Online collaborative writing in an online EFL writing class

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Abstract

Most learners of English as a Foreign Language (EFL) consider writing a challenging task, and they experience difficulties such as organizing thoughts, selecting relevant words to represent their views, and producing rhetorical patterns specific to the target culture. Research into L2 writing suggests that collaboration in the classroom can assist students to set goals, generate ideas, write and edit, and reflect on the task. The effects of collaboration in online classes, however, remain unknown. This quasi-experimental study aims to examine the effect of online collaborative writing (OCW) in an online EFL writing class on students' writing performance in terms of syntactic complexity, lexical complexity, and fluency. A four-week OCW intervention was carried out with 26 university students enrolled in an online English writing course at A2 level in the Common European Framework of Reference for Languages (CEFR). Data were collected using writing tasks administered as pre- and post-tests. Fluency, syntactic and lexical complexity were measured and analyzed across tasks. The results showed that OCW in an online EFL writing course improved the lexical complexity and fluency of the writings of students with an A2 level of English proficiency but had no effect on their syntactic complexity. Based on the findings, it is possible to conclude that OCW can be employed to promote students' writing performance in online EFL classes.

Keywords: English as a Foreign Language, Collaborative writing, Fluency, Lexical complexity, Online collaborative writing, Syntactic complexity, Writing

Introduction

Writing is an essential skill for efficient communication in both the first language (L1) and the second language (L2). Most English as a Foreign Language (EFL) learners consider writing as a challenging task because they lack the linguistic and lexical resources as well as the experience to translate their thoughts into effective compositions in their L2 (DeKeyser, 2007). According to Hyland (2003), while expert writers are concerned with setting goals, generating ideas, and reflecting on the task, novice writers are more

concerned with creating content than planning and editing. This line of thought suggests that EFL writers who have limited language proficiency and experience in academic writing, namely novice writers, may find producing written texts in the target language even more challenging. Collaborative writing (CW), defined as "the co-authoring of a text" (Storch, 2019), can be used to enable novice writers to cope with issues including idea generation, planning, writing and editing in an interactive manner. The CW process will allow learners to discover new ways of communicating their thoughts by sharing ideas with their peers.

Previous research on the use of CW tasks in the classroom has shown that CW tasks boost learner engagement, promote interaction (Storch, 2005; 2011), and serve as a mediating tool to complete cognitively demanding tasks by allowing students to express their ideas freely (Li & Kim, 2016; Storch & Wigglesworth, 2003). Besides conventional face-to-face writing classes, CW tasks may also be used in online learning environments. The demands of online learning have resulted in the development of several platforms and tools that allow students to access more sophisticated content at any time and from any location (Elola & Oskoz, 2017; Harasim, 2017; Heinonen et al., 2020; Kitjaroonchai & Suppasetseree, 2021; Zhai, 2021). This has created new avenues for communication and made writing a more interactive and group activity (Zheng & Warschauer, 2017). Despite increased interest in the online world, as Harasim (2017) argues, online activities are still viewed as secondary to traditional classroom activities because the value of online education is not fully understood by the public. Most of the studies found in the literature are on the effects of CW in face-to-face L2 classroom settings, with or without the integration of some online tools into instruction (Chen, 2019; McDonough et al., 2018; Shehadeh, 2011; Storch, 2005; Wigglesworth & Storch, 2009; Villarreal & Gil-Sarratea, 2019).

The outbreak of the COVID-19 pandemic forced many institutions to switch to emergency online teaching, demonstrating the importance of being prepared for any teaching and learning situation. As Rezeki and Surmiyati (2021) also observed, social isolation during the pandemic demotivated students in terms of participation and task completion, resulting in issues with students' writing skills development. This situation also provided the opportunity to investigate the issue differently than in earlier studies by utilizing a variety of online tools that enable social interaction through teamwork. Nevertheless, scholarly interest in online collaborative writing (OCW) is quite recent. Despite the limited number of studies, there is evidence that it has the potential to improve students' writing skills in varying degrees (Abe, 2020; Moonma, 2021; Strobl, 2014; Yang, 2017; Zenouzagh, 2020). Further studies are needed to fully understand the impact of OCW tasks on EFL students' writing skills. This study, which was carried out during the COVID-19 emergency online teaching period, aims to add to the literature by examining the effect

of OCW in an online EFL writing class on students' writing performance, specifically their syntactic complexity, lexical complexity, and fluency.

Literature review

Learning to write is daunting for EFL learners since L2 is not a means of daily communication (Hyland, 2003; Manchón et al., 2009). Writing becomes an even more difficult task for novice L2 writers. Although the term novice writer has been utilized for students of various proficiency levels in literature, it is most often used to describe L2 students who lack the necessary linguistic and lexical resources, as well as the experience, to effectively transform their thoughts into academic writings. Writing challenges faced by tertiary level EFL learners have been subject to research in different contexts for more than twenty years (e.g., Afrin, 2016; Biber et al., 2011; Bitchener & Baştürkmen, 2006; Derakhshan & Karimian Shirejini, 2020; Fareed et al. 2016; Flores & Lopez, 2019; Siekmann et al., 2022). Previous research discovered that novice L2 writers struggle with efficient planning and revision strategies (Akyel, 1994; Silva, 1993), generating and organizing ideas (Wang & Wen, 2002), and rely heavily on their L1 writing experience when producing texts in English (Kobayashi & Rinnert, 2008). As a result, their writings enclosed limited lexical repertoire (Liu & Braine, 2005; Sasaki, 2004; Zhang, 2000), lacked coherence (Ahmed, 2010), syntactic variety and sophisticated subordination (Biber et al., 2011), and contained frequent spelling and grammatical errors (Maamouri Ghrib, 2001; Uba & Souidi, 2020). Such issues can be addressed by incorporating CW into writing classes.

