Supporting EFL Writing during the Pandemic: The Effectiveness of Data-Driven Learning in Error Correction

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Abstract

The COVID-19 pandemic continues to pose challenges to the teaching and learning of English as a foreign language (EFL) around the globe, including China. Through online instruction, data-driven learning (DDL), a pedagogical tool that extracts concordances of authentic language examples from specific corpora, can be seen as a powerful resource for helping learners deal with their EFL writing errors during the lockdown. This paper examines the effects of DDL on students' EFL writing accuracy considering four specific error types and shows how students, as well as teachers, perceive this learning method. Four students and their English teacher in a Chinese university participated in this study. Students were required to complete six writing tasks electronically, which were later revised for four most frequent lexico-grammatical errors under the conditions of using (a) typical referencing resources, (b) DDL material only and (c) the combination of two. Online error correction spreadsheets and stimulated recall were used to investigate students' error correction preferences and processes, while the online questionnaire and interview were used to retrieve students' and their teacher's perceptions of DDL-mediated error correction. The qualitative data analysis revealed that DDL material supported activation of students' prior knowledge and helped them learn appropriate language use by utilising a series of cognitive strategies. Participants highly appreciated the advantages of DDL-mediated writing activities, although some reservations were made about their practices which warrant further investigation.

Keywords: DDL, EFL writing, error correction.

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1. Introduction

To help schools and universities to meet the challenges posed by the COVID-19 pandemic, China's Ministry of Education has published a guidance on online learning which outlines a blended approach combining online teaching with students' self-study, and which emphasises supporting students to develop into autonomous learners (Ministry of Education of the People's Republic of China, 2020). This guidance posed challenges for English as a Foreign Language (EFL) teachers in China, who have few resources to refer to when adapting their existing teaching practices to meet the new requirements for online learning.

Data-driven learning (DDL) was first introduced by Johns (1990), referring to language acquisition via searching corpora. The latest review of DDL literature revealed that DDL-mediated error correction in second language writing is one of its most frequent application (Chen & Flowerdew, 2018). The literature also indicates that DDL helps learners achieve the inductive language learning by comparing between learner outputs and target linguistic knowledge inputs (Boulton, 2009; Chambers, 2010; Schmidt, 1990). However, recent classroom-based research reported that specific learning environments with prescribed syllabus may limit the DDL application (Bridle, 2019).

The new teaching and learning context occasioned by the pandemic offers an opportunity to retest the effectiveness of DDL and evaluate its potential contribution to second language writing instruction in China. This paper reports upon a small-scale study which applied DDL to support Chinese students' EFL writing error correction as part of their online EFL classes. The study investigated the process of DDL-mediated error correction activities as well as users' perceptions of using DDL-mediated error correction in an online teaching and learning environment. The author argues that making a precedent in and after the pandemic, DDL may inspire the EFL teaching for the purpose of enhancing online instruction and promoting personalised learning that go beyond the traditional EFL classroom.

2. Literature Review

EFL online teaching in China during pandemic

To date, only a limited number of papers have described and reviewed the practice of EFL teaching in China during the COVID-19 pandemic. Zhang and Wang (2020) undertook a reflective study of college English online teaching practice in their institute. They found that most students were satisfied with online EFL teaching and responded positively to live teaching resources, in-class communication, and after-class learning tasks. Teachers involved in the

study emphasised the importance of carefully designing online activities, information and communication technology (ICT) training, and prompt feedback to high quality online learning. Gao and Zhang (2020) interviewed three Chinese EFL teachers about their experiences of online teaching. The participants noted the need to learn how to use new technologies and to integrate them with traditional teaching methods.

In summary, little research reported how Chinese EFL teaching was, or is, being conducted and adapted to fulfil the requirement of high-quality online instruction during this pandemic, which calls for more studies investigating the details of practice under such circumstances.

DDL-mediated error correction in EFL writing

DDL refers to a series of exploratory learning activities via searching corpora (Johns, 1990). It is believed that "a corpus that contains thousands of authentic text samples can greatly enhance a learner's exposure to naturally occurring language and offer a vast linguistic resource" (Quinn, 2015, p.165). The outcome of corpus search, the concordance lines, is an index of the words or phrases in a corpus searched by syntax queries, whose most common format is the KWIC concordance - Key Word in Context (O'Keeffe et al., 2007). In a KWIC concordance, the node word/phrase is in a central position with all lines vertically aligned around it (see Figure 1). A learner is then able to compare their own language output and the concordance lines, meaning the learner can generalise the information from the concordances to arrive at a solution to a language problem (Quinn, 2015).

Figure 1. Concordance lines for the phrase "prevent ... from ..."

DDL-mediated error correction means using DDL for correcting written errors. On a theoretical level, DDL-mediated error correction, in the context of "scaffolding", is a Social-cultural Theory term to describe supportive mediation in the learning process (e.g., Flowerdew, 2015; O'Keeffe, 2020). Learners have shaped their own level of language knowledge, then through the mediation of feedback and concordance lines provided by experienced teachers,

their knowledge can be progressively reshaped for reaching a higher level. This means DDL emphasises the significance of interaction between teachers, DDL material, and learners for the engagement of knowledge co-construction. There are two DDL approaches to error correction exist in the literature: indirect DDL and direct DDL. Indirect DDL involves the consultation of corpus-informed material through teacher's mediation, while direct DDL involves students exploring the corpus data themselves and performing follow-up analyses (Leńko-Szymańska & Boulton, 2015). Yoon and Jo (2014) conducted a study investigating the effectiveness of these two DDL approaches on learners' error correction in an English writing class. The study revealed that the error-correction rate was higher with indirect DDL than direct DDL.

Research also reported that DDL is suitable for correcting lexico-grammatical errors (e.g., Bridle, 2015; Crosthwaite, 2017; Gaskell & Cobb, 2004; Tung et al., 2015). Crosthwaite (2017) found that students used corpora to correct errors of word choice, word form, collocations, and phrasing, but were less likely to use corpora to correct errors of deletion or morphosyntax. Furthermore, students were likely to successfully correct errors of collocation but were less successful in correcting errors of morphosyntax via DDL. Bridle (2015) found that incorrect words and informal words were more likely to be treated by concordances, compared to other errors, and these two types of errors were also more successfully corrected through DDL than through other methods.

However, few studies explored the process of DDL-mediated error correction and its relationship with other typical referencing resources. Liou (2019) conducted a study blending DDL with other available tools (e.g., prior knowledge, online bilingual dictionaries, Google) in EFL writing class. The result shows that most of the students could learn how to use concordances to correct errors and they realised the advantages of DDL. But due to the research design and the focus, it is difficult to know whether DDL played a decisive role in error correction when multiple resources were used, and whether the process of DDL-mediated error correction was different from that with other tools.

The research findings on how students perceive DDL in writing error correction share many similarities. Students believe DDL is helpful for improving their writing accuracy, and learning appropriate vocabulary and grammar usage (e.g., Crosthwaite, 2017; Yoon & Hirvela, 2004). However, students complain about the time-consuming process of reading concordances (Tung et al., 2016) and potential confusion when linking the teacher feedback with the concordances to correct errors (Crosthwaite, 2017).

It is well documented that Chinese EFL learners in higher education make numerous lexico-grammatical errors in English writing, especially errors of preposition, article, verb, and word choice (Jichun, 2015; Zhan, 2015). In China, where most EFL teachers' instruction is didactic (Kılıçkaya, 2015; Lin & Lee, 2017), inductive learning is not emphasised, and so students often find it difficult to address their specific writing problems. Meanwhile, DDL has not been adopted by EFL teachers in mainstream education due to relatively limited local research with few theoretical supports (Yoon, 2011).

However, the situation has been changing during the COVID-19 pandemic, as both teachers and students have been required to adopt more flexible strategies for online instruction (Fu & Zhou, 2020). Individual learning outside the classroom plays a more important role than before. The pandemic therefore represents an opportunity to re-explore implementing DDL in Chinese EFL classrooms, where students should be guided to recognise their problems first and then find the solutions independently.

This study aims to evaluate the DDL-mediated error correction applied in the context of EFL instruction during the COVID-19 in China, by answering the following questions:

RQ1: To what extent did students correct the errors of articles, prepositions, verbs, and word choice under the condition of using typical referencing resources (such as prior knowledge, online dictionaries, grammar books, textbooks and peer support), DDL material, and the combination of two, in their online English writing?

RQ2: What is the interaction between referencing resources and student error correction behaviour across these three conditions?

RQ3: What are the teacher and students' perceptions about the usefulness of DDL-mediated error correction on EFL writing during the pandemic?

3. Methods

Participants

Participants in the study were chosen through convenience sampling, based on the researcher's connections with their university. Convenience sampling was the most appropriate sampling method because campuses were closed during the early stages of the pandemic in China and the researcher had no alternative method of contacting potential participants. Four second-year English major students with intermediate English language proficiency participated in the study, as did their English module teacher with 12 years of teaching experience. The students

were preparing for Test for English Major: Band 4 (TEM-4) examinations. The teacher and the researcher invited these students to participate in a series of short-term online writing sessions focussing on TEM-4 writing. Before commencing, the author confirmed that these students and their teacher had limited knowledge of language corpora or DDL.

Instruments

Error correction spreadsheet

The error correction spreadsheet aims to assist the researcher in investigating students' error correction process with/without DDL. Students used the empty error correction spreadsheet to record errors, their attempts to identify the types of errors they had made, the sequence in which they used referencing resources, and the resource they found most useful when making corrections. The spreadsheet provides the real-world data about to what extent students consult different reference resources and whether there is a pattern in error correction behaviour.

Online Questionnaire

A questionnaire was used to collect data about students' perceptions of DDL-mediated error correction. It is a modified version of Yoon and Hirvela's (2004) questionnaire measuring students' experience of using DDL for error correction. A Likert scale is used for all questionnaire items, containing five response options, from strongly disagree to strongly agree.

Stimulated recall and semi-structured interview

Each student engaged in stimulated recall to verbalise their processes of error correction and provide details to support their questionnaire answers. Mackey and Gass (2015) assert that stimulated recall is some tangible reminder of an event which can stimulate recall to the extent that respondents can retrieve and then verbalise what was going on in their minds during that specific event. In this study, the error correction spreadsheet and questionnaire answers facilitated the stimulated recall. The focus of this recall is to find out whether there is a similar pattern among students' error correction behaviour, and whether they experienced difficulties in using DDL/non-DDL referencing materials during error correction.

Additionally, the researcher conducted a semi-structured interview with the class teacher. Questions focussed on the teacher's familiarity with language corpora, their reflections on the advantages and disadvantages of DDL as applied during the online sessions, and their opinions on the future application of DDL in her classes.

Procedures

Students engaged in a total of six writing tasks across three separate writing sessions (two tasks per session). Each session was assigned to one of the following research conditions: (a) using typical referencing resources only, (b) using DDL material only and (c) using typical referencing resources and DDL. Students received a writing task during the weekday and were required to submit by the weekend. In the following week, students received the feedback and revised their writing for re-submission, while a new writing task was also assigned requiring students to submit it by the weekend, again. After completing all of the assignments and the revised versions, students were asked to undertake an online questionnaire and to join a stimulated recall session, while their English teacher was invited to participate in a semi-structured interview.

The written assignment topics were selected from the TEM-4 mock test bank maintained by the exam organiser, and participants were asked to complete their writing within 30-40 minutes for no less than 350 words without the support of any external references. Due to remote teaching, all assignments were submitted electronically. The teacher and the researcher monitored the status of the submission and used the automatic marking system iWrite (developed by Beijing Foreign Studies University) to help provide feedback. The teacher and author then took 2-3 days to review and modify the feedback produced by the system, focussing on encouraging inductive learning. The feedback form provided to the students highlighted problem areas and also included a summary comment summarising the strengths and weaknesses of the writing. Students read the feedback and corrected errors by using the referencing resources under the research conditions. They were also required to complete the error correction spreadsheet and submit it with their revised writing.

Additionally, for the second and third round of writing, the author reviewed the target errors, then attached relevant DDL material before returning the writings. The DDL material comprised concordance lines selected by the author and the teacher which helped indicate the appropriate correction for each highlighted error. Figure 2 illustrates an example of how students' target errors were marked in the feedback and how concordances were attached.

For instance, we are not necessary to carry too much cash, especially when we go out or travel with our family and friends, and cashless payment embodies an enormous advantage that is conducive to our pleasant purchase or travelling ==without much burden==. More importantly, ==carrying considerable amount of cash== may increase the risk of loss.

de us in all of our physical, mental, emotional, and spiritual preparation. that we can leave home	**without any burdens**	tying us down and holding us back from the journey set before us. that we can grow to be one, i
pathways of industrial development, they still hanker for a global agreement that will leave them	**without any burdens**	at all. </s><s> This is especially reflected in the attitude of the Indian state in the climate negotia
ble of suffering I want it to give Jesus everything [15] possible. </s><s> Here, dear Mother, I live	**without any burdens**	from the cares of this miserable earth, and have only to accomplish the sweet and easy mission
en stopped seeing her altogether when he married Nancy who wanted him to make a fresh start	**without any burdens**	from his first marriage. </s><s> Maureen remained locked out. </s><s> Speaking of her father a
uilding a crypto-valley that will make it possible for crypto-currency related companies to operate	**without any burdens**	or difficulties and most importantly – they will be able to operate legally. </s><s> The goal is it to

deficiencies ' . Chatterton told the conference : ' regretfully there is	a considerable amount of	material which is unrecorded and unavailable to the researcher locked away in
though Chatterton in his notes to my thesis argued there has been	a considerable amount of	' participant police research ' , I would question whether many of
presentation of information necessary for an ethnography could be actionable . For	a considerable amount of	inconsequential information owned by the institution is classed as confidential , eve
ideal should be a circular seat but I felt it would take	a considerable amount of	timber with a lot of waster so I opted for an hexagonal
Cabinet discussion . But I start that by saying there was already	a considerable amount of	Cabinet discussion . ' Nevertheless , he appeared to suggest Mrs Thatcher

Figure 2. Feedback and DDL material in a student's sample assignment

Data analysis

In this study, quantitative and qualitative methods were employed for answering the proposed research questions. To answer the first research question, the frequencies of four targeted errors were recorded, and the percentages of their appropriate corrections were calculated in Microsoft Excel. To answer the second research question, the student participants' spreadsheets were collected and the stimulated recall about their error correction was audio-recorded. These data were analysed with the grounded theory (Mackey & Gass, 2015), which examines the error correction behaviour from multiple points, to help arrive at a complete picture of the interaction between error correction behaviour and referencing resources, without predetermined coding or analysis schemes.

For answering the third research question, the questionnaire answer scores were calculated and the common issues the student participants brought up during the stimulated recall were identified. The semi-structured interview was audio-recorded, transcribed and carefully studied to summarise teacher's viewpoints.

4. Findings and Discussion

The data reported in this paper has been derived from students' writing assignments (with revisions), error correction spreadsheets, questionnaires, stimulated recalls, and teacher's interview. The major research findings have been divided into three categories: 1) descriptive data on error correction of target error types, 2) DDL-mediated error correction process, and 3) users' perceptions of DDL-mediated error correction.

The frequencies with which the four targeted types of errors and their corrections occurred in participants' writings were counted, and the correction rates for these error types were calculated. In Table 1, across the three rounds of writing, students generated more errors related to articles and verbs than those to prepositions and word choices. Frequencies of errors for prepositions and word choice slightly declined after the introduction of DDL from Round 2. Figure 3 indicates that in Round 1, without access to DDL, students corrected article errors less successfully than any other target types of errors (correction rate 0.54). However, an increase in the rate of successful correction of article errors was observed after introducing DDL (0.93 in Round 2 and 0.8 in Round 3).

Table 1

Frequencies of Target Errors before and after the Correction

	Round 1 (No DDL)		**Round 2 (DDL Only)**		**Round 3 (Blend)**	
	Before	**After**	**Before**	**After**	**Before**	**After**
ART	11	5	15	1	19	3
PREP	6	1	4	2	1	0
V	10	4	10	2	9	4
WC	9	0	6	2	6	1
Total	35	10	35	7	35	8

Note. ART = article; PREP = preposition; V = verb; WC = word choice.
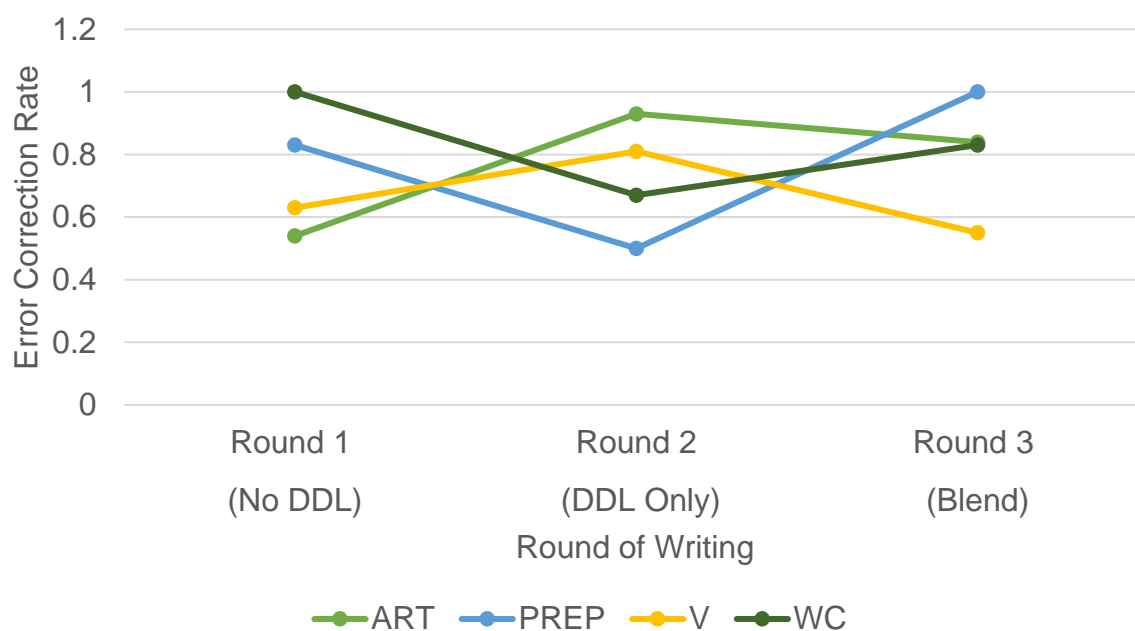
Figure 3. Correction rates of targeted error types among three rounds of writings

To investigate the relationship between the use of referencing resources and the error correction, a qualitative analysis of the error correction spreadsheet was conducted. In Round 1, the following major patterns of using referencing resources were identified as: prior knowledge only, online dictionary only, and online dictionary support for prior knowledge. Table 2 illustrates the most frequent referencing patterns by each target error type and the relationship between referencing patterns, the most useful referencing resource and the correction rates. For preposition errors, students tended to consult their prior knowledge then an online dictionary. When following this pattern of referencing, students tended to rely most on online dictionaries when making final decisions (66% of usefulness). For verb errors and word choice errors, although students had high correction rates when consulting prior knowledge (100% in both cases), they did not often consider it as the most useful resource.

Table 2

Most Frequent Consultation Patterns, Usefulness and Correction Rates (Round 1)

	Most frequent pattern	Percentage of total attempt	Usefulness	Correction rate within pattern
ART	Online dictionary only	55%	50%	83%
PREP	Prior knowledge then online dictionary	50%	33% (For prior knowledge) 66% (For online dictionaries)	100%
V	Prior knowledge only	89%	37%	100%
WC	Prior knowledge only	56%	20%	100%

Table 3 shows that in Round 2, major patterns of using referencing resources were prior knowledge only, concordances only, and prior knowledge plus concordances. Use of concordances was common when students attempted to correct all target error types. Compared to the use of online dictionaries in Round 1, students displayed higher rate of choosing concordances as the most useful referencing material, and usually concordances resulted in more successful corrections. When combining prior knowledge and concordances in correcting verb errors, students considered concordances as the most useful resource for 75% of the corrections.

Table 3

Most Frequent Consultation Patterns, Usefulness and Correction Rates (Round 2)

	Most frequent pattern	Percentage of total attempt	Usefulness	Correction rate within pattern
ART	Concordances only	73%	100%	100%
PREP	Concordances only	100%	100%	100%
V	Prior knowledge then concordances	80%	25% (For prior knowledge) 75% (For concordances)	88%
WC	Concordances only	33%	100%	100%
	Prior knowledge only	33%	50%	50%

In Round 3, where students could use both concordances and other available resources, concordances and prior knowledge were frequently used for revising target error types. As described in Table 4, students expressed a similar level of confidence in consulting concordances for error correction, in comparison with Round 2, although this did not necessarily lead to the appropriate correction. Students in Round 3 mainly used concordances

without prior knowledge to review article and preposition errors, while students tended to apply prior knowledge to correct verb and word choice errors.

Table 4

Most Frequent Consultation Patterns, Usefulness and Correction Rates (Round 3)

	Most frequent pattern	Percentage of total attempt	Usefulness	Correction rates within pattern
ART	Concordances only	79%	100%	87%
PREP	Concordances only	100%	100%	100%
V	Prior knowledge only	40%	100%	100%
WC	Concordances only	50%	100%	66%
	Prior knowledge only	50%	100%	100%

These preliminary findings form an image consistent with former research (e.g., Crosthwaite, 2017; Gilmore, 2009) that students positively and actively apply DDL to the correction of the target error types. Similar to Yoon and Jo's study (2014) in an Asian EFL setting, students in this study had weak performances regarding uses of articles, however they demonstrated improvements after DDL. New findings from this study may suggest that DDL can potentially become a stable substitution for online dictionaries, even though students could freely select referencing resources. To a large extent, students used DDL material to address their issues relevant to articles and prepositions, while prior knowledge was combined with DDL material for treating verb and word choice errors.

DDL-mediated error correction process

DDL-mediated error correction was investigated via stimulated recall. The qualitative data provided useful information about how students processed error correction with/without DDL and whether DDL applied in this study reflects the existing second language acquisition (SLA) theories.

In Round 1, similar patterns of error correction process were identified from the stimulated recall. Students reported that the use of highlighting as feedback first drew their attention. Then, they read the context and referred to prior knowledge to interpret the feedback. If students were able to rely on their prior knowledge to address the particular issue, they would attempt to correct errors. In such cases, students might decide to double-check their intuitions with online dictionaries and attempt to find examples to support themselves. However, if they had not previously encountered the particular issue, students complained that few external

referencing resources could help. One of the participants reported the following experience on correcting the highlighted errors in Round 1:

Sentence with errors: *On this way, people can embrace more convenient and efficient future.*

Student B: *I repeatedly read the sentence and I guess the first error is preposition error, but I don't know what's wrong with the second one. I think I used the wrong preposition but I'm not that sure. I typed "this way" in iciba.com then I found two sample sentences used "in this way", so I feel I had the right answer. I don't know how to correct the second error by dictionary. I tried to type some of the words in the search box, but I can only get meanings and a few sample sentences. They didn't help me figure it out.*

In Round 2 and 3, students reported that concordance lines provided a clearer navigation for the error correction process. They paid attention to the feedback first, and then used lower-level cognitive skills, such as re-reading problematic areas and translating it into Chinese, to activate their prior knowledge (Yoon & Jo, 2014). They would form a hypothesis about how to correct the error. Depending on how confidently they relied on their prior knowledge, either they directly corrected the target error, or they read the concordance lines to seek supporting evidence. If students failed to gain useful information from their prior knowledge, they were still able to read concordance lines and used a series of cognitive skills to generalise new language knowledge or re-activate their prior knowledge for error correction (Sun, 2003). Specifically, students mentioned in their recall that because of their limited knowledge of article use in English, they relied heavily on the provided concordance lines to assist them in identifying the article error type. All the participants agreed that concordance lines were specific enough to indicate the error type and the number of concordance lines provided per error was sufficient in helping them reach to a solution.

Figure 4 illustrates a model of DDL-mediated error correction process, which was generalised from participants' recall data. These findings indicate that DDL-mediated error correction can be beneficial to improve EFL writing. As Flowerdew (2015) points out, DDL helps to promote SLA via conscious efforts on noticing the gaps in the linguistic knowledge a student might have in their L2 repertoire. Moreover, O'Keeffe (2020) believes that "if we can provide a more detailed articulation of the pedagogical underpinnings of DDL and the related teaching and learning processes, we will be able to align more with key areas of concern within instructed SLA" (p. 6). The involvement of students' attention and awareness of erroneous

areas, their exposure to authentic language input, and their use of cognitive strategies when reading concordance lines, reflects well-known learning theories (e.g., Flowerdew, 2015) and SLA theories (e.g., Schmidt, 1990). Such a connection between practice and theory found in the current research suggests that students may benefit from the DDL-mediated error correction process and teachers may better understand DDL from a theoretical perspective.
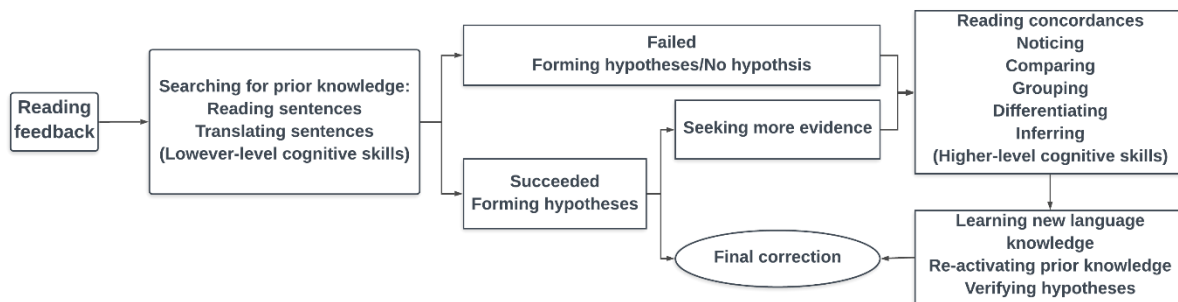

Figure 4. DDL-mediated error correction process

User's perception of DDL application in EFL writing

Users of DDL are not only students, but also their teachers. In the questionnaire, students not only displayed a positive attitude towards DDL-mediated error correction practice, but also expressed their willingness to apply it in their future studies (Figure 5). Some of the questionnaire items, such as the benefits and drawbacks of DDL-mediated error correction, were later expanded in the stimulated recall so that students could provide specific examples from their practice. They generally agreed that DDL mediation promoted active self-learning during the pandemic when it was difficult for them to seek help from classmates or teachers. Concordances were considered to be more useful than online dictionaries for learning grammar rules. Furthermore, students expressed a desire to learn more about DDL for future EFL learning purposes. However, segmented sentences, unfamiliar lexis, and limited numbers of concordances without enough context were reported as complaints which stopped students from gaining useful information for error correction. These findings are consistent with the literature about how students perceived DDL (e.g., Crosthwaite, 2017; Luo, 2016; Quinn, 2015. What is new to the DDL research field is that students in this research reported they were not only satisfied with the immediate correction facilitated by selected concordances, but they also expected further material explaining their errors and guiding them to conduct individual research in the corpus. Such a requirement seeking direct DDL is considered as a limitation of applying indirect DDL to more advanced learners.
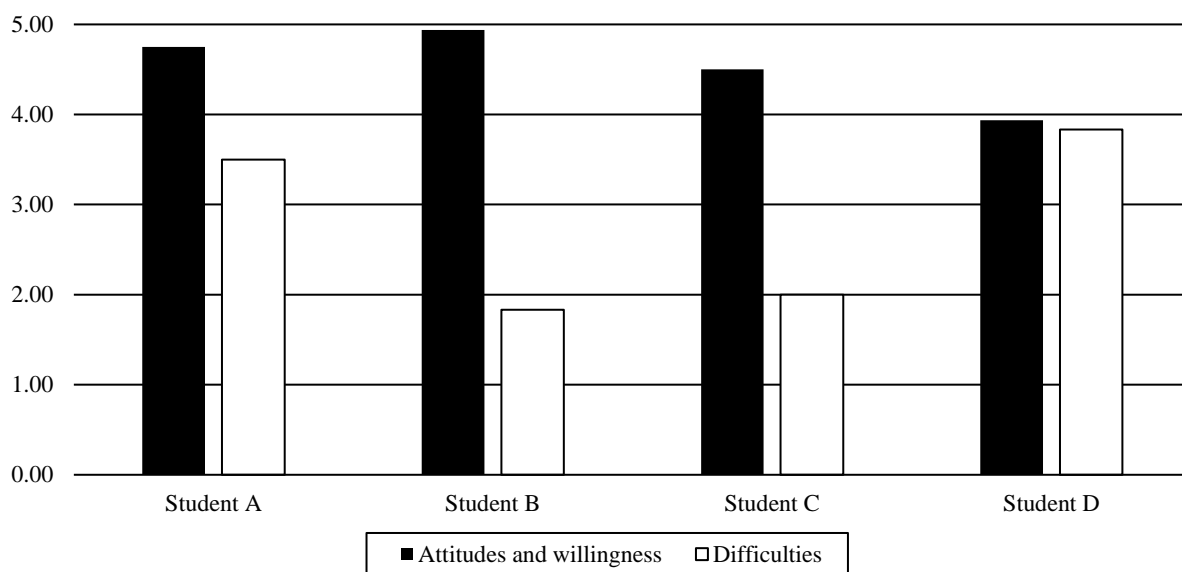
Figure 5. Students' perceptions on DDL-mediated error correction
Note. 1: negative attitude/fewer difficulties - 5: positive attitude/more difficulties.

The semi-structured interview with the teacher revealed that she perceived DDL-mediated error correction as a positive activity for promoting student-oriented learning and improving students' writing accuracy, especially when she could not deliver English writing classes as normal during the lockdown. She also affirmed she would continue learning and using DDL in her future teaching practices. However, she highlighted that the limited knowledge and practice of DDL, the time-consuming process of DDL material preparation, and the difficulties accessing online corpora in China were the major issues potentially limiting her from applying DDL. In the present study, the teacher only needed to prepare materials and provide feedback for four students, and she could use the author's account for searching corpora, which is not reflective of the real circumstances in her daily teaching.

These opinions are similar to what can be found in previous DDL research: teachers were positive about DDL for teaching because of its potential for inductive learning; on the other hand, they had concerns about additional knowledge and the workload required for developing the activities as well as about technical difficulties with materials design and classroom practice (Chen, Flowerdew & Anthony, 2019; Lin & Lee, 2015). However, both students and their teacher in this study believed that the pandemic offers an opportunity to learn and use DDL, because they were not able to teach and learn as usual and so were open to alternative modes of study, and had more flexibility in time and focussed more on online resources and learning. This research thus argues that the COVID-19 pandemic could potentially speed up implementing DDL alongside traditional EFL instruction and may

encourage more students and teachers to take advantage of it, though it should be of course based on the systematic training.

The findings of this study imply that EFL teachers in the Chinese and other Asian higher education systems need to progressively erase "fears" relating to the application of DDL. Schaeffer-Lacroix (2019) categorised these fears as being at knowledge level or cultural level. Knowledge-level fears, as the teacher interview in this study suggests, are due to a lack of knowