Farahian and Ebadi *Research and Practice in Technology Enhanced Learning* (2023) 18:5
https://doi.org/10.58459/rptel.2023.18005

Research and Practice in Technology Enhanced Learning

RESEARCH Free and Open Access

Collaborative digital writing and metacognitive knowledge in writing among TEFL students: the mediating role of online knowledge sharing

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Abstract

Previous studies indicate that metacognitive knowledge has a key role in learning and that collaborative learning and knowledge sharing may affect learners' metacognition. As such, the present study set out to test a structural model of teaching English as a foreign language (TEFL) students' collaborative digital writing, online knowledge sharing, and metacognitive knowledge in writing, and specifically to examine the hypothesis that online knowledge sharing mediates the effect of collaborative digital writing and metacognitive knowledge in writing. With the participants of 102 Iranian TEFL undergraduate students, a structural equation modeling (SEM) was employed to establish the structural model. The findings revealed the fitness of the structural model of relationships among the study variables. The results also confirmed the mediator role of knowledge sharing. The implications of the findings about knowledge sharing, attitude to collaborative digital writing, and metacognitive knowledge in writing are discussed.

Keywords: Online knowledge sharing, Attitude to collaborative digital writing, Metacognitive knowledge in writing, TEFL students

Introduction

Collaborative learning has long been regarded as an efficient strategy for learning. It involves "a community of learners and teachers, where members acquire and share an experience or knowledge" (Zhu, 2012, p. 128). Over the last decade, a large array of studies has been published on the use of collaborative learning in educational settings and foreign language (FL) education (see Oxford, 1997). Meanwhile, recent studies have shown that technologies such as Web 2.0 may provide an effective collaborative learning community (Ali et al., 2018; Ghazal et al., 2018). These technologies can also provide interaction

among learners and consequently result in students' reflectivity and knowledge sharing (Aldoayan et al., 2019; Plisorn & Piriyasurawong, 2019). This, by itself, may contribute to all language skills, especially FL writing that an (English as a foreign language) EFL learner is going to acquire.

The concept of collaborative learning is some way affiliated with Vygotsky's notion of the zone of proximal development (ZPD), which refers to "the distance between the actual developmental level … and the level of potential development … under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978, p. 86). FL writing research has provided significant insight into the usefulness of interaction and knowledge construction (Mirzaei & Eslami, 2013; Storch & Wigglesworth, 2007; Wigglesworth & Storch, 2009). Research has pointed out that peer reviews in FL writing have some benefits such as promoting fluency, drawing attention to form, eliminating psychological barriers and developing analytical or critical skills (Kuiken & Vedder, 2002; Leki, 1993; Nixon & Topping, 2001). Based on the theoretical framework of sociocultural theory (SCT), we can assume that learners' participation in FL writing may help them improve their ZPD and, as a result, grow their metacognitive knowledge in writing that orchestrates their cognitive functioning. Additionally, it seems that the mediating role of the knowledge sharing in the relationship between collaborative digital writing and metacognitive knowledge in writing has not been well-addressed in education in general and in TEFL educational system in particular. To partially address these gaps, the current research was set to explore the relationship between attitude to collaborative digital writing and online knowledge sharing; the relationship between online knowledge sharing and metacognition in writing; and the mediating role of the students' online knowledge sharing in the relationship between attitude to collaborative digital writing and metacognitive knowledge in writing.

Purpose of the study

Collaborative learning in general and collaborative writing, in particular, are highly significant issues in education. Collaborative writing is one example of sharing knowledge where students share and construct knowledge as they develop content (Dubé et al., 2006; Parker & Chao, 2007). Reflection, knowledge sharing and critical thinking develop in such collaboration (Sukirman, 2016). What is more fascinating in this regard is the rapid growth of online technologies such as Web 2.0 that have generated new possibilities to co-construct knowledge through interaction during the process of writing. Web 2.0 technologies can transform and support learning (Ebadi & Rahimi, 2018). They provide collaborative editing tools for writers and facilitate new forms of interaction between them (Ebadi & Rahimi, 2017). Since they support the processes and contexts of learning, they provide opportunities for collaboration, participation and practice, and knowledge

construction (Burden, 2012). This is aligned with the view that communication tools can affect knowledge construction and sharing (Veerman & Veldhuis-Diermanse, 2001).

As to the possible impact of knowledge sharing on metacognition, it has been argued that knowledge sharing may impact students' higher-order thinking (Alblehai & Umar, 2016; Ricci, 2009). Such a speculation gains support from the literature (Lipman, 1991), which proposes that social interaction and scaffolding affect learners' mental development and higher-order thinking (Vygotsky, 1978). This comes as no surprise since scaffolding as guided support provided to the novice learner facilitates second language learning and takes place within the learner's ZPD that is "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance" (Vygotsky, 1978, p.86). As the consequence of such an aid to the learner, cognitive development occurs.

Although there have been speculations about the impact of collaborative learning on knowledge construction (e.g., Dubé et al., 2006) and the impact of knowledge sharing on learners' higher-order thinking (e.g., Ricci, 2009), to the researchers' knowledge, no study has investigated the possible relationship between the three variables, namely, attitude to collaborative digital writing. Additionally, it seems that the construct of collaborative digital writing has not been well-addressed in TEFL educational system in particular. Collaborative digital writing by using different features of Google Docs such as highlighting and editing and at the same time receiving help from peers is rooted in social constructivism which is in turn in harmony with Vygotsky's SCT (Fosnot & Perry, 2005). To address this research lacuna, the following hypotheses were proposed:

H1. There is a significant relationship between attitude to collaborative digital writing and online knowledge sharing.

H2. There is a significant relationship between online knowledge sharing and metacognition in writing.

H3. TEFL students' online knowledge sharing mediates the relationship between attitude to collaborative digital writing and metacognitive knowledge in writing.

Literature review

Online knowledge sharing

Knowledge management is defined as "the process of collecting, managing and sharing ... knowledge in an organization" (Bojarajo, 2005, p. 37). Individuals use knowledge management to "create, share, and apply knowledge to achieve their strategic and operational goals" (North & Babakhanlu, 2016, p. 211). As an important subset of knowledge management, knowledge sharing "is the acquisition, organization, reuse and transfer of experience-based knowledge and making that knowledge available to others"

(Lin, 2007, p. 27). Knowledge sharing makes the experience-based knowledge available and transmits it to other members. Hence, as Khalil (2012, p.44) puts it, "knowledge sharing is about connection not collection". Such a view draws on the social aspect of knowledge sharing. An organization's chances of survival are enhanced through efficient knowledge sharing (Argote et al., 2003). In educational settings, the effectiveness and ultimate success and collaborative learning approach to a great extent are contingent upon students' cognition of knowledge sharing with their peers. Some examples of collaborative learning activities which require active knowledge sharing are pair and group problem solving, team projects, face-to-face and online discussions. If these activities are properly integrated into instructional design, they could result in more interesting, interactive and engaging learning (Majid & Wey, 2009). Various studies have evidenced that interactive engagements promote students' learning outcomes (Baleni, 2011; Fredlund et al., 2012).