The current study explains learning using sociocultural theory, which supports the idea that learning is inherently a social activity (Chen, 2019; Storch, 2005) and sees writing as a socially situated activity (Hyland, 2003). Collaboration becomes an essential component of learning under this definition because it entails engaging in social activities for meaningful tasks and creating knowledge together (Johns, 1990). Collaboration serves as a mental tool in the classroom, providing a foundation for the zone of proximal development (ZPD) through social interaction (Donato, 2004). According to Harasim (2017), collaborative learning has three stages: "idea generating, idea organizing, and intellectual convergence, where students construct knowledge or a product by making mutual contributions to the process" (p. 122). This process can be more efficient in online learning environments with Web 2.0 technologies. When applied to online EFL writing classrooms, students collaborate in groups to brainstorm and generate ideas for the writing task, plan what they will write, contribute to the writing process, and finally provide feedback to one another on the final product. It is envisioned that the experience they will gain from this collaboration will help them perform better when writing independently in the target language.

Prior research into the effect of CW and OCW included single group and comparative studies as well as the integration of technological tools into face-to-face classroom settings. In addition, although some studies were conducted with novice writers, others did not specify it explicitly. Complexity, accuracy, and fluency (CAF) were taken as a measure to assess writing skills, however, since the studies do not apply the same indices, they present various results regarding CAF (Bueno-Alastuey et al., 2022).

Measuring complexity and fluency

Various indices have been used to measure performance in the field of L2 writing. In the existing literature, complexity, accuracy and fluency (CAF) are among the metrics used to assess language learners' written and oral competence (Housen & Kuiken, 2009). They are used to monitor learners' progress in the target language. However, measuring complexity and fluency is not without challenges. These are complex systems with constantly evolving and changing subsystems (Norris & Ortega, 2009). Because of this dynamic structure, measuring the systems and subsystems is difficult. Despite these difficulties, Norris and Ortega (2009) argue that understanding how and why languages develop over time in a specific context is essential for researchers seeking ways to understand language development in their particular research setting.

The complexity of a text is measured at both syntactic and lexical levels. Some of the indices used to assess syntactic complexity include clauses per T-unit (C/T), dependent clauses per clause (DC/C) (Storch, 2009; Wolfe-Quintero et al., 1998), and the mean length of T-unit (MLT) (Kawauchi, 2005). Among these indices, the most frequently used one is the T-unit. Hunt (1966) defines a T-unit as "one major sentence plus subordinate clauses connected to that clause" and considers the length of the T-unit a "better measure of maturity" (p. 737). Lexical complexity, on the other hand, is measured by various indices such as the number of different words (Kawauchi, 2005) and word frequency (Yoon, 2017). Although some studies use the T-unit as a measure of syntactic complexity (Bardovi-Harlig, 1992; Kawauchi, 2005; Yoon, 2017), Storch (2009) examined fluency using both the total number of words (W) and the number of T-units. Because language learning is a dynamic process that evolves over time, there is a need for more research that takes a variety of perspectives on the effects of changing circumstances on students' writing performance. As a result, the current study examines how writing practice in a fully online environment affects syntactic and lexical complexity as well as fluency.

Previous research on the impact of CW and OCW on writing

The literature on the effect of collaboration on writing in L2 contexts is still in its early stages. Most of the studies were carried out in traditional face-to-face classrooms with

students ranging in proficiency from beginner to advanced level. There are also studies in which the participants' proficiency level was not specified.

In an earlier classroom-based study, Storch (2005) compared the texts produced by B2 level undergraduate students who were given a choice to write in pairs or individually in terms of CAF. Complexity and accuracy were measured using T-units and DC, while W was computed to assess fluency. The results revealed that whereas pairs produced shorter texts, they outperformed individual writers in task completion, grammatical accuracy, and complexity. Wigglesworth and Storch (2009) used a similar methodology to investigate the effect of CW on essays written by undergraduate students with an advanced level of English. Grammatical complexity was measured using C/T and DC/C, accuracy was assessed using error-free T-units (EFT) and error-free clauses (EFC), and fluency was evaluated using W, T-units and, clauses (C). The findings showed that CW had no influence on grammatical complexity or fluency, but did have a significant effect on accuracy in texts. Shehadeh (2011) investigated the effect of CW on the writing quality of texts produced by 38 first-year students with low-intermediate proficiency from two intact classes. While students in the experimental group collaborated with their peers to complete the assigned writing task, the students in the control group worked independently. The results showed that CW improved text quality in content, organization, and vocabulary but not in grammar or mechanics. To investigate the impact of CW on the prewriting task, McDonough et al. (2018) compared accuracy and complexity of texts written by undergraduate students in three conditions: collaborative writing, collaborative prewriting, or no collaboration. The accuracy was calculated using errors per word, and the complexity was calculated using DC/C. The results showed that the CW group outperformed the other two groups in accuracy but not in complexity. Chen (2019) investigated the effects of CW on the accuracy, fluency and complexity of texts written by 78 intermediate-level undergraduate EFL students. Complexity and accuracy were measured using T-units, DC, and EFC. Fluency was measured using T-units, C/T, and W. The CW group performed better in terms of fluency and accuracy, but not in terms of complexity. Similarly, Villarreal and Gil-Sarratea (2019) compared the texts written by intermediate and upper-intermediate-level undergraduate students in terms of CAF in two conditions: collaborative writing and individual writing. While EFT and EFC were computed for accuracy, T-units, DC, type-token ratio (TTR), and VOCD counts (D index) were used as complexity measures. Words per T-unit, words per clause, the number of T-units, C, and W were used to measure fluency. The findings showed that CW did not affect fluency but enhanced global accuracy and complexity.

