

## Collaborative Writing Using CMC Technologies – Benefits and Challenges for Second Language (L2) Learners: A Research Synthesis

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**Abstract:** This paper identifies benefits and challenges of computer-mediated collaborative writing for L2 learners and provides some useful guidelines for L2 instructors and instructional designers. Many studies found that collaborative writing using CMC technologies improved L2 students' writing skills and had a positive impact on their motivation, based both on the technologies themselves and the social interactions such tools facilitated. However, not all studies found positive effects on students' performance. Some of the negative effects found were technological limitations and interpersonal issues inherent in collaborative learning, which demands constant interaction between people with diverse backgrounds and characteristics. More attention should be given to instructional design and instructor facilitation to overcome both technology and interpersonal issues. The findings and implications from this study with L2 learners can be applied to any online courses that use CMC tools for collaborative writing projects.

### Introduction

Computer-mediated communication (CMC) describes the process of generating, exchanging, and perceiving information through various forms of networked communication programs (Romiszowski & Mason, 2013). Many studies have been conducted to assess the effectiveness of CMC technologies in collaborative writing for L2 students (Du et al., 2016; Li, 2018; Miyazoe & Anderson, 2010; Wu et al., 2015; Yen et al., 2015; Zou et al., 2016). Web 2.0 tools such as Wikis, Facebook, and Forum are also CMC tools, and these tools have been adopted in second language (L2) classes to enhance students' motivation and achievement. For instance, Wiki-based programs (i.e., Wikis) such as Wikispaces and PBWorks provide L2 students with a platform for collaborative projects. Wikis have many useful functions such as simultaneous access and version control, which are useful for collaborative works. L2 students can also benefit from the latest technologies to enhance their writing skills through collaborative writing. Collaborative writing has been broadly used in L2 classes, and CMC technologies facilitate collaborative writing while providing students with more effective and efficient ways of communication than in a traditional classroom (Du et al., 2016; Li & Zhu, 2013). It is widely known that collaborative writing strengthens students' motivation and writing skills through social interaction (Zou et al., 2016). However, social interaction between students often raises interpersonal problems and issues. Technology also causes some concerns when used for educational purposes.

## **Definitions**

### **English as a Foreign Language (EFL) vs. English as a Second Language (ESL)**

English as a foreign language refers to English that is used by foreign speakers who are learning English in their own country. English as a second language refers to English that is used by people who live in an English-speaking country but do not have mastery of English. Both EFL and ESL students are called second language (L2) students because English is not their first or native language (L1).

### **Collaborative writing**

Collaborative writing is defined as a writing task in which more than two individuals contribute to a single writing work. It includes both individual writing with peer-review activity and group writing with cooperative or collaborative efforts. Within a group writing task, students produce one final output either by completing their portion of work or by working together on the whole writing project. The former case is usually called cooperative writing and the latter is called collaborative writing. In the case of collaborative writing, students discuss a given topic, give feedback to each other to improve the quality of writing, and edit in turn (Du et al., 2016). In this review, collaborative writing is used as the unified term for three types of writing: individual writing with peer-review, cooperative writing, and collaborative writing.

### **Computer-mediated communication (CMC)**

Computer-mediated communication (CMC) indicates any type of communication that uses computer programs and networked services in both synchronous and asynchronous formats. Messengers and social network services such as Facebook, blogs, and Wikis are examples. This review focuses on text-based, asynchronous CMC technologies used for collaborative writing.

### **Purpose and Research Questions**

The dual aims of this paper are 1) to identify the benefits and challenges of collaborative writing using CMC technologies and 2) to provide useful guidelines for computer-mediated collaborative writing for L2 students. The research questions guiding this review are as follows:

1. What are the forms of collaborative writing?
2. What are the benefits of collaborative writing using CMC for L2 learners?
3. What are the challenges and issues involved in collaborative writing using CMC for L2 learners?

## Method

### Research Approach and Procedures

This study used qualitative research synthesis method to provide useful information and knowledge on a topic by synthesizing multiple studies selected through purposeful sampling (Drisko, 2020; Suri, 2011). ERIC, an online database of education literature and resources, was used to collect the articles about computer-mediated collaborative writing for L2 students. The researcher used ERIC because the target context was formal school learning settings, and ERIC is the authoritative database including full-text educational resources. Google Scholar was also used to extract further articles that met the relevancy criteria.

### Search Strategies and Relevancy Criteria

The search was focused on empirical journal articles written in English using a combination of various search terms and keywords pertaining to the target subject (EFL, ESL), tool (e.g., computer-mediated communication, computer-mediated language learning, computer-aided language learning, etc.), and topic (e.g., collaborative writing, peer review) with some variations. The search was limited to articles published between 2010 and 2022. The articles were selected according to inclusion and exclusion criteria in Table 1. A total of 15 journal articles were selected for synthesis.

**Table 1.** Inclusion and Exclusion Criteria for Article Selection

Category	Inclusion Criteria	Exclusion Criteria
Year	2010 – 2022	Published before 2010
Article type	Empirical, peer-reviewed	Conceptual/theoretical, literature review, non-reviewed
Language	English	Non-English languages
Research context	Formal learning settings (elementary, middle, high, college)	Informal learning settings (e.g., MOOC, social media, etc.)
Subject	English L2 learners (i.e., EFL & ESL learners)	L2 learners of other languages (e.g., Spanish, German)
Topic/focus	Studies include collaborative English writing using CMC tools for peer interaction.	Studies involve English writing but there is no peer interaction (e.g., peer feedback, group writing).
Tool	Asynchronous, text-based CMC tools (e.g., Wiki, Forum, etc.)	Audio & video-based CMC tools; electronic devices without networks

### Coding, Analysis, and Summary of Findings

A total of 15 relevant articles were logged and coded into a spreadsheet using 11 dimensions for basic information and method. Additionally, 3 dimensions were used to answer research questions about computer-mediated collaborative writing among English L2 learners (See Table 2). The forms, benefits, and challenges of collaborative writing from each article were identified and briefly described in the spreadsheet. These descriptions were thematically analyzed to find patterns and themes for each subcategory. Two forms of collaborative writing (individual writing with peer reviews, group writing), three types of benefits (technological, affective, performance-related), and two types of challenges (technology and interpersonal) were found and summarized in the ‘Results’ section by reviewing the content of each article more closely.

**Table 2.** Coding Scheme

Category	Subcategory	Codes
Basic information	Author	First author’s last name
	Year of publication	2010, 2011, ..., 2022
	Empirical	Yes/No
	Study purpose	This was taken from each journal article
Method	Student level	Elementary, middle, high, college
	Student type	EFL, ESL
	Target language	English, English/Chinese, English/Spanish, etc.
	Native language	English, Korean, Japanese, German, etc.
	Data type	Quantitative, qualitative, mixed
	Data collection	Achievement test, interview, survey, text archive, writing assignment, etc.
	CMC Tool	Wikis, Forum, Facebook, blog, etc.
Collaborative writing	Form	These subcategories (form, benefits, and challenges) were summarized and analyzed thematically to answer the research questions.
	Benefits	
	Challenges	

*Note.* Some of the selected studies were conducted in the context of language exchange programs.

The seven codes for the method category were summarized using a frequency distribution. Since 15 articles are not exhaustive enough to represent all relevant articles published between 2010 and 2022, this distribution is not intended to show the trend of the empirical articles on the given topic but rather to describe the target articles for this research synthesis (See Table 3). Most studies were conducted with Chinese speaking EFL learners at a college level. There were two studies where EFL learners were collaborating with English speaking students in a language exchange program. Most studies used mixed methods. Pre- and post-test were used to measure students’ writing skills before and after collaborative writing. Interviews, survey questionnaires, and text archives were used to collect data. Wikis (Wikispaces, PBWorks) were the most popular CMC tool for collaborative writing. Online forums were also used in many studies for discussion and brainstorming among group members for collaborative writing.

**Table 3.** Method Used in 15 Articles

Category	Subcategory	Number of Studies
Basic information	Year of publication	2010 (1), 2011 (0), 2012 (2), 2013 (2), 2014 (0), 2015 (1), 2016 (2), 2017 (2), 2018 (1), 2019 (1), 2020 (0), 2021 (1), 2022 (2)
Method	Student level <sup>1</sup>	Elementary (1), middle (1), high (3), college (13)
	Student type	EFL (13), ESL (2)
	Target language <sup>2</sup>	English (15), Chinese (1), Spanish (1)
	Native language <sup>3</sup>	- EFL: Arabic (2), Chinese (9), Spanish (1), Thai (1) - ESL: Creole & Spanish (1), various (1) - Others (CFL, SFL): English (2)
	Data type	Quantitative (1), qualitative (3), mixed (11)
	Data collection <sup>4</sup>	Achievement test (6), interview/FGI (5), observation (2), survey (6), text archive (10)
	Course format	- Web-based, in-person/computer lab (10) - Online, outside of school (5)
	CMC tool	Facebook (1), Google Docs (3), Forum (1), Wikis (10)

*Note.* <sup>1</sup> One study included students at all levels from elementary to college. <sup>2</sup> Chinese and Spanish were studied by English learners through the language exchange program. <sup>3</sup> Chinese as a Foreign Language (CFL) and Spanish as a Foreign Language (SFL) for native English speakers in language exchange programs.

