essay, and the supporters then added details, gave opinions on the main thesis, and sometimes asked questions for clarification. The leader (Angel) also provided other suggestions: grammatical suggestions, the usage of words, and the structure of the essay, etc. Even though there was an apparent leader in Group A, all the members helped each other, and answered questions when necessary. In other words, the peer leadership approach is promising in supporting student’s self-efficacy and self-regulation in learning (Selcuk et al., 2021). Having higher mutuality and equality, Group A exhibited collaborative interaction with a clear group leader, but Group B did not have one and only tried to get the online tasks completed. They seemed to work hard only to complete the assignment, which was particularly evident synchronous mode.

Comparisons and contrasts of the two groups were made in Table 4 to provide a closer look at group similarities and differences during their collaborative writing process.

Table 4. Comparisons and contrasts of two groups

	Group A	Group B
Amount of interaction (in posts and in chats)	similar amount of posts/ much more chats	similar amount of posts/ less chats
Function of posts	same function of interaction/ fewer function varieties	same function of interaction/ more function varieties
Function of chats	same major functions/more function varieties	same major functions/fewer function varieties
Roles in the group chats	having a leader	no leader
Mode of mutuality and equality	high mutuality and equality	got tasks done
Grit	more perseverance and higher interest	less perseverance and interest
Emotions	More positive emotions	More positive emotions

While both groups showed more positive emotions than negative ones, Group A had higher perseverance of effort and consistency of interest in English learning. With a group leader, Group A seemed to show more mutuality and equality than Group B. While interacting online, Group A may be more collaborative with those features and they thus generated more chats and created more meaning-making actions to contribute to their writing task (Abrams, 2019).

Discussion

Influence of collaborative writing on jointly writing process and outcome

In both groups, the average word counts for each draft increased gradually and between two essays while collaborating online. Over time, they both wrote longer across drafts. Their scores across drafts also rose gradually as their experiences in writing increased over time. Both groups had clear progress in their writing quality regarding the lengths and scores of the participants’ writing outcome in the ten-week project.

While the interaction amount of Group B in the asynchronous posts slightly exceeded that of Group A in the first essay task, Group A talked four times more in synchronous chats in the second essay task. That is, both groups were similarly active in the asynchronous interaction mode, but Group A was far more active in the synchronous chatting mode. What they did with posts or chats could be revealed from their functional coding. Concerning the posts in two groups, Group B commented on drafts using more words and thus generated more functional varieties with three top functions: positive evaluations, suggestions, and observations. As for chats, Group A talked four times more than Group B, with more functional varieties on raising questions, giving responses, and offering comments or suggestions. It seems that Group A on the synchronous chat mode became much more engaging in the writing tasks with active collaboration in order to fulfill the task goal.

In the synchronous mode, there seemed to be a leader and two supporters

guiding their peers and completing the essay in Group A. The leader suggested and generated the main direction of the essay, and the supporters then added details, gave opinions on the main thesis, and sometimes asked questions for clarification. All the members helped each other and answered questions when necessary. The peer leadership approach is promising in supporting student's self-efficacy and self-regulation in learning (Selcuk et al., 2021). Having higher mutuality and equality, Group A showed their collaborative interaction with a clear group leader but Group B did not have a clear leader while trying to get the writing task done.

Most of the six focal students indicated that they had benefitted a lot from the collaborative writing process and experienced positive influences in their posts. With on-task discussion and a great variety of coded functions in their interactions, we also found that there was a gradual growth in their essay scores with completion of the two writing tasks successfully and mutual scaffolding from their peers (Abe, 2020; Li, 2018; Storch, 2019).

Overall, we found that composing via collaborative writing provided more online learning opportunities for our six participants asynchronously and synchronously like prior research (Abe, 2020; Li, 2018; Pai, 2009; Storch, 2019). Collaborative writing led both groups to produce more words in their writing outcome (Abrams, 2019) and synchronous or asynchronous on-task interactions over time. Analysis of interaction functions with more word counts and more function varieties reflected their on-task collaborative discussion as the participants seldom digressed from their writing purposes and tasks. While the interactions within the two groups were slightly different, both groups were able to complete the two writing tasks together via scaffolding and collaborating with their peers in different ways. Being able to submit essay drafts and posts on time shows their learner autonomy. All these findings support their overtime engagement in this online collaborative writing project. To sum up, online collaborative writing as designed in our study improved students' writing skills and created positive influences among learners via conducive L2 learning opportunities.