Studies comparing the effects of the writing modes on CAF measures have found that OCW improves students' writing performance, particularly in terms of accuracy and fluency. However, its impact on syntactic complexity may not be as significant. Strobl

(2014) studied the effect of online collaboration on synthesis writing with 48 university students. Each participant was required to write two synthesis essays, one individually and one collaboratively. Although there were statistically significant differences in complexity, accuracy, and fluency between collaborative and individual written products, collaborative texts scored significantly higher on content selection and organization. The researcher attributed this difference to in-depth discussions during the planning phase. Zenouzagh (2020) compared the effects of three writing modes (individual, collaborative, and e-collaborative) on the development of syntactic complexity in 90 Iranian intermediate EFL learners. The individual writing mode was the most effective at increasing syntactic complexity; however, CW's effect persisted in the delayed post-test. Recently, Moonma (2021) compared the textual errors made in two different CW conditions: face-to-face and online. Face-to-face collaboration had a higher rate of errors, suggesting that online collaboration had more impact on the syntactic quality of students' texts.

Overall, findings of the previous studies on the impact of CW and OCW in L2 classes demonstrated that collaboration positively influences fluency and accuracy (Chen, 2019; McDonough et al., 2018; Moonma, 2021; Strobl, 2014). It helps students to improve their texts in terms of content, organization, and vocabulary use (Shehadeh, 2011); increases syntactic complexity (Storch, 2005; Strobl, 2014) and lexical complexity (Storch, 2005; Villarreal and Gil-Sarratea, 2019). Additionally, prior research indicates that while face-to-face collaboration does not influence syntactic complexity (Zenouzagh, 2020), face-to-face collaboration improves text accuracy (Moonma, 2021). These findings suggest that OCW may improve students' writing skills more effectively.

Following the COVID-19 pandemic, the shift to remote online instruction has sparked interest in the impact of OCW. The current study, based on sociocultural theory, attempts to investigate how collaboration in an online writing class influences the writing skills of university-level students:

1. What is the effect of OCW in an online EFL writing class on students' writing performance with respect to syntactic and lexical complexity and fluency?

Methodology

This study employs a time-series research design, which is a type of longitudinal research design that allows researchers to understand the underlying naturalistic process and the pattern of change over time, as well as to evaluate the effects of an intervention (Plano Clark & Creswell, 2015; Velicer, 2013). The current study aims to examine the impact of an intervention—OCW activities—and thus, data was collected from a single group of university students before and after the intervention. One of the researchers involved in the process served as the instructor.

Participants

Twenty-six learners from the School of Foreign Languages at a public university in Turkey were recruited for the study using convenience sampling (21 female and five male), majoring in various subjects ranging from biology to astronomy and space sciences. University policies mandate that students take a proficiency exam at the beginning of the academic year; those who score 70 or higher are exempt from receiving preparatory education. Students who do not satisfy the criterion are assigned to classes corresponding to their level of proficiency (A1, A2, or B1) based on their placement test scores. The participants in this study had an A2 level of English proficiency according to the CEFR. Their ages ranged from 18 to 22 years old. They enrolled in a 5-hour writing class designed to improve students' English writing skills and expose them to the academic register. The study was conducted during the COVID-19 pandemic in the spring term of the 2020-2021 academic year. The class sessions were held entirely online via Zoom. Attendance was not mandatory as part of the school policy. Students had access to recorded videos of lessons via the institution's online platform. During the intervention, the students were instructed on how to write an opinion essay.

Data collection procedure

Writing tasks served as data collection instruments. Felix (2008) proposed that a short, fully controlled experimental design is suitable for evaluating clearly defined outcomes. As a result, to evaluate the influence of OCW on students' writing performance in a fully online learning environment, texts written by students before and after the interventions were used as data sources. The study lasted for four weeks (20 class hours in total). The teaching resource was a writing booklet created by the institution. The students collaborated on a different topic while working through the same instructional stages during the intervention. Each week of intervention followed five phases: brainstorming, outlining, producing, peer-reviewing, and revising. At the end of week 1 and 4, an individual opinion essay (minimum of 200 words) was assigned. These essays were used as pre-test and post-test. Their performance on the pre-test and post-test was graded on syntactic and lexical complexity, and fluency. Table 1 below contains a comprehensive description of the OCW intervention.

Table 1 The OCW intervention procedure

Week	Instructor's Role	Student's Role
1	-Teaching students how to write an opinion essay; providing tips; and displaying sample essays. -Informing students about OCW. -Assigning a topic for an opinion essay (a minimum of 200 words in length). -Giving holistic feedback on writing tasks on Google Docs after the class.	-Students individually worked on Google Docs on the assigned writing task and submitted the tasks to the instructor via Google Class. -They revised and edited their essays after receiving feedback from the instructor.
2, 3, 4	-Conducting a brief review of how to write an opinion essay and highlighting typical errors in the essays submitted the previous week. -Assigning a topic for an opinion essay to be written collaboratively (of a minimum of 200 words in length). -Randomly assigning students to breakout rooms on Zoom. -Monitoring students as they work on the essay by visiting each breakout room, viewing their Google Docs sheet on the screen and offering assistance if needed. -Providing holistic feedback to the writing tasks on Google Docs after the class.	-In the breakout rooms, each group created a Google document and shared the link with the instructor before they started composing. -They brainstormed to generate ideas about the assigned topic; made a brief search on the topic using all available resources; created an outline (2 class hours). -They wrote the first draft with a minimum of 200 words. Each group member contributed to the production. The first draft took one class hour to complete. -Upon finalizing the essays, the instructor paired each group and provided a rubric for peer feedback. The paired groups exchanged Google Docs links. Every student read and commented on the paired group's essay individually. -Following peer review, groups met in Zoom breakout spaces to exchange oral critiques based on the rubric. -The groups then revised their essays and submitted them to Google Class to receive final feedback from the instructor. Peer review and editing took up one class period.