On the other hand, ever-growing online networks may facilitate such a purpose since nowadays, various technologies have been employed to support creating, organizing access and using intellectual assets (Nassuora, 2011). The utilization of information technology has a fundamental role in knowledge sharing (Davenport & Prusak, 2000) and the growth of knowledge management has been closely linked to information technology (Chumer et al., 2000). Besides, the outbreak of the COVID-19 pandemic has hastened the prevalence of virtual education throughout the world. In Iran, the government has implemented the closure of all schools, colleges, and universities to prevent the transmission of the COVID-19. Hence, the ministry of education has run online classes and face-to-face classes were replaced by online courses. Teachers and students have been encouraged to take part in these courses.

Although social media has been widely used in the country and the new technologies have been integrated into education for years, the situation, as Murphy (2020) called it, turned to be 'emergency e-learning.' Hodges et al. (2020) defined emergency e-learning as "the temporary shift of instructional delivery to an alternate delivery mode due to crisis circumstances" (p. 6). Consequently, many Iranian teachers and students who were accustomed to face-to-face classes have to rely on online courses as their only choice to teach and learn, so they have difficult days in their careers (Badrkhani, 2021). It seems that it is likely to predict the exact time of the pandemic (Ebadi et al., 2020); nevertheless, such an opportunity, if properly utilized, can turn into valuable assets to the educational systems and for students to get involved in collaborative learning ad knowledge sharing if genuine and timely decisions are made.

Collaborative digital writing

Collaboration has always been regarded as an important strategy in learning (Bruffee, 1987). Collaborative learning is attributed to "tasks that require joint intellectual efforts

among students or between students and teachers" (Chu & Kennedy, 2011, p.2). This means that students work in groups to co-construct a task (Smith & MacGregor, 1992). This involves social and intellectual interaction in the learning process so that learners' differences in knowledge, skills, and attitudes turn to be their strengths rather than weaknesses (Chu & Kennedy, 2011).

The emergence of Web 2.0 technologies has shown promise in facilitating collaboration. They have heralded improvement in communication, collaboration, and information sharing (Chu & Kennedy, 2011). Web 2.0 technologies have gained increasing popularity in educational environments. Among the technologies, some online collaborative writing tools, like Google Docs, have been integrated into teaching and learning settings. Among other benefits, accessibility, ubiquity, low cost, and ease of use have made Web 2.0 technologies more popular than traditional software (Ajjan & Hartshorne, 2008). The use of several online collaborative writing tools has been integrated into educational environments. Google Docs is a tool developed by software designers to be used by anyone who can work with a word processor like Microsoft Word. Even some Web 2.0 technologies can come to the aid of less proficient learners who wish to get help from more proficient ones. Google Docs encourages online collaboration by providing learners with single-user space. One who works with this online tool can either synchronously or asynchronously edit a single document (when the document is shared with him/her). This can take place on different smartphones and/or computers. The distinguishing feature of Google Docs is its collaborative editing feature that makes it an efficient program to develop and facilitate collaborative writing among the students and/or between the teacher and students (Sharp, 2009). If the teacher and students are online, they can simultaneously view and edit the writing in the document, and if they are offline, they can store their writing and edit and revise it later (Yang, 2010). This is where the notion of scaffolding deeply rooted in SCT of Vygotsky (1978) comes into play.

SCT is viewed as an approach that has had great effect on the field of education. In SCT, learning is considered a social event that occurs in an interaction between the learner and his/her environment. The theory is originated in the work of psychologist L.S. Vygotsky (1978, 1986). Vygotsky underlined the link between the individual's psychological development and the social contexts (Alharbi, 2019). Vygotsky believed that the process of developing learning is dependent on social interaction and that social learning actually leads to cognitive development. This theory lends support to the establishment of providing opportunities for students to collaborate with their peers and teachers and by doing so, construct knowledge. As he argues, the development of human cognitive ability moves from the inter-psychological plane to the intra-psychological plane with language's help. Based on Lantolf and Thorne (2007), Vygotsky mainly highlights the importance of

interactions within the social context in cultivating human cognition. For him, learning happens through interaction and subsequent negotiations of meaning among individuals.

Although studies on scaffolding have largely attributed much of its success to the (more) capable human partner(s), scaffolded instruction through technological facilities is relatively new. As Goda et al. (2013) note, "Computer-Supported Collaborative Learning (CSCL) help the individual acquire higher-level cognitive thinking skills and adopt the constructivism, socio-cognitive, and situated-leaning theories" (p. 1). Accordingly, teachers use collaborative language learning activities employing computer-mediated communication (CMC). CMC can have two modes, namely synchronous versus asynchronous. While in asynchronous computer-assisted language learning (CALL) programs, people communicate in a delayed fashion via computer via offline modes, such as email; in a synchronous CALL environment, learners can contact in real via chat or chat discussion software, with all participants at the same time. Both of the modes of CMC can be adopted to help EFL students promote their language learning abilities.

Metacognitive knowledge in writing

During the past forty years, various attempts have been made to develop the theory of metacognition. Flavell (1979) was among the first scholars who proposed a definition for the concept of metacognition. As Flavell (1987) suggested, metacognitive knowledge is "the part of one's acquired word knowledge that has to do with cognitive (or perhaps better, psychological) matters" (p. 21). He postulated that metacognition has four subscales, including metacognitive knowledge, metacognitive experience, goals and strategies. In the same line, Paul (1993) defined metacognition as "thinking about your thinking while you are thinking to make your thinking better" (p. 91). Later on, researchers (Brown et al., 1983; Schraw & Dennison, 1994; Schraw & Moshman, 1995) hypothesized two dimensions for the concept of metacognition, namely knowledge of cognition (i.e., what one knows about cognition) and regulation of cognition (i.e., how one uses that knowledge to regulate cognition). It has been suggested that metacognition has a key role in learning a second language (Flavell, 1979) and that successful second language learners effectively use knowledge (Wenden, 1998). As for writing skills, it has been found that successful writers make effective use of metacognitive strategies (Farahian & Avarzamani, 2018; Flavell, 1979; O'Malley & Chamot, 1990; Wenden, 1998). In this regard, Kasper (1997) found that second language writing achievement positively correlates with three metacognitive variables: person knowledge, task knowledge, and strategy knowledge. Victori (1999) reported that among the strategies used by effective language writers are metacognitive knowledge and that these "informed decisions guide the choice of those strategies that best suit the demands, purposes, and constraints of the task" (p. 538). In the same vein, Devine (1993) argued that metacognition is more crucial than linguistic competence.

Collaborative digital writing, online knowledge sharing and metacognitive knowledge in writing

As Confucius stated in 450 BCE (Larkley & Maynhard, 2008, p. 86) 'Tell me and I will forget. Show me, and I may remember. Involve me, and I will understand'. This highlights the social constructivist theory that considers learning to be a social activity (Vygotsky, 1978). Meanwhile according to constructivism 'knowledge is individually constructed and socially co-constructed by learners based on their interpretations of experiences in the world' (Jonassen, 1999, p. 217). This means that cooperative and collaborative learning has a decisive role in learning.

Collaborative writing has been considered as collaborators producing a shared document by engaging in interaction and sharing knowledge for it. This has been facilitated by the development of technology that enables collaborative writing to take place in digital format, collaboratively, even concurrently.

In such a collaboration – which may have one of different types of writing processes such as co-authoring, peer editing, joint editing and revision or collaborative document planning (Suominen & Jussila, 2018), knowledge sharing and higher-order thinking develop (Sukirman, 2016). The use of online technologies may facilitate co-construction of knowledge. Web 2.0 technologies can transform and support learning (Ebadi & Rahimi, 2018) since they provide individuals with collaborative editing tools and facilitate new forms of interaction (Ebadi & Rahimi, 2017). It is expected that with the help provided to support the processes and contexts of learning, online technologies promote and improve collaboration, participation, and knowledge construction (Burden, 2012). Accordingly, communication tools can facilitate knowledge construction and sharing (Veerman & Veldhuis-Diermanse, 2001).

No study has investigated the possible relationship between knowledge sharing and metacognition; however, to the researchers' knowledge, only Cavic et al. (2019) explored the relationship between cooperative learning and metacognition. They reported that based on the findings there was a statistically significant correlation between the use of cooperative methods and metacognition. Despite the scarcity of research in this area it has been postulated that knowledge sharing may have effect on individuals' higher-order thinking (Alblehai & Umar, 2016; Ricci, 2009). This is in line with the social constructivism which states that social interaction impacts learners' mental development (Vygotsky, 1978).

Methodology

Design

The present study employed a quantitative and correlational design to address the research hypothesis. Quantitative data were collected through three questionnaires and then analyzed using descriptive and inferential statistics.

Participants and setting

The participants were 102 undergraduate TEFL students who had enrolled in a two-credit writing course at three private universities in the west of Iran. In general terms, the course aimed to develop students' ability to write paragraphs. These universities were chosen because in the wake of COVID 19 all courses were online. Three teachers as the instructors, were given detailed training on how to conduct the courses. Meanwhile, all students were ascertained that their data would be confidential. Informed consent was obtained from the participants and they were assured that their personal information would remain confidential.

Instruments

The instruments used in the study were as follows:

The DIALANG test

The DIALANG test as an online Web-based assessment tool was used to assess the proficiency level of the participants. The test assesses all language skills and reports the results in levels from A1 to C2. The results of the test for the participants of the present study indicated that they were either at B1 or B2 level.

TEFL students' attitudes towards collaborative digital writing

Following Wang (2014), we designed a survey which was based on a 5-point Likert scale to probe the TEFL students' attitudes and experiences towards collaborative digital writing. There were 15 items with four subscales, namely, instructional, interactional, reflective, and affective in the scale. The items were developed based on the related literature (Al-Chibani, 2016; Fathi et al., 2021; Gillow-Wiles & Niess, 2015; Ishtaiwa & Aburezeq, 2015; Rabu & Badlishah, 2020; Zhou et al., 2012). A 5-point Likert scale ranging from strongly disagree to strongly agree used in the questionnaire. After the first draft of the scale with 20 items was developed, four experts were asked to review the items. After that, necessary revisions were made on the scale and two items were removed. Then, exploratory factor analysis was run. Since the results of Kaiser-Meyer-Olkin (KMO) 0.62 was not satisfactory,

we removed three items that suffered low levels of factor loading (below 0.50) and reran factor analysis. This time the KMO increased to 0.79, above the recommended value of 0.60. A significant result for Bartlett's Test of Sphericity (χ^2 (665) = 2568.27, p = 0.000 < 0.05) was also obtained. A principal component factor analysis with Varimax rotation was run whose results revealed that all items had acceptable loadings. There remained 15 ones which created the final draft of the scale. As the final step, the reliability was estimated in order to make sure whether the items elicited consistent responses. Based on Cronbach α and finally found to be adequate (.82).

Metacognitive writing questionnaire (MWQ)

The instrument was developed by Farahian and Avarzamani (2018). As the authors reported, the theoretical framework for developing the scale was Flavell's (1987) and Wenden's (1998). The questionnaire includes 34 items on a 4-point Likert scale (ranging from strongly disagree to strongly agree) with three subscales: person, task, and strategic knowledge.

Students' online knowledge sharing behavior

To explore TEFL students' online knowledge sharing behavior, we employed the scale developed by Farahian et al. (2022). The scale is originally developed by Wangpipatwong (2009) and is based on the related literature (Andersson, 2000; Awad & Ghaziri, 2004; Lin, 2007; Van den Brink, 2003). Since the original questionnaire was for face-to-face courses some modifications were made in the scale; and items 13, 14, 17, and 18 were also replaced to suit online courses. There are 21 items in the scale using a 5-point Likert ranging from "Strongly Disagree" to "Strongly Agree". The subscales include willingness to share, ability to share, instructor support, degree of competition, technology availability, technology support, and knowledge sharing.

To ensure the appropriateness of the questionnaires, a pilot study was conducted with some students. After the pilot study necessary revisions were made.

Based on Table 1, Cronbach's alpha coefficient was used to estimate the reliability of the questionnaires.

Table 1 The result of Cronbach's alpha

Questionnaires	Constructs	Number of questions	Cronbach's alpha	Total
Google Docs	Instructional	4	.808	.889
	Interactional	3	.720	
	Reflective	5	.886	
	Affective	3	.776	
Knowledge sharing behavior	Willingness to share	3	.927	.718
	Ability to share	3	.890	
	Instructor support	3	.880	
	Degree of competition	3	.927	
	Technology availability	3	.898	
	Technology support	3	.906	
Metacognitive knowledge in writing	Person knowledge	12	.815	.866
	Task knowledge	8	.894	
	Strategic knowledge	7	.831	

Data collection and data analysis procedure

We conducted the study in Iran during the first term of the 2020–2021 academic year. The population included 120 undergraduate TEFL students from three private universities. To determine the proficiency level of the participants the DIALANG test was employed. Of 120 TEFL students, 18 were excluded from the study since their proficiency levels were lower or higher than the other participants.

As already explained, the teachers practiced collaborative writing using Google Docs in the three classes. To do so, the students were put into pairs and all students were required to hand in a draft. A week time was given to them to complete and turn in the assignments. To be more specific, they were required to submit the drafts online, sending the assignment from Google Docs to the teachers' email. The suggested activities can be found in Table 2.

It is noteworthy that if the first drafts prepared by the students were carelessly prepared, or severe grammatical mistakes were found, the student was asked to do necessary revisions. As Table 2 illustrates, each participant was asked to write a paragraph on a prespecified topic suggested by the teacher.

The data for the study was collected through three questionnaires. Because of the COVID-19 lockdown, we did not have direct access to participants as such questionnaires were distributed via Google Forms. Then, the data derived from Google Forms were uploaded to SPSS 23 for analysis.

A structural equation model of three latent variables (attitude to collaborative digital writing, online knowledge sharing, and metacognitive knowledge in writing) was developed to analyze data.

Table 2 Stages of the treatment

Stages of treatment	Details
1	A weekly 1.30-hour online lesson was held on Saturdays. All students were required to write a paragraph on a prespecified topic.
2	The students were required to immediately upload the paragraphs on Google Docs.
3	In two days' time, students received general feedback from the teacher to make sure if they were on the right track. a. If found satisfactory, they proceeded to the next stage. b. If not satisfactory, they were asked to redo the process based on the general comments.
4	a. Following the previous stage, the pairs were asked to reflect upon the text written by the groupmates and do necessary revisions. b. Since Google Docs allows students to communicate on the same page, each student was required to write some suggestions on the draft prepared by the groupmate. All comments and revisions were in a different font color. c. After the suggestions and comments, the students were asked to immediately chat on the page in case of any disagreement or ambiguity.
5	The teacher monitored activities on Google Docs.
6	At the end of the week, the students emailed the texts to the teacher.

Results

The demographic characteristics of respondents showed that the participants included 84 (82.35%) males and 18 (17.65%) females.

H1. There is a significant relationship between attitude to collaborative digital writing and online knowledge sharing.

As shown in Table 3, we found that all the instructional, interactional, reflective, and affective variables were statistically significant to 0.01 level and had a positive linear relationship with each other.

H2. There is a significant relationship between online knowledge sharing and metacognition in writing

Table 3 Correlation matrix

	Knowledge sharing	Instructional	Interactional	Reflective	Affective	Total (Google Docs)
Knowledge sharing	1					
Instructional	.485** .000	1				
Interactional	.499** .000	.045 .656	1			
Reflective	.380** .000	-.063 .527	.456** .000	1		
Affective	.490** .000	.203* .040	.506** .000	.277** .005	1	
Total (Google Docs)	.256** .009	.172 .083	.507** .000	.488** .000	.568** .000	1

*. Correlation is significant at the 0.05 level (2-tailed); **. Correlation is significant at the 0.01 level (2-tailed).

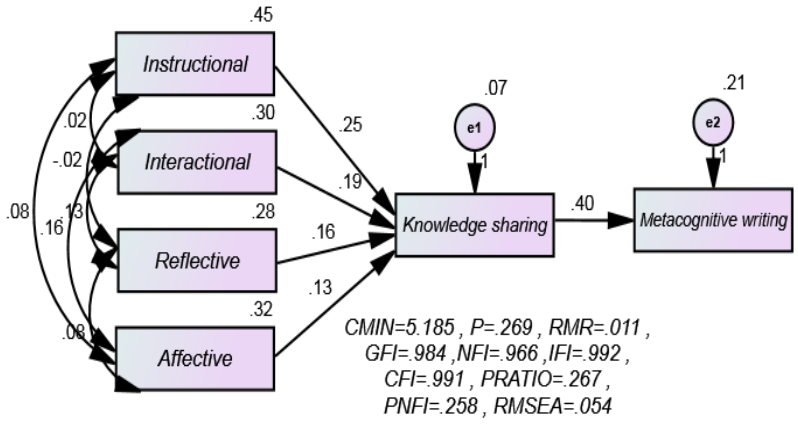

Fig. 1 End model

As illustrated in Table 4, it was found that knowledge sharing and metacognitive writing were statistically significant to 0.01 level and had a positive linear relationship with each other.

H3. TEFL students' online knowledge sharing mediates the relationship between attitude to collaborative digital writing and metacognitive knowledge in writing.

A structural model was used to answer the third question. The results of this test are shown in Figure 1. Also, Table 4 presents the summarized result of fit indices.

According to Table 5, the results show except for the index RMSEA = .054, all model indices fit well. The researchers decided to employ the bootstrapping method to test the direct effects of each factor on the knowledge-sharing variable. Table 6 shows the results.

Bootstrapping is further utilized to confirm the result of the path analysis, which indicates that knowledge sharing has a mediating effect on metacognitive writing. Table 7 reveals the bootstrapping results.

Table 4 Relationship between knowledge sharing and metacognitive writing

Variable	N	r	Sig.
Knowledge sharing and Metacognitive writing	102	.311**	.001

**. Correlation is significant at the 0.01 level (2-tailed).

Table 5 Summary of model fit indices

Index name	CMIN/DF	GFI	AGFI	RMR	NFI	CFI	IFI	RMSEA
Acceptable fit	<3	>.90	>.90	<.05	>.90	>.90	>.90	<.05
Fitting adequacy value	1.296 (p = .269)	.984	.914	.011	.966	.991	.992	.054

Table 6 Regression weights (mediation effect)

			Regression Weights	Standardized Regression Weights			
			Estimate	Estimate	S.E.	C.R.	p
Knowledge sharing	<---	Instructional	.250	.447	.039	6.411	***
Knowledge sharing	<---	Interactional	.189	.276	.058	3.257	.001
Knowledge sharing	<---	Reflective	.162	.228	.054	2.981	.003
Knowledge sharing	<---	Affective	.130	.195	.054	2.428	.015
Metacognitive writing	<---	Knowledge sharing	.401	.311	.122	3.292	***

Table 7 Decomposition of effects for model

Predictor	Criterion	Direct effects	Indirect Effect	Total Effect
Instructional	Knowledge sharing	.250	.000	.250
Interactional	Knowledge sharing	.189	.000	.189
Reflective	Knowledge sharing	.162	.000	.162
Affective	Knowledge sharing	.130	.000	.130
Knowledge sharing	Metacognitive writing	.401		.401

Based on Table 7, the total effect of each variable on knowledge sharing is gained by adding indirect and direct effects. In this research, the total effect of instructional on knowledge sharing (.250) is calculated as follows: direct effect + indirect effect (.250+.000= .250). In terms of the total effect, perceived level of instructional was identified as the most influential variable on knowledge sharing. Other cases were calculated in the same way. Thus, results showed knowledge sharing had a mediating effect in the relationship of collaborative digital writing and metacognitive knowledge in writing.

Discussion and conclusion

The purpose of the present study was to investigate the intervening effect of attitude to online knowledge sharing on the relationship between EFL learners' attitude to collaborative digital writing and metacognitive knowledge in writing. Accordingly, three research hypotheses were proposed. The first hypothesis proposed that there is a significant relationship between attitude to collaborative digital writing and online knowledge sharing. The findings supported the hypothesis.

The idea of technology-supported knowledge distribution is a controversial issue (McDermott, 1999). On the one hand, some researchers argue that we cannot rely on technology to share and distribute knowledge (e.g., Malhotra, 2000) since technology by itself "does not turn a knowledge hoarding organization into a knowledge sharing one" (Mohamed et al., 2006, p.107) and should only be regarded as an opportunity to change individuals' behavior. On the other hand, the opposite view suggests that knowledge management systems are essential for the knowledge management process (Alavi & Leidner, 2001). In the same line, it has been argued that collaborative learning results in

co-construction of knowledge (Jeong & Chi, 1997). The findings are in line with Sukirman (2016) who notes that collaboration in writing may promote knowledge sharing. The finding also corroborates with Krumova and Milanezi (2014) since, as they suggest, the process of knowledge sharing can be improved by collaboration technologies such as Web 2.0. Similarly, Ansari and Khan (2020) who examined the usefulness and application of social media in transferring the resources and interaction among students, reported that online social media significantly impacted students' interactivity with teachers, peers, and online sharing of knowledge. In the same line, DeWitt et al. (2014) found that students get involved in knowledge sharing during the collaborative writing process. Cain (2008) also argues that Web 2.0 technology prepares the condition for students to interact with peers, share the contents, and helps with building connections. This cast light on the importance of technology as one of the most effective assets in cultivating a knowledge-sharing culture among students. Perhaps, technology helps remove communication barriers and improves the ease and efficiency of knowledge transfer.

Based on the results, it was also found that there is a significant relationship between attitude to online knowledge sharing and metacognition in writing.

The finding partially supports Farahian and Parhamnia (2022) who reported that knowledge sharing through social media promoted EFL teachers' reflectivity. In the same vein, the finding is in tandem with Indrašienė et al. (2021) who studied the relationship between critical thinking and knowledge management and found a positive relationship between the two constructs. The study's findings can also be explained in the light of Vygotsky's (1978) ZPD theory in that students get to share knowledge and receive help from their peers can help each other move from their actual level to the level of potential development. Another reason for the study's findings may be attributed to the role of Google Docs as a Web 2.0 technology. This was the context in the present study where knowledge sharing took place. In this regard, Roblyer and Doering (2010) note that, "blogs encourage students to think critically when composing and sharing reflections on their coursework and course topics" (p.199). Similarly, Subran (2013) suggests that Web 2.0 tools can support problem solving skills, inquiry skills, creativity, critical thinking, and critical reflection. Letchuman et al.'s (2020) finding is in tandem with that of the present study since they explored how information and communication technology (ICT) tools were employed to improve higher-order thinking skills among university students. Based on the results, ICT helped the students understand the concept better and assisted them in communicating and collaborating effectively with other students. Above that, the students' higher-order thinking was promoted. The result is also compatible with the findings of Lee and Lai (2017) who explored whether flipped classrooms can help promote higher-order thinking. The findings revealed that the students accepted the new teaching model and that the flipped classrooms promoted students' higher-order thinking. Nevertheless, these

findings contradict those of Ho and Lam (2016) cited in Lee and Lai (2017) who found that e-learning practices do not improve higher-order thinking.

Regarding the mediating role of online knowledge sharing, the results indicated that the relationship between EFL learners' attitude to collaborative digital writing and metacognitive knowledge in writing was positively significant. In other words, online knowledge sharing has a mediating effect in the relationship between attitude to collaborative digital writing and metacognitive knowledge in writing. This means that students who get involved in collaborative digital writing tend to engage in knowledge sharing, and by doing so, their level of metacognition in writing promotes. Although a few studies have shown the relationship between collaboration and knowledge sharing (e.g., Sukirman, 2016) and knowledge sharing and higher-order thinking (e.g., Sukirman, 2016), no studies have directly examined the relationship between attitude to collaborative digital writing and metacognitive knowledge in writing through online knowledge sharing. The finding comes as no surprise since it can be surmised that students' collaboration to write a text results in their sending and receiving feedback and, as a result construction of knowledge regarding the content, grammar, and mechanics of writing. This process of knowledge construction by itself can lead to the increase at the students' higher-order thinking especially metacognition. This means that they gain knowledge about the process of writing and hence can regulate their writing process. In conjunction with Vygotsky's (1978) social constructivism and Dewey's (1933) concept of practical inquiry which postulates that cognitive development occurs through the social interaction of social presence, it can be argued that collaborative digital writing contributes to students' knowledge sharing which in turn generates a learning community that leads to higher-order thinking and learning.

The result of this study supports the evidence that knowledge sharing processes rooted in collaborative digital writing can contribute to higher-order thinking. As such, online knowledge sharing has a mediating effect in the relationship between attitude to collaborative digital writing and metacognitive knowledge in writing. This has some implications for educational institutions. The first implication is that the emergence of Web 2.0 technologies such as Google Docs instigates major changes in students' collaboration and their higher-order thinking. An EFL course which makes use of Google Docs can offer teachers some benefits. It frees them from the conventional methods of teaching and introduces collaborative writing effectively. As such, TEFL teachers can make use of Google Docs as a tool for students' writing. The second recommendation is for TEFL coursebook developers. They could assign particular pages in the books to pair work assignments which are related to Web 2.0 technologies. Such assignments in the workbooks could encourage students to collaborate and raise teachers' awareness of the efficacy of technology in TEFL.

One of the limitations of the study is related to the small number of participants. In fact, with more participants, the results would be more generalizable. Another limitation was that the participants were chosen only from the west of Iran which does not represent the whole country. The third limitation was that the students were only from private universities.

Further investigations could replicate the present study with participants from both state and private universities since participants' characteristics may differ in these two contexts. Finally, the participants of the present study were undergraduate students with an average of intermediate proficiency. A similar study could be conducted on postgraduate students or students with post intermediate and above proficiency levels.

Abbreviations

CALL: Computer-assisted language learning; CMC: Computer-mediated communication; CSCL: Computer-Supported Collaborative Learning; EFL: English as a foreign language; FL: Foreign language; ICT: Information and communication technology; KMO: Kaiser-Meyer-Olkin; MWQ: Metacognitive writing questionnaire; SCT: Sociocultural theory; SEM: Structural equation modeling; TEFL: Teaching English as a foreign language; ZPD: Zone of proximal development.

Acknowledgements

Hereby we thank the reviewers for their comments that helped us to improve the quality of the study.

Authors' contributions

Dr. Farahian conducted the study and prepared the first draft. Dr. Ebadi revised the text.

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Funding

Not applicable.

Availability of data and materials

Not applicable.

Declarations

Competing interests

The authors declare that they have no competing interests.

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Received: 21 September 2021 Accepted: 5 August 2022
Published: 28 February 2023 (Online First: 17 September 2022)

References

Ajjan, H., & Hartshorne, R. (2008). Investigating faculty decisions to adopt Web 2.0 technologies: Theory and empirical tests. *Internet & Higher Education, 11*(2), 71–80. https://doi.org/10.1016/j.iheduc.2008.05.002

Alavi, M., & Leidner, D. (1999). Knowledge management systems: Issues, challenges and benefits. *Communications of the Association for Information Systems, 1*, 2–36.

Alblehai, F. M., & Umar, I. N. (2016). Web 2.0 tools and the development of cooperative learning and higher order thinking in the Saudi higher education institutions. *International Journal of Internet of Things, 5*(1), 29–36. DOI: 10.5923/j.ijit.20160501.04

Aldoayan, M., Sahandi, R., John, D., & Cetinkaya, D. (2019). *Collaborative cloud-based online courses: Issues and challenges* [Paper presentation]. The 8th International Conference on Educational and Information, Cambridge, United Kingdom.

Alharbi, W. (2019). E-feedback as a scaffolding teaching strategy in the online language classroom. *Journal of Educational Technology Systems, 46(2),* 239–251. https://doi.org/10.1177/0047239517697966

Ali, M. B., Wood-Harper, T., & Mohamad, M. (2018). Benefits and challenges of cloud computing adoption and usage in higher education: A systematic literature review. *International Journal of Enterprise Information Systems, 14*(4), 64–77.

Al-Chibani, W. (2016). *Impact on student motivation of integrating Google Docs within remedial English writing class* [Paper presentation]. The 16th International Conference on Information, Communication Technologies in Education, Rhodes, Greece.

Andersson, K. (2000). *Knowledge technology applications for knowledge management.* http://uu.diva-portal.org/smash/get/diva2:170306/FULLTEXT01

Ansari, J. A. N., & Khan, N. A. (2020). Exploring the role of social media in collaborative learning the new domain of learning. *Smart Learning Environments, 7*(9), 2–16. https://doi.org/10.1186/s40561-020-00118-7

Argote, L., McEvily, B., & Reagans, R. (2003). Managing knowledge in organizations: An integrative framework and review of emerging themes. *Management Science, 49*(4), 571–582.

Awad, E. M., & Ghaziri, H. M. (2004). *Knowledge management*. Pearson Education Inc.

Badrkhani, P. (2021). How a catastrophic situation turns into an exceptional opportunity: Covid-19 pandemic in Iran and challenges of online education for new English language educators. *Interactive Learning Environments.* https://doi.org/10.1080/10494820.2021.1956545

Baleni, Z. (2011). *On-line discussion forums: New platforms to supplement face-to-face professional development at Walter Sisulu University*. Proceedings of the International Conference on E-Learning.

Brown, A. L., Bransford, J. D., Ferrara, R. A., & Campione, J. C. (1983). Learning, remembering, and understanding. In P. H. Mussen (Ed.), *Handbook of child psychology: Cognitive development* (4th ed.). Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.225.4916&rep=rep1&type=pdf

Bruffee, K. A. (1987). The art of collaborative learning: Making the most of knowledgeable peers. *Change: The Magazine of Higher Learning, 19*(2),42–47. https://doi.org/10.1080/00091383.1987.9939136

Burden, K. J. (2012). *Crossing the transformation horizon: Conceptualising teachers' learning and transformations with the affordances of Web 2.0*. Doctoral dissertation, University of Hull. http://www2.hull.ac.uk/ifl/pdf/Burden,%20K%20Complete%20thesis.pdf

Cain, J. (2008). Online social networking issues within academia and pharmacy education. *American Journal of Pharmaceutical Education, 72*(1), 10. https://doi.org/10.5688/aj720110

Cavic, M., Skuban, S., Stojanovic, M., Bogdanovic, I., & Beljin, M. (2019). *Effect of cooperative learning on the development of metacognition*. AIP Conference Proceedings 2075, 180014 (2019). https://doi.org/10.1063/1.5091411

Chu, S. K. W., & Kennedy, D. M. (2011). Using online collaborative tools for groups to co-construct knowledge. *Online Information Review, 35*(4), 581–597.

Chumer, M., Hull, R., & Prichard, C. (2000). Introduction: Situating discussions about knowledge. In C. Prichard, R. Hull, M. Chumer & H. Willmott (Eds.), *Managing knowledge: Critical investigations of work and learning*. MacMillan.

Davenport, T. H., & Prusak, L. (2000). *Working knowledge: How organizations manage what they know*. Harvard Business Press.

Devine, J. (1993). The role of metacognition in second language reading and writing. In J. G. Carson & I. Leki (Eds.), *Reading in the composition classroom: Second language perspectives* (pp. 105–127). Heinle and Heinle.

Dewey, J. (1933). *How we think* (Rev ed.). Heath.

DeWitt, D., Alias, A., Siraj, S., & Zakaria, A. R. (2014). Interactions in online forums: A case study among first-year undergraduate students. *Frontiers in Education, 2*(1), 6–13.

Dubé, L., Bourhis, A., & Jacob, R. (2006). Towards a typology of virtual communities of practice. *Interdisciplinary Journal of Information, Knowledge, and Management, 1*, 2006. http://www.ijikm.org/Volume1/IJIKMv1p069-093Dube.pdf

Ebadi, S., & Rahimi, M. (2017). Exploring the impact of online peer-editing using Google Docs on EFL learners' academic writing skills: A mixed methods study. *Computer Assisted Language Learning, 30*(8), 787–815. https://doi.org/10.1080/09588221.2017.1363056

Ebadi, S., & Rahimi, M. (2018). An exploration into the impact of WebQuest-based classroom on EFL learners' critical thinking and academic writing skills: A mixed-methods study. *Computer Assisted Language Learning, 31*(5-6), 617–651. https://doi.org/10.1080/09588221.2018.1449757

Ebadi, S., Khazaie, S., & Bashiri, S. (2020). Technology acceptance of NAVID learning management system in the Iranian medical English courses under the COVID-19 pandemic. *Journal of English Language Teaching and Learning, 12*(26), 401–433.

Farahian, M., & Avarzamani, F. (2018). Metacognitive awareness of skilled and less-skilled EFL writers. *Asian-Pacific Journal of Second and Foreign Language Education, 3*(10), 1–17. https://doi.org/10.1186/s40862-018-0052-4

Farahian, M., & Parhamnia, F. (2022). Knowledge sharing through WhatsApp: Does it promote EFL teachers' reflective practice? *Journal of Applied Research in Higher Education, 14*(1), 332–346. https://doi.org/10.1108/JARHE-12-2020-0456

Farahian, M., Parhamnia, F., & Maleki, N. (2022). The mediating effect of knowledge sharing in the relationship between factors affecting knowledge sharing and reflective thinking: The case of English literature students during the COVID-19 crisis. *Research and Practice in Technology Enhanced Learning, 17*, 24. https://doi.org/10.1186/s41039-022-00200-3

Fathi, J., Arabani, A. S., & Mohamadi, P. (2021). The effect of collaborative writing using Google Docs on EFL learners' writing performance and writing self-regulation. *Language Related Research, 12*(5), 333–359.

Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive-developmental inquiry. *American Psychologist, 34*, 906–911.

Flavell, J. H. (1987). Speculation about the nature and development of metacognition. In F. Weinert & R. Kluwe (Eds.), *Metacognition, motivation, and understanding* (pp. 21–29). Lawrence Erlbaum.

Fosnot, C. T., & Perry, R. S. (2005). Constructivism: A psychological theory of learning. In C. T. Fosnot (Ed.), *Constructivism: Theory, perspectives and practice* (pp. 8–38, 2nd ed.). Teacher's College Press.

Fredlund, T., Airey, J., & Linder, C. (2012). Exploring the role of physics representations: An illustrative example from students sharing knowledge about refraction. *European Journal of Physics, 33*(3), 657–666.

Ghazal, S., Al-Samarraie, H., & Aldowah, H. (2018). "I am still learning": Modeling LMS critical success factors for promoting students' experience and satisfaction in a blended learning environment. *IEEE Access, 6*, 77179–77201. DOI: 10.1109/ACCESS.2018.2879677

Gillow-Wiles, H., & Niess, M. L. (2015). Engaging Google Docs to support collaboration and reflection in online teacher education. In M. L. Niess & H. Gillow-Wiles (Eds.), *Handbook of research on teacher education in the digital age* (pp. 635–662). IGI Global.

Goda, Y., Yamada, M., Matsuda, T., Kato, H., Saito, Y., & Miyagawa, H. (2013). *Effects of help seeking target types on completion rate and satisfaction in E-Learning*. In L. Gómez Chova, A. López Martínez & I. Candel Torres (Eds.), *Proceedings of 7th International Technology, Education and Development Conference* (pp. 1399–1403). International Association of Technology, Education and Development.

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The difference between emergency remote teaching and online learning. *Educause Review, 27*(1), 1–12.

Indrašienė, V., Jegelevičienė, V., Merfeldaitė, O., Penkauskienė, D., Pivorienė, J., Railienė, A., Sadauskas, J., & Valavičienė, N. (2021). Linking critical thinking and knowledge management: A conceptual analysis. *Sustainability, 13*, 1–17. https://doi.org/10.3390/su13031476

Ishtaiwa, F. F., & Aburezeq, I. M. (2015). The impact of Google Docs on student collaboration: A UAE case study. *Learning, Culture and Social Interaction, 7*, 85–96. https://doi.org/10.1016/j.lcsi.2015.07.004

Jeong, H., & Chi, M. (1997). *Construction of shared knowledge during collaborative learning.* Proceedings of Computer Support for Collaborative Learning: The 2nd International. Conference on Computer Support for Collaborative Learning, Stanford, CA, December 12-15.

Jonassen, D. H. (1999). Designing constructivist learning environments. In C. M. Reigeluth (Ed.), *Instructional design theories and models* II (Vol. 2, pp. 215–239). Lawrence Erlbaum Associates, Inc. Publishers.

Kasper, L. F. (1997). Assessing the metacognitive growth of ESL student writers. *TESL EJ, 3*(1), 1–20.

Khalil, O. E. M. (2012). Knowledge sharing barriers and effectiveness at a higher education institution. *International Journal of Knowledge Management, 8*(2), 43–64.

Krumova, M. Y., & Milanezi, B. D. (2014). Knowledge sharing and collaboration 2.0. *KSI Transactions on Knowledge Society, 7*(4), 51–56.

Kuiken, F., & Vedder, I. (2002). Collaborative writing in L2: The effect of group interaction on text quality. In S. Ransdell & M. Barbier (Eds.), *New directions for research in L2 writing* (pp. 169–188). Kluwer.

Lantolf, J. P., & Thorne, S. L. (2007). Sociocultural theory and second language learning. In B. VanPatten & J. Williams (Eds.), *Theories in second language acquisition: An introduction* (pp. 197–221). Lawrence Erlbaum, Mahwah.

Larkley, J. E., & Maynhard, V. B. (2008). *Innovation in education*. Nova Science Publishers.

Lee, K.-Y., & Lai, Y.-C. (2017). Facilitating higher-order thinking with the flipped classroom model: A student teacher's experience in a Hong Kong secondary school. *Research and Practice in Technology Enhanced Learning, 12*, 8. https://doi.org/10.1186/s41039-017-0048-6

Leki, I. (1993). Reciprocal themes in reading and writing. In J. Carson & I. Leki (Eds.), *Reading in the composition classroom: Second language perspectives* (pp. 9–33). Heinle & Heinle.

Letchumanan, M., Husain, S. K. S., Chau, K. T., & Ayub, A. F. M. (2020). Investigating the use of ICT tools by academicians to promote higher order thinking skills among university students. *Proceedings of the 27th National Symposium on Mathematical Sciences*. https://doi.org/10.1063/5.0019887

Lin, H. F. (2007). Knowledge sharing and firm innovation capability: An empirical study. *International Journal of Manpower, 28*(3/4), 315–332.

Lipman, M. (1991). *Thinking in education*. Cambridge University Press.

Majid, S., & Wey, S. M. (2009). Perceptions and knowledge sharing practices of graduate students in Singapore. *International Journal of Knowledge Management, 5*(2), 21–32.

Malhotra, Y. (2000). From information management to knowledge management: Beyond the 'Hi-Tech Hidebound' systems. In K. Srikantaiah & M.E.D. Koenig (Eds.), *Knowledge Management for the information professional* (pp. 37–61). Information Today Inc.

McDermott, R. (1999). Why information technology inspired but cannot deliver knowledge management. *California Management Review, 41*, 103–117.

Mirzaei, A., & Eslami, Z. R. (2013). ZPD-activated languaging and collaborative L2 writing. *Educational Psychology: An International Journal of Experimental Educational Psychology, 35*(1), 5–25. https://doi.org/10.1080/01443410.2013.814198

Mohamed, M., Stankosky, M., & Murray, A. (2006). Knowledge management and information technology: Can they work in perfect harmony? *Journal of Knowledge Management, 10*(3), 103–116.

Murphy, M. P. (2020). COVID-19 and emergency e-learning: Consequences of the securitization of higher education for post-pandemic pedagogy. *Contemporary Security Policy, 41*(3), 492–505. https://doi.org/10.1080/13523260.2020.1761749

Nassuora, B. A. (2011). Knowledge sharing in institutions of higher learning. *International Journal of Economics and Management Sciences, 1*(3), 29–36.

Nixon, J. G., & Topping, K. J. (2001). Emergent writing: The impact of structured peer interaction. *Educational Psychology, 21*(1), 41–58. https://doi.org/10.1080/01443410123268

North, K., & Babakhanlou, R. (2016). Knowledge management tools for SMES. In K. North & G. Varvakis (Eds.), *Competitive strategies for small and medium enterprises* (pp. 211–222). Springer International Publishing AG.

O'Malley, J. M., & Chamot, A. U. (1990). *Learning strategies in second language acquisition*. Cambridge University Press.

Oxford, R. L. (1997). Cooperative learning, collaborative learning, and interaction: Three Communicative strands in the language classroom. *The Modern Language Journal, 81*(4), 443–456.

Parker, K., & Chao, J. (2007). Wiki as a teaching tool. *Interdisciplinary Journal of Knowledge and Learning Objects, 3*, 57–72.

Paul, R. W. (1993). Critical thinking: Fundamental to education for a free society. In J. Willsen & A. J. A. Binker (Eds.), *Critical thinking: What every person needs to survive in a rapidly changing world* (3rd ed.). Foundation for Critical Thinking.

Plisorn, W., & Piriyasurawong, P. (2019). Model of intelligent cloud learning system to develop digital literacy and collaborative learning skills. *Journal of King Mongkut's University of Technology North Bangkok, 29*(3), 518–526.

Rabu, S. N. A., & Badlishah, N. S. (2020). Levels of students' reflective thinking skills in a collaborative learning environment using Google Docs. *TechTrends, 64*, 533–541.

Ricci, A. F. (2009). *Encouraging critical thinking in distance learning ensuring challenging intellectual programs*. United States Distance Learning Association.

Roblyer, D. M., & Doering, H. A. (2010). *Integrating educational technology into teaching*. Pearson Education Inc.

Schraw, G., & Dennison, R. S. (1994). Assessing metacognitive awareness. *Contemporary Educational Psychology, 19*, 460–475.

Schraw, G., & Moshman, D. (1995). Metacognitive theories. *Educational Psychology Review, 7*(4), 351–371.

Sharp, V. (2009). *Computer education for teachers: Integrating technology into classroom teaching* (6th ed.). John Wiley.

Smith, B., & MacGregor, J. (1992). What is collaborative learning? In A. Goodsell et al. (Eds.), *Collaborative learning: A sourcebook for higher education* (pp. 10–22). National Center on Postsecondary Teaching, Learning, and Assessment.

Storch, N., & Wigglesworth, G. (2007). Writing tasks: The effect of collaboration. In M. Garcia Mayo (Ed.), *Investigating tasks in foreign language learning* (pp. 157–177). Multilingual Matters.

Sukirman. (2016). Using collaborative writing in teaching writing. *Langkawi, 2*(1),33–46.

Subran, D. (2013). *Developing higher order thinking skills with ICT*. https://uwispace.sta.uwi.edu/dspace/bitstream/handle/2139/15701/Developing%20Higher%20Order%20Thinking%20with%20ICT%20Subran.pdf?sequence=1&isAllowed=y

Suominen, A. H., & Jussila, J. (2018). Collaborative writing and knowledge creation in a social media online community. In A. Visvizi, M. D. Lytras & L. Daniela (Eds.), *The future of innovation and technology in education: Policies and practices for teaching and learning excellence* (pp. 95–109). Emerald Publishing Limited, Bingley.

Van den Brink, P. (2003). *Social, individual and technological conditions that enable knowledge sharing*. PhD Thesis. Universiteit van Amsterdam.

Veerman, A., & Veldhuis-Diermanse, E. (2001), Collaborative learning through computer-mediated communication in academic education. In P. Dillenbourg (Ed.), *Proceedings of the 1st European Perspectives on Computer-Supported Collaborative Learning: European Conference on Computer-Supported Collaborative Learning* (pp. 625–632). Maastricht University, Maastricht.

Victori, M. (1999). An analysis of writing knowledge in EFL composing: A case study of two effective and two less effective writers. *System, 27*, 537–555.

Vygotsky, L. S. (1978). *Mind in society*. Harvard University Press.

Vygotsky, L. S. (1986). *Thought and language*. MIT Press.

Wang, Y.-C. (2014). Promoting collaborative writing through wikis: A new approach for advancing innovative and active learning in an ESP context. *Computer Assisted Language Learning, 28*(6), 499–512. https://doi.org/10.1080/09588221.2014.881386

Wangpipatwong, S. (2009). *Factors influencing knowledge sharing among university learners*. Paper presented at 17th International Conference on Computers in Education, Asia-Pacific Society for Computers in Education, Hong Kong.

Wenden, A. L. (1998). Metacognitive knowledge and language learning. *Applied Linguistics, 19*(4), 515–537.

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

Yang, C. C. R. (2010). Using Google Docs to facilitate collaborative writing in an English language classroom practice. *TESL-EJ, 14*(3), 1–6.

Zhu, C. (2012). Student satisfaction, performance, and knowledge construction in online collaborative learning. *Journal of Educational Technology & Society, 15*(1), 127–136.

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