Influence of collaborative writing on grit and emotions

The six students indicated that they experienced diversified emotions in the ten-week project with co-existence of both negative and positive kinds: four kinds of negative emotions and seven kinds of positive emotions like great varieties of emotions in previous studies (Chen Hsieh, 2021; Chen Hsieh & Lee, 2021; Sampson, 2020; Sampson & Yoshida, 2021; Yoshida, 2022). Our students rated being "happy" and "thankful" on the top of all emotions. Classroom activities, the teacher, and other students were among causes for these positive emotions (Sampson, 2020). Students showed a lot of gratitude/thankfulness to their peers while completing our designed online collaborative tasks. They showed much more positive emotions toward their peers, the teacher, and the teaching assistants. Triggering of positive emotions may be related to their perseverance of effort and interest in learning to write English. Some pointed out

that feeling “proud” about their writing had an impact on their confidence to continue the passion for English learning, which suggested that positive emotions are connected to students’ consistency of interest and perseverance of effort. Feeling motivated was also highlighted as they meanwhile experienced a sense of achievements and being proud by their accomplishments of completing English essays.

On the other hand, the frequency of “lack of writing skills” was ranked on top of all the negative emotions. Probably feeling anxious in writing, one member in Group A used fixed phrases repeatedly when giving feedback to their peers in the asynchronous mode. Still, the higher quantity of positive emotions and their kinds supports the fact that the participants mostly had positive experiences in this online collaborative writing project.

With more positive emotions in our study, the six students were found to become motivated for English writing in the collaborative writing process like previous studies (Chen Hsieh & Lee, in press; Sampson & Yoshida, 2021). Their boosted motivation may trigger their perseverance of efforts and interest in learning English writing as assessed in their grit questionnaire and contribute to mutuality and equality of their online interaction processes and improve writing outcome in the ten-week project.

Conclusion

Our study is among the first studies that examined both interaction processes and functions of discussions, and the EFL learners’ affective factors of L2 grit and emotions while doing online collaborative writing over ten weeks. The six focal participants in two groups wrote longer with slightly higher scores in the project. Most of the six focal participants acknowledged the benefits of having received peer comments for their essay improvement and felt a sense of achievement and pride when they could accomplish English essays compared with their performance in high school. Mutuality and equality of contributions (Elabdali & Arnold, 2020; Storch, 2013) were found in both groups while they had variations. Learner autonomy is confirmed as they have benefitted from giving and receiving feedback for better writing performance and encouraging members along the project.

While the two groups were active in different modes, they were able to finish the goal of the tasks (completing two essays collaboratively) and benefited from the two online writing modes. Besides, one group presented more grit in learning English than the whole class, and the two groups shared similar numbers and kinds of positive emotions and less negative emotions. The present study provides a comprehensive analysis of the focal students’ synchronous and asynchronous interactions, grit, and emotions in the collaborative writing project. The positive outcome may come from the design of the collaborative tasks and their peers’ feedback in the interaction process.

Limitations of the study

While we meant to highlight the interplay of grit and emotions as well as online discussion of EFL learners via a case study approach of detailed analyses of various data sources in their collaborative writing processes, the number of six participants, all female, in two groups was small. The gender balance and size of sample prevents our findings from being broadly generalized to other EFL contexts. Additionally, while data of online discussions and group interactions and emotions were collected over ten weeks, the L2 grit level was only measured once in this project so its changes were unable to be documented. Future research can address these issues.

Pedagogical implications

Our study suggests some implications for teachers and researchers. First, via a process-oriented writing approach with three essay drafts, the students can make improvement over drafts by including peer feedback, teacher feedback, and moral support. The design of online collaborative writing tasks provides students a chance for mutual scaffolding among peers (Sampson & Yoshida, 2021). In other words, the task design in the current study and peer support in the process foster the students' positive emotions, which in turn may trigger their perseverance and passion for learning to write. Designing multi-draft tasks plus online collaborative tasks in ten weeks makes a longer-term collaborative writing project a feasible and encouraging approach for college EFL writing.

Second, as shown in the two focal group's interaction styles in synchronous vs. asynchronous collaborative modes, they performed differently between the two modes concerning the amount of discussion and functional varieties. Future studies can design collaborative writing via asynchronous as well as synchronous modes in order to benefit different EFL students while fostering positive emotions and more grit.

Our design of online collaborative writing tasks provides students a chance for mutual scaffolding among peers. Teachers or researchers can learn from our writing task design or explore similar collaborative writing activities while fostering students' grit and positive emotions in other contexts.