Data analysis

Student essays were analyzed for syntactic complexity, lexical complexity, and fluency using online tools. Syntactic complexity and fluency were measured using the Tool for the Automatic Analysis of Syntactic Sophistication and Complexity (TAASSC) (Kyle, 2016), and lexical complexity was measured using the Tool for the Automatic Analysis of Lexical Sophistication (TAALES) (Kyle & Crossley, 2015; Kyle et al., 2018).

TAASSC calculates syntactic complexity using the fourteen automated indices employed in the L2 Syntactic Complexity Analyzer (L2SCA) (Lu, 2010). On the other hand, the TAALES analyzes texts using various indices, such as the number of words/sentences (per sentence), TTR, conjunctions, and connectives. Subordination was measured using C/T

and DC/C (Storch, 2009; Wigglesworth & Storch, 2009; Wolfe-Quintero et al., 1998). In addition, using Kawauchi's (2005) methodology, the production unit was calculated using MLT. For lexical complexity, frequency and range values were calculated. For informal expressions, results obtained from the TAALES for COCA Academic Frequency (COCA/AF), COCA Academic Range (COCA/AR), COCA Spoken Frequency (COCA/SF) and COCA Spoken Range (COCA/SR) values were used. W, T-unit and the number of T-units per sentence (T/S) computed were used to calculate fluency (Hunt, 1965; Storch, 2009; Strobl, 2014; Wigglesworth & Storch, 2009).

The calculated values were analyzed using Jamovi (2021), a free statistical software. First, normality tests (Shapiro-Wilk) were used to determine whether the data was normally distributed with Skewness-Kurtosis values ranging between -1.5 and +1.5 (Tabachnick & Fidell, 2013). Normally distributed datasets were analyzed using paired samples *t*-test, whereas non-normally distributed datasets were analyzed using the Wilcoxon rank test. The effect size for each test was also calculated.

Findings

For ease of presentation, the results will be presented with respect to each measure separately.

Syntactic complexity

According to the distribution of data, a paired samples *t*-test for MLT and Wilcoxon test for C/T and DC/C were administered. Measures of central tendency for MLT, C/T, and DC/C were also computed to summarize the data in the pre-test task and post-test task data set. Mean scores of MLT indicated that students' performances were slightly better in the pre-test task ($M = 15.0$, $SD = 2.82$) than in the post-test task ($M = 14.9$, $SD = 2.97$). On average, they wrote 15 words per T-unit in the pre-test and 14.9 words in the post-test, which showed there was not a significant difference after the implementation of the OCW ($t(25) = 0.06$, $p > .05$, *Cohen's d* $= 0.01$). According to Cohen (1988), an effect size of $d = 0.2$ is considered to have a small effect, $d = 0.5$ has a medium, and $d = 0.8$ and above has a large effect size. The effect size of MLT was small, with a *Cohen's d* of 0.01.

The number of C/T was fewer in the post-test task ($M = 1.61$, $SD = 0.4$) than in the pre-test task ($M = 1.62$, $SD = 0.2$); on average, they wrote 1.62 clauses per T-units in the pre-test and 1.61 in the post-test. However, the difference was not statistically significant ($W = 211$, $p > .05$, $r = 0.2$).

As for DC/C, contrary to the results obtained for MLT and C/T, there was an increase from the pre-test ($M = 0.3$, $SD = 0.08$) to post-test task ($M = 14.7$, $SD = 73.5$). On average, students wrote 0.3 dependent clauses per clauses in the pre-test and 14.7 in the post-test.

The number of dependent clauses they used increased after the implementation of OCW. However, the difference was not statistically significant ($W = 157$, $p > .05$, $r = 0.04$).

Lexical complexity

As for the second measure, the lexical complexity, a paired samples *t*-test for COCA/AF, COCA/SF, and COCA/SR and Wilcoxon test for COCA/AR were performed. Also, measures of central tendency were computed to summarize the data in pre-test task and post-test task data sets. Mean scores of COCA/AF showed that students' performance was better in the post-test task ($M = 7997$, $SD = 1003$) than in the pre-test task ($M = 6677$, $SD = 1129$), which yielded a statistically significant difference between the individual writing performances after the implementation of the OCW ($t(25) = -6.03$, $p < .001$, *Cohen's d* = 1.18). The effect size indicated a large effect. This finding demonstrated that students used academic words more frequently as a result of OCW.

The mean scores for COCA/AR demonstrated that the range of academic words students used in the post-test task was larger ($M = 0.97$, $SD = 0.027$) than in the pre-test task ($M = 0.61$, $SD = 0.028$); producing a statistically significant difference and a large effect size ($W = 0.00$, $p < .001$, $r = 1.0$). After working collaboratively in an online environment, the variety of academic words used in opinion essays increased.