## Results

### RQ1. What are the Forms of Collaborative Writing?

Writing tasks can be implemented individually or within a group. In both cases, collaborative writing is possible through interaction between two students as a pair or among three or more students as a group or team. For individual writing, collaborative writing is realized through peer review activities. Peer review is an activity in which students provide verbal or written feedback for one another's writing drafts (Chen, 2016). Within a group, collaborative writing is realized through sharing responsibility and authorship for a joint writing. Thus, collaborative writing is a group activity in which two or more students create a single document together (Du et al., 2016). Peer review and collaborative writing have been drawing attention and getting support from L2 instructors because of the collaborative potential of the latest CMC tools such as Wikis and social media. With these technologies, students can work more easily and simultaneously in groups of three or more than with previous technologies (Kessler et al., 2012).

### RQ2. What are the Benefits of Collaborative Writing Using CMC for L2 Learners?

**Technological benefits.** CMC contributes to collaborative writing in two ways: simultaneous and convenient revision, and classroom extension. As CMC evolves with Web 2.0 technologies, it allows simultaneous revisions of the same text by more than three students, and it provides more convenient feedback and faster response time than before (Du et al., 2016; Zou et al., 2016). The web-based CMC tools also provide students with flexibility by allowing them to make

formatting changes and to continuously work on writing without waiting for others' responses (Kessler et al., 2012). CMC also contributes to extended communication and learning beyond traditional classrooms. Students can interact whenever and wherever after school (Alghasab & Handley, 2017; Rahimi & Fathi, 2022; Wichadee, 2010). Moreover, they can communicate with native speakers of the target language beyond borders (Díez-Bedmar & Pérez-Paredes, 2012; Zou et al., 2016).

***Affective benefits.*** CMC technologies mitigate face-threatening atmospheres and anxiety for introverted students (Yen et al., 2015). CMC gives shy and reticent students a safe place to voice themselves. CMC platforms also provide unobtrusive and non-threatening ways of providing comments to students who don't want to hurt others' feelings. While making comments in red pen on the paper seems offensive to some student writers, CMC commenting features such as those available in Google Docs can help student reviewers feel less intimidated (Chen, 2016; Wu et al., 2015). Additionally, CMC increases students' willingness to participate by allowing anonymous communication. The anonymous features of CMC allow student reviewers to be candid in peer review. Honest criticism can result in real improvements in peers' writing (Wu et al., 2015). Finally, CMC influences students' intrinsic motivation and positive attitudes in collaborative writing. Motivation in language learning signifies that students continue to maintain interest and show higher self-efficacy and self-regulation, thereby investing more time and effort in learning the language (Liu et al., 2022; Rahimi & Fathi, 2022; Wichadee, 2010; Zou et al., 2016).

***Performance-related benefits.*** The key benefit of collaborative writing using CMC is the positive effect on students' actual writing skills. Many studies showed that collaborative writing using CMC affected students' writing skills in a positive way through collective scaffolding (Hsu & Lo, 2018; Levrai & Bolster, 2019; Rahimi & Fathi, 2022; Vorobel & Kim, 2017; Wichadee, 2010; Wu et al. 2015; Yen et al., 2015; Zou et al., 2016). Peer review activities also enhance 21<sup>st</sup> century skills such as collaboration, communication, and critical thinking skills (Kessler et al., 2012; Levrai & Bolster, 2019; Vorobel & Kim, 2017; Wu et al., 2015; Yen et al., 2015). Through the social interaction students engage in during peer review and joint writing activities, students improve their communications skills. Students also automatically enhance their critical thinking skills when they read and critique other students' works. However, there were also studies that showed no significant effects on students' performance (Wu et al., 2015; Yen et al., 2015). In these studies, technology only played a secondary role. Integrating CMC technologies effectively into course design was more important than the attributes of the individual technology (Kessler, 2012). In some cases, students provided incorrect feedback because of their limited language proficiency. For this reason, students preferred instructors' feedback over their peers' (Vorobel & Kim, 2017; Wu et al., 2015).

### **RQ3. What are the Challenges and Issues Involved in Collaborative Writing Using CMC for L2 Learners?**

***Technology-related issues.*** Technologies are challenging for some students because it takes a fair amount of time to learn and use certain technologies skillfully. Some students feel frustrated if they cannot figure out how to use Wikis to comment and edit, for example. Others have more patience to wait to learn the technology, but they also struggle until they feel comfortable in posting and editing. Researchers indicated that some students were not satisfied with the Wikis

because they lacked technical proficiency and did not receive sufficient help while using the technologies (Kessler et al., 2012; Wu et al., 2015; Zou et al., 2016). Students preferred certain technologies based on their familiarity with those technologies. Some students preferred pen and paper for writing tasks over CMC technologies because they were not familiar with the technologies (Liu & Sadler, 2003).

Moreover, technology was not always effective because each technology has its own advantages and disadvantages. Process-oriented Forum was often used in pre-writing stages. On the other hand, product-oriented Wikis and Google Docs were used in both writing and post-writing stages. Pre-writing stages include ice-breaking, brainstorming, and discussion. Thus, Forum was used to establish relationships among group members (Díez-Bedmar & Pérez-Paredes, 2012). When different modes of communication were used, they generated different patterns of interaction. The amount of interaction also varied due to the different features in each technology. For example, the chat room in Google Docs was perceived to be more efficient than the Line online chat room in facilitating group collaboration because it provided revision history and tracked all the changes made by group members (Yeh, 2021).

Lastly, technology design matters for an effective learning outcome. In Wu et al.'s study (2015), students could see feedback from experts as well as other students' feedback online. Since many students borrowed comments from experts and peers, students received the same suggestions repeatedly from different peers. This practice was problematic because it prevented students from receiving constructive feedback from diverse perspectives.

***Interpersonal issues.*** Some students hesitate to give comments to their peers because they don't want to offend their classmates or jeopardize their friendships. If students are close, they become more cautious about creating unnecessary tension. Therefore, familiarity influences group dynamics and performance in collaborative writing (Li & Zhu, 2013; Vorobel & Kim, 2017; Wu et al., 2015). Cultural difference is also one of the factors associated with students feeling reserved and being less active in giving peer reviews (Vorobel & Kim, 2017). Although this issue is just briefly mentioned in one of the selected articles for this review study, there are studies that showed international students' struggles with cultural adaptation, feelings of othering, and the impact of such feelings on their engagement in collaborative learning activities such as online discussions (Choi, 2015; Choi et al., 2021; Öztok, 2016; Phirangee & Malec, 2017).

Another challenge relates to students' different levels of English proficiency. Students with relatively high proficiency usually hold more power than those who are less proficient, and high-proficiency students often dominate the narrative of the writing product as representative of the entire group (Wu et al., 2015). Students with relatively low proficiency tend to be reserved and more cautious about making comments because they are not confident in their English ability (Vorobel & Kim, 2017). Students also perceive that feedback from their counterparts is of low quality, preferring feedback from experts to feedback from their peers (Li & Zhu, 2013; Wu et al., 2015).

For various reasons, group members participate in joint writing tasks with different levels of contribution (Alghasab & Handley, 2017; Li & Zhu, 2013). There are leaders who contribute

more than their shares. There are also team players who actively collaborate and contribute to the team's work. Lastly, there are always passive participants, free riders, or social loafers who rarely contribute to group works (Arnold et al., 2012; Levrai & Bolster, 2019). However, interaction patterns and group dynamics vary depending on group composition. For example, Li and Zhu (2013) compared group dynamics (mutuality and equality in this study) among three small writing groups that had different characteristics (e.g., gender, English proficiency, familiarity, class standing) and found these factors shaped the dynamics differently.

Finally, students' age and level of education must be taken into consideration, as students at different levels of education engage in computer-mediated collaborative writing in different ways. In general, university students utilize the technology more than primary and secondary school students. They post and write more frequently on discussion boards, and older students also focus more on organization and idea presentation than on grammar and spelling. It is noticeable that primary school students rarely focus on group coordination. A single author is prevalent among primary school students (Du et al., 2016).

### **Discussion and Implications**

Many studies showed that CMC technologies provide a positive impact on L2 students' performance in collaborative writing projects (Kessler et al., 2012; Wu et al., 2015; Yen et al., 2015; Zou et al., 2016). The latest Web 2.0 technologies provide cutting-edge features allowing effective and efficient learning through social interaction (Kessler et al., 2012; Wu et al., 2015; Zou et al., 2016). This social interaction helps students improve their writing skills, communication skills, and critical thinking skills (Levrai & Bolster, 2019; Vorobel & Kim, 2017; Wu et al., 2015; Yen et al., 2015; Zou et al., 2016). However, not all findings were consistent due to the technological and interpersonal issues inherent to collaborative activities. CMC technologies have their own limitations despite multiple benefits and advantages. Interpersonal issues due to differences in age, gender, personality, culture, English proficiency, and relationship between group members create different dynamics in knowledge co-construction activities for collaborative writing tasks (Li & Zhu, 2013; Vorobel & Kim, 2017).

#### ***Careful selection, design, and training of CMC technologies***

Some implications based on the findings from this review can be applied to improve L2 learners' motivation and performance in computer-mediated collaborative writing. In terms of technology, it is important to select the right CMC tools, as each technology has its own advantages and disadvantages. Combining CMC technologies with face-to-face interaction needs to be considered for L2 learners because of the importance of nonverbal communication in language learning. Either classroom discussion or online discussion using synchronous communication tools can be useful in the pre-writing stages to establish social bonds among group members. Additionally, the CMC interface must be carefully designed to make collaborative writing effective. For example, peer review or team interaction can be restricted to group members, or it can be open to everyone for vicarious learning within a course. Anonymous peer review should be considered if instructors think it would better facilitate students' active participation. Asian students often hesitate to give honest feedback to their unfamiliar counterparts (Wu et al., 2015). Therefore, anonymity in CMC could elicit more participation and effective critique from those students. Technological training and assistance before and during the class is essential for both teachers and students to help familiarize them with CMC technologies. If students feel confident



and comfortable using technologies, they will actively participate in computer-mediated collaborative writing tasks (Kessler et al., 2012; Wu et al., 2015; Zou et al., 2016).

### ***Group composition for mutual scaffolding and active participation***

When designing collaborative writing groups, instructors need to consider both member and group attributes (Maqtary et al., 2019; Yang et al., 2020). For example, member attributes include age, gender, personality, and English proficiency. Group attributes include homogeneity and familiarity. In forming groups for collaboration, familiarity among group members is important for mutual support in collaborative writing (Wu et al., 2015). This does not mean that students must have prior close relationships with each other to be successful in a team. Rather, it indicates that developing positive rapport and building trust among group members before starting collaborative works is a critical factor in successful collaborative learning. More importantly, instructors should pair students for peer review and form groups for collaborative writing considering different levels of students' English proficiency. For collaborative scaffolding, a heterogeneous group in terms of English ability sounds desirable. However, this needs more investigation using an experimental design. In the meantime, the researcher suggests that instructors should train students to give constructive feedback, focusing on content more than form, based on a rubric. This is because many L2 learners are not confident in their English and are consequently reluctant to give feedback to their peers. Providing training and concrete criteria in the form of a rubric would empower these learners to engage more confidently as reviewers.

To prevent passive participation and free riders, instructors should continue to check in with groups to ensure there is equal and mutual teamwork going on. Setting clear guidelines for collaborative writing activities and reflecting peer reviews and collaborative writing into final grades are important because most students participate in course activities to receive a good grade (Dennen, 2005). In other words, students are usually extrinsically motivated. Finally, students in different educational levels require different instructional designs for collaborative writing (Du et al., 2016). Primary school students are not good at communicating and coordinating for collaboration. These students require more help, intervention, and monitoring from instructors.

### **Limitations and Future Research**

This study is not exhaustive because it reviewed only 15 articles from 2010 to 2022. Participants were English L2 learners but did not include L2 learners for other languages except in two studies where a language exchange program was investigated. Therefore, more thorough investigation into collaborative writing for various L2 learners would be beneficial. This includes experimental studies based on different levels of students' English proficiency and studies based on different group compositions. Collaborative writing using CMC technologies is important not only for L2 learners but also for students in general as more and more activities are occurring online after the pandemic. Students now often participate in online discussions for knowledge co-construction and write papers in groups using CMC technologies such as Wikis and Google Docs. Therefore, future studies about collaborative writing in online group projects or peer review activities would provide useful insights for online instructors and instructional designers.

## Conclusion

Computer-mediated collaborative writing provides many benefits for L2 learners. However, there are also challenges pertaining to use of the technology itself and to the interpersonal nature of participating in collaborative activities. Many studies selected for this research synthesis revealed that collaborative writing using CMC technologies increased L2 students' motivation and writing performance. However, these studies also suggest that the benefits can be achieved only if technological limitations and interpersonal issues are overcome through the careful selection and implementation of CMC technologies and with well-designed peer review or small group activities for collaborative writing tasks. The findings and implications from this study on collaborative writing using CMC among L2 learners can be applied to any online courses that use CMC technologies for collaborative writing projects.

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