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Coding scheme of interactions

Types of feedback	Definitions	Examples
1. Question (shortened as Q)	Peers request for further information or clarification on certain points. This request can be either an explicit question or a statement saying that something is unclear.	DF: The last late, means late for school or what?Chat: 開頭要怎麼開始? 以第一人稱還是第三人稱(English translation from Chinese) <i>How should we start? From the first person or the third person perspective?</i>
2. Explanation (E)	Peers explain an unclear point, an opinion, or the content of the essay.	DF: You have to notice whether your sentence clearly explain what it means [suggestion], and "Yet he isn't really into study, it's because he was in the gifted class [explanation]."Chat: 我們怎麼知道有沒有跟別組重複(How could we know if we overlap with the other groups?) [question] / 我的意思是說也選生日的那組 [explanation](What I meant is the group who chose to write on "birthday".)
3. Suggestion (S)	Peers suggest ways to change words, sentences, content, and organization of essays.	DF: And in the last paragraph, I think you can add your feeling while riding the bicycle and recall that incident Chat: 開頭可以用suddenly (<i>In the beginning, we can use "suddenly".</i>)
4. Evaluation (Positive) EV+	Peers provide subjective opinions toward the essays, including compliments.	DF: Overall, I consider the draft is pretty good.Chat: 助教說很棒~~~~/ 讚讚 (<i>Our teaching assistant said it is good. Great!</i>)
5. Evaluation (Negative) EV-	Peers provide subjective opinions toward the essays, including criticizing negatively.	DF: It seems to me that this essay still has room to grow.Chat: NA
6. Grammar (G)	Peers identify or correct a grammatical structure in essays	DF: Hence, I sincerely suggest that the author can double check the sentence structures, including the verb tense and the words meaning, before submitting the final file.Chat: 因為前面沒有名詞 所以聚首不用放連接詞and (<i>Because there is no noun before it, we do not need a conjunction.</i>)
7. Chat (C)	Peers chat on things unrelated to the essay or revision, such as greeting or off-task chats.	DF: NACHat: 好好笑 (<i>It was very funny.</i>)
8. Observation (Ob)	Peers state or repeat a peer's comment.	DF: According to Jane's article, first of all, I think she is focus on the quality of the person.Chat: 然後評論的部分,他們是寫說要我們描述多點她的朋友是如何準備這個驚喜的 (<i>For their comments, they were writing to suggest that we add more details about how her friends prepared the surprise.</i>)
9. Comment (CM)	something that students say or write that expresses their opinion	DF: Keep going! Chat: 第一段感覺已經都差不多了(<i>I feel our first paragraph is almost done.</i>)
10. Response (R)	Peers' feedback toward their peers' question or request	DF: NACHat: 我們沒有topic sentence 嗎? (<i>Don't we have a topic sentence?</i>) [question] / 目前看起來沒有(<i>None, for now.</i>) [response]

Note: NA means “not applicable in either chats or posts”. Errors in the examples were not corrected.

Appendix B

Coding scheme of L2 emotional instances

Types	Definitions	Examples
Positive Affect (PA)		
Happy	feeling, showing, or causing pleasure or satisfaction	I am <i>happy</i> to participate in this composition exercise.
Cheerful	feeling positive and pleasant	In my opinion, I think the process of writing and revising the article with my group members is <i>cheerful</i> .
Proud	feeling pleasure and satisfaction because you or people connected with you have done or got something good	In my opinion, the major feeling I have had about this ten-weeks-project is <i>proud</i> .
Joyful	Feeling very happy	I feel that writing an essay isn't difficult and also feel <i>joyful</i> in this class.
Thankful	feeling grateful because of something	I really feel <i>thankful</i> for them.
Sense of accomplishment	feeling something that is successful, or that is achieved after a lot of work or effort	After completing the first writing assignment, I had a <i>sense of accomplishment</i> .
Motivated	feeling very enthusiastic or determined because you really want to do something	In addition, my partner not only pointed out the problem of the essay but also gave me encouragement, it lets me have more <i>motivation</i> to write the essay.
Negative Affect (NA)		
Sad	feeling unhappy because of an expectation that one will miss something	When I received her [peers'] comments, I was <i>sad</i> at first.
Afraid	feeling fear, or feeling worry about the possible results of a particular situation	I'm <i>afraid</i> that I can't keep up with everyone.
Lack of confidence due to weak writing skills, etc.	feeling not good at something	Reading through her writing I felt <i>no confident</i> , yet I can't give her my opinion, because everything looks wonderful.
Confused	Feeling unable to think clearly or to understand something	I sometimes feel confused when my group member types her feedback to me. She gives me some suggestions, but that suggestion can't focus on the quality of that person.

Note: errors in the examples were not corrected.



Feedback patterns from Rae, Group A.

2nd post	According to Jane’s article, first of all, I think she is focus on the quality of the person [observation]. She typed her classmate is very a materialism person, he always wear new things, such as clothes, shoes and cellphone [observation]. On top of that, I consider she can tell us some his classmate’ family, such as economic status and family relations [suggestion]. That is can explore whether his family makes his character [explanation]. Finally, I really like to her typed “Happiness consists in contentment.” This is the truth. [evaluation, p]
3rd post	According to Jane’s article, first of all, I think she has a topic sentence.... On top of that, she also does the example truly show the person quality.
4th post	According to Jane’s essay, she still has some things to improve[observation]. First of all, there are some words missing in her sentence[grammar]

Note: mistakes were not corrected.