In terms of COCA/SF, in the post-test task, students used more words from spoken language ($M = 6924$, $SD = 567$) than in the pre-test task ($M = 6257$, $SD = 728$). The difference between pre- and post-test tasks was statistically significant, with a large effect size ($t(25) = -4.32$, $p < .001$, *Cohen's d* = 0.8). Following OCW, spoken word usage was more prevalent in the post-test tasks.

The results of COCA/SR analysis indicated that the range of spoken words students used in the post-test task was smaller ($M = 0.54$, $SD = 0.03$) than in the pre-test task ($M = 0.56$, $SD = 0.039$), however, the difference between the scores of test tasks was not statistically significant ($t(25) = 1.86$, $p > 0.05$). Students used varying spoken words in the pre-test while using more academic words in the post-test.

Fluency

The third measure, fluency, was calculated by performing a paired samples *t*-test for W and Wilcoxon test for T/S. To summarize the data of pre-test and post-test tasks, measures of central tendency for W and T/S were computed. The mean scores of W revealed that students' performances improved as a result of OCW. The number of words used was higher in the post-test task ($M = 463$, $SD = 168$) than in the pre-test task ($M = 394$, $SD = 145$). On average, 394 words were written in the pre-test, whereas 463 words were used in the post-test. The difference, however, was not statistically significant ($t(25) = -1.80$, $p > .05$).

As for T/S, the mean values revealed that students used more T-units per sentence in the post-test task ($M = 1.17$, $SD = 0.2$) than in the pre-test task ($M = 1.07$, $SD = 0.06$), which yielded a statistically significant difference and an effect closer to medium size ($W = 84.0$, $p < .05$, $r = 0.4$).

Discussion

The present study investigated the effect of OCW in an online EFL writing class on writing performance concerning syntactic complexity, lexical complexity, and fluency and findings provided a detailed understanding of the issue.

Concerning syntactic complexity, the mean scores of MLT and C/T were slightly lower in the post-test, which indicated that the OCW had no impact on MLT or C/T. Despite the increase in the mean score of DC/C in the post-test, the difference was not statistically significant. These results collectively imply that the intervention did not significantly change syntactic complexity. Other elements, like the length of the intervention, might account for this finding. A four-week intervention might not be enough time to enable the acquisition of complex syntactic features. Skehan (2009) notes that attention and working memory affect performance, indicating that while one measure increases the other(s) may be negatively affected, resulting in students' not performing at the same level for each measure.

Regarding the lexical complexity, the mean scores of COCA/AF, COCA/AR and COCA/SF were higher in the post-test, but COCA/SR was slightly lower. So, OCW did not affect the range of spoken words. It might result from students' using more complex and uncommon vocabulary as their vocabulary knowledge grows (Caruso, 2014). On the third measure, fluency, the higher mean scores of W and T/S in the post-test indicated that students wrote longer texts and used more T-units per sentence.

The results of the present study corroborate the findings of the previous studies (Chen, 2019; McDonough et al., 2018; Shehadeh, 2011; Wigglesworth & Storch, 2009; Villarreal & Gil-Sarratea, 2019), indicating that OCW did not have a positive effect on syntactic complexity in student writings. However, confirming the findings of Shehadeh (2011) and Villarreal and Gil-Sarratea (2019), the findings suggest that OCW resulted in improved lexical complexity. Additionally, in line with the findings of Chen (2019) and Strobl (2014), this study revealed that students wrote with greater fluency after engaging with OCW.

In Wigglesworth and Storch's (2009) study, participants wrote argumentative essays during one 90-minute CW session. The results demonstrated no improvement in the syntactic complexity of the texts produced by the students. Similarly, in Shehadeh's (2011) study, students wrote paragraphs with and without CW for 16 weeks. The results indicated that while vocabulary use improved, grammar did not. Likewise, Villarreal and Gil-Sarratea (2019) conducted a study where students engaged in both individual and group

work within a single session. Results showed little progress in the lexical complexity. McDonough et al. (2018) used a 75-minute paragraph writing task with three groups to test the effects of collaboration: CW, CW pre-writing, and no-collaboration. While the CW group completed the entire task collaboratively, the pre-writing group worked collaboratively only at the planning stage. The no-collaboration group wrote their paragraphs individually. The researchers found that while accuracy was better in the CW group, complexity was higher in the CW pre-writing and no-collaboration groups. Our results, consistent with earlier research, demonstrated that collaboration, independent of the length of interventions or the genre, might not boost syntactic complexity, yet it may increase lexical complexity. Storch (2005) suggested that collaboration enables students to share their linguistic knowledge, hence, extend their interlanguage systems. In the present study, although there was no significant effect on syntactic complexity, lexical complexity and fluency improved as a result of OCW in an online EFL writing class, suggesting that OCW has the potential to enhance student performance in writing academic essays in terms of lexical complexity and fluency.

   Overall, the findings of this study suggest that OCW enhances lexical complexity and fluency despite no change in syntactic complexity. While collaborating, learners in groups contributed to each other by negotiating and exchanging ideas. Students' social and cognitive engagement in the class increases through OCW (Chen et al., 2021), which encourages them to broaden their linguistic knowledge. In terms of implications for teaching, online environments foster writing by providing better understanding (Abe, 2020). According to Wu et al. (2022), when an online approach is adopted, students generate better writings, their satisfaction with the learning process increases along with the time they devote to learn. Therefore, they produce better texts when collaborating online than they do in a traditional classroom environment (Moonma, 2021). Regarding the issue, Yang (2017) highlighted the importance of negotiation in OCW to help learners to construct knowledge. Within this in mind, teachers can implement OCW in online EFL writing classes to improve their students' writing performance by encouraging them to participate in a socially constructive environment.

Conclusion

The need for a transition to online teaching because of COVID-19 has led to the use of online learning environments. As every student has a different pace of learning and performance in a classroom environment, teachers had to update their teaching resources and instructional techniques accordingly. So, there was a tendency to use collaborative activities. With the purpose of investigating the effect of OCW on the writing performance of students in terms of syntactic complexity, lexical complexity, and fluency in an online EFL writing class, this study concluded that OCW had a positive effect on lexical

complexity and fluency in students' writings whereas it did not affect the use of syntactic complexity. In light of these findings, the study might contribute to the literature on using OCW in EFL writing classes. This study offers various possibilities for future research. To begin with, accuracy was not measured in this study; therefore, further studies might consider including it as a variable. Researchers can increase the number of interventions and include a delayed post-test to get clearer results as to the longitudinal effects of OCW, which will make statistically significant differences. Other than Google Docs and Zoom, various online tools and learning environments can be used since they might influence the collaboration process and the product. Further studies might elaborate on these issues to examine the effects of OCW on L2 writing.

The present study had some limitations that should be acknowledged. One major limitation was the duration of the intervention. Three major interventions took place over four weeks. Due to this limited time, we could not observe the impact of collaboration on the development of complex syntactic features. It is advised for researchers who want to examine how OCW affects syntactic complexity to follow learners over a longer time frame. Another limitation was the absence of a control group. The absence of mandatory attendance during the COVID-19 pandemic forced us to conduct our research with a small sample size without the option of including a control group. Incorporating it into the study could provide a clearer picture of the effect of OCW on writing performance in online EFL writing classes.

Declarations

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References

Abe, M. (2020). Interactional practices for online collaborative writing. *Journal of Second Language Writing*, *49*, 100752. https://doi.org/10.1016/j.jslw.2020.100752

Afrin, S. (2016). Writing problems of non-English major undergraduate students in Bangladesh: An observation. *Open Journal of Social Sciences*, *4*(3), 104–115. http://dx.doi.org/10.4236/jss.2016.43016

Ahmed, A. H. (2010). Students' problems with cohesion and coherence in EFL essay writing in Egypt: Different perspectives. *Literacy Information and Computer Education Journal*, *1*(4), 211–221.

Akyel, A. (1994). First language use in EFL writing: Planning in Turkish vs. planning in English. *International Journal of Applied Linguistics*, *4*(2), 169–184. https://doi.org/10.1111/j.1473-4192.1994.tb00062.x

Bardovi-Harlig, K. (1992). A second look at T-unit analysis: Reconsidering the sentence. *TESOL Quarterly*, *26*(2), 390–395. https://doi.org/10.2307/3587016

Biber, D., Gray, B., & Poonpon, K. (2011). Should we use characteristics of conversation to measure grammatical complexity in L2 writing development?. *TESOL Quarterly*, *45*(1), 5–35. https://doi.org/10.5054/tq.2011.244483

Bitchener, J., & Bastürkmen, H. (2006). Perceptions of the difficulties of postgraduate L2 thesis students writing the discussion section. *Journal of English for Academic Purposes*, *5*, 4–18. https://doi.org/10.1016/j.jeap.2005.10.002

Bueno-Alastuey, M. C., Vasseur, R., & Elola, I. (2022). Effects of collaborative writing and peer feedback on Spanish as a foreign language writing performance. *Foreign Language Annals*, 1–23. https://doi.org/10.1111/flan.12611

Bulqiyah, S., Mahbub, M. A., & Nugraheni, D. A. (2021). Investigating writing difficulties in essay writing: Tertiary students' perspectives. *English Language Teaching Educational Journal*, *4*(1), 61–73. https://doi.org/10.12928/eltej.v4i1.2371

Caruso, G. (2014). *The Impact of wiki-based collaborative writing on English L2 learners' individual writing development* (Publication No. 1568387) [Master's thesis]. Portland State University.

Chen, S., Ouyang, F., & Jiao, P. (2021). Promoting student engagement in online collaborative writing through a student-facing social learning analytics tool. *Journal of Computer Assisted Learning*, *38*, 192–208. https://doi.org/10.1111/jcal.12604

Chen, W. (2019). An exploratory study on the role of L2 collaborative writing on learners' subsequent individually composed texts. *Asia-Pacific Education Researcher*, *28*(6), 563–573. https://doi.org/10.1007/s40299-019-00455-3

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Erlbaum Associates.

DeKeyser, R. (2007). Skill acquisition theory. In B. VanPatten & J. Williams (Eds.), *Theories in second language acquisition: An introduction* (pp. 97–113). Lawrence Erlbaum.

Derakhshan, A., & Karimian Shirejini, R. (2020). An investigation of the Iranian EFL learners' perceptions towards the most common writing problems. *Sage Open*, *10*(2), https://doi.org/10.1177/2158244020919523

Donato, R. (2004). Aspects of collaboration in pedagogical discourse. *Annual Review of Applied Linguistics*, *24*, 284–302. https://doi.org/10.1017/S026719050400011X

Elola, I., & Oskoz, A. (2017). Writing with 21st century social tools in the L2 classroom: New literacies, genres, and writing practices. *Journal of Second Language Writing*, *36*, 52–60. https://doi.org/10.1016/j.jslw.2017.04.002

Fareed, M., Ashraf, A., & Bilal, M. (2016). ESL learners' writing skills: Problems, factors and suggestions. *Journal of Education and Social Sciences*, *4*(2), 81–92. https://doi.org/10.20547/jess0421604201

Felix, U. (2008). The unreasonable effectiveness of CALL: What have we learned in two decades of research? *ReCALL*, *20*(02), 141–161. https://doi.org/10.1017/s0958344008000323

Flores, E. R., & Lopez, M. (2019). Self-reported summarizing and paraphrasing difficulties in L2 writing contexts: Some pedagogical interventions. *Indonesian Journal of Applied Linguistics*, *9*(2), 286–296. https://doi.org/10.17509/ijal.v9i2.20219

Harasim, L. (2017). *Learning theory and online technologies* (2nd ed.). Routledge.

Heinonen, K., De Grez, N., Hämäläinen, R., De Wever, B., & van der Mejis, S. (2020). Scripting as a pedagogical method to guide collaborative writing: University students' reflections. *Research and Practice in Technology Enhanced Learning*, *15*, 15. https://doi.org/10.1186/s41039-020-00131-x

Housen, A., & Kuiken, F. (2009). Complexity, accuracy, and fluency in second language acquisition. *Applied Linguistics*, *30*(4), 461–473. https://doi.org/10.1093/applin/amp048

Hunt, K. W. (1965). *Grammatical structures written at three grade levels. NCTE research report no. 3.* National Council of Teachers of English.

Hunt, K. W. (1966). Recent measures in syntactic development. *Elementary English*, *43*(7), 732–739.

Hyland, K. (2003). *On second language writing*. Cambridge University Press. https://doi.org/10.1017/CBO9780511667251

Johns, A. M. (1990). L1 composition theories: Implications for developing theories of L2 composition. In B. Kroll (Ed.), *Second language writing research insights for the classroom* (pp. 24–36). Cambridge University Press. https://doi.org/10.1017/CBO9781139524551

Kawauchi, C. (2005). The effects of strategic planning on the oral narratives of learners with low and high intermediate L2 proficiency. In R. Ellis (Ed.), *Planning and task performance in a second language* (pp. 143–164). John Benjamins.

Kitjaroonchai, N., & Suppasetseree, S. (2021). Online collaborative writing via Google Docs: Case studies in the EFL classroom. *Journal of Language Teaching and Research*, *12*(6), 922–934. https://doi.org/10.17507/jltr.1206.08

Kobayashi, H., & Rinnert, C. (2008). Task response and text construction across L1 and L2 writing. *Journal of Second Language Writing*, *17*(1), 7–29. https://doi.org/10.1016/j.jslw.2007.08.004

Kyle, K. (2016). *Measuring syntactic development in L2 writing: Fine grained indices of syntactic complexity and usage-based indices of syntactic sophistication* [Doctoral dissertation]. Georgia State University. https://scholarworks.gsu.edu/alesl_diss/35/

Kyle, K., & Crossley, S. A. (2015). Automatically assessing lexical sophistication: Indices, tools, findings, and application. *TESOL Quarterly*, *49*(4), 757–786. https://doi.org/10.1002/tesq.194

Kyle, K., Crossley, S. A., & Berger, C. (2018). The tool for the analysis of lexical sophistication (TAALES): Version 2.0. *Behavior Research Methods*, *50*, 1030–1046. https://doi.org/10.3758/s13428-017-0924-4

Li, M., & Kim, D. (2016). One wiki, two groups: Dynamic interactions across ESL collaborative writing tasks. *Journal of Second Language Writing*, *31*, 25–42. https://doi.org/10.1016/j.jslw.2016.01.002

Liu, M., & Braine, G. (2005). Cohesive features in argumentative writing produced by Chinese undergraduates. *System*, *33*(4), 623–636. https://doi.org/10.1016/j.system.2005.02.002

Lu, X. (2010). Automatic analysis of syntactic complexity in second language writing. *International Journal of Corpus Linguistics*, *15*(4), 474–496. http://dx.doi.org/10.1075/ijcl.15.4.02lu

Maamouri Ghrib, E. (2001). Thinking and writing in EFL: Cutting off Medusa's head. *ITL-International Journal of Applied Linguistics*, *133*(1), 243–269. https://doi.org/10.1075/itl.133-134.04maa

Manchón, R. M., Roca de Larios, J., & Murphy, L. (2009). The temporal dimension and problem-solving nature of foreign language composing processes: Implications for theory. In R. Manchón (Ed.), *Writing in foreign language contexts: Learning, teaching, and research* (Vol. 43) (pp. 102–129). Multilingual Matters.

McDonough, K., De Vleeschauwer, J., & Crawford, W. (2018). Comparing the quality of collaborative writing, collaborative prewriting, and individual texts in a Thai EFL context. *System*, *74*, 109–120. https://doi.org/10.1016/j.system.2018.02.010

Moonma, J. (2021). Comparing collaborative writing activity in EFL classroom: Face-to-face collaborative writing versus online collaborative writing using Google Docs. *Asian Journal of Education and Training*, *7*(4), 204–215. https://doi.org/10.20448/journal.522.2021.74.204.215

Norris, J. M., & Ortega, L. (2009). Towards an organic approach to investigating CAF in instructed SLA: The case of complexity. *Applied Linguistics*, *30*(4), 555–578. https://doi.org/10.1093/applin/amp044

Plano Clark, V. L., & Creswell, J. W. (2015). *Understanding research a consumer's guide.* (2nd ed.). Pearson.

Rezeki, Y. S., & Surmiyati. (2021). EFL students' perceptions of collaborative writing during remote teaching. *Jurnal Pendidikan Bahasa*, *10*(2), 231–242.

Sasaki, M. (2004). A multiple-data analysis of the 3.5-year development of EFL student writers. *Language Learning*, *54*(3), 525–582. https://doi.org/10.1111/j.0023-8333.2004.00264.x

Shehadeh, A. (2011). Effects and student perceptions of collaborative writing in L2. *Journal of Second Language Writing*, *20*(4), 286–305. https://doi.org/10.1016/j.jslw.2011.05.010

Siekmann, L., Parr, J. M., & Busse, V. (2022). Structure and coherence as challenges in composition: A study of assessing less proficient EFL writers' text quality. *Assessing Writing*, *54*, 1–13. https://doi.org/10.1016/j.asw.2022.100672

Silva, T. (1993). Toward an understanding of the distinct nature of L2 writing: The ESL research and its implications. *TESOL Quarterly*, *27*, 665–677. https://doi.org/10.2307/3587400

Skehan, P. (2009). Modelling second language performance: Integrating complexity, accuracy, fluency, and lexis. *Applied Linguistics*, *30*(4), 510–532. https://doi.org/10.1093/applin/amp047

Storch, N. (2005). Collaborative writing: Product, process, and students' reflections. *Journal of Second Language Writing*, *14*(3), 153–173. https://doi.org/10.1016/j.jslw.2005.05.002

Storch, N. (2009). The impact of studying in a second language (L2) medium university on the development of L2 writing. *Journal of Second Language Writing*, *18*, 103–118. https://doi.org/10.1016/j.jslw.2009.02.003

Storch, N. (2011). Collaborative writing in L2 contexts: Processes, outcomes, and future directions. *Annual Review of Applied Linguistics*, *31*, 275–288. https://doi.org/10.1017/S0267190511000079

Storch, N. (2019). Collaborative writing as peer feedback. In K. Hyland & F. Hyland (Eds.), *Feedback in second language writing: Contexts and issues* (pp. 143–162). Cambridge University Press. https://doi.org/10.1017/9781108635547.010

Storch, N., & Wigglesworth, G. (2003). Is there a role for the use of the L1 in an L2 setting?. *TESOL Quarterly*, *37*(4), 760–770. https://doi.org/10.2307/3588224

Strobl, C. (2014). Affordances of web 2.0 technologies for collaborative advanced writing in a foreign language. *CALICO Journal*, *31*(1), 1–18. https://doi.org/10.11139/cj.31.1.1-18

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.). Pearson.

The Jamovi Project. (2021). *Jamovi* (Version 1.8.4). Jamovi. https://www.jamovi.org

Uba, S. Y., & Souidi, N. M. (2020). Students' writing difficulties in English for business classes in Dhofar University, Oman. *International Journal of Higher Education*, *9*(3), 86–97. https://doi.org/10.5430/ijhe.v9n3p86

Wang, W., & Wen, Q. (2002). L1 use in the L2 composing process: An exploratory study of 16 Chinese EFL writers. *Journal of Second Language Writing*, *11*, 225–246. https://doi.org/10.1016/S1060-3743(02)00084-X

Wolfe-Quintero, K., Inagaki, S., & Kim, H. (1998). *Second language development in writing: Measures of fluency, accuracy and complexity*. Second Language Teaching & Curriculum Center, University of Hawaii at Manoa.

Wigglesworth, G., & Storch, N. (2009). Pair versus individual writing: Effects on fluency, complexity and accuracy. *Language Testing*, *26*(3), 445–466. https://doi.org/10.1177/0265532209104670

Wu, W., Ma, Q., & Santos, I. (2022). Inquiry into online learning communities: Potential for fostering collaborative writing. *Journal of China Computer-Assisted Language Learning*, *2*(1), 20–44. https://doi.org/10.1515/jccall-2022-0006

Velicer, W. F. (Ed.). (2013). Time series analysis for psychological research. In J. A. Schinka, W. F. Velicer & I. B. Weiner (Eds.), *Handbook of psychology: Research methods in psychology* (pp. 628–660). John Wiley & Sons, Inc.

Villarreal, I., & Gil-Sarratea, N. (2019). The effect of collaborative writing in an EFL secondary setting. *Language Teaching Research*, *24*(6), 1–24. https://doi.org/10.1177/1362168819829017

Yang, Y.-F. (2017). New language knowledge construction through indirect feedback in web-based collaborative writing. *Computer Assisted Language Learning*, *31*(4), 459–480. https://doi.org/10.1080/09588221.2017.1414852

Yoon, H. J. (2017). Linguistic complexity in L2 writing revisited: Issues of topic, proficiency, and construct multidimensionality. *System*, *66*, 130–141. https://doi.org/10.1016/j.system.2017.03.007

Zenouzagh, Z. M. (2020). Syntactic complexity in individual, collaborative and E-collaborative EFL writing: Mediating role of writing modality, L1 and sustained development in focus. *Educational Technology and Research Development*, *68*, 2939–2970. https://doi.org/10.1007/s11423-020-09818-w

Zhai, M. (2021). Collaborative writing in a Chinese as a foreign language classroom: Learners' perceptions and motivations. *Journal of Second Language Writing*, *53*, 100836. https://doi.org/10.1016/j.jslw.2021.100836

Zhang, M. (2000). Cohesive features in the expository writing of undergraduates in two Chinese universities. *Regional English Language Centre Journal*, *31*(1), 61–95. https://doi.org/10.1177/003368820003100104

Zheng, B., & Warschauer, M. (2017). Epilogue: Second language writing in the age of computer-mediated communication. *Journal of Second Language Writing*, *36*, 61–67. https://doi.org/10.1016/j.jslw.2017.05.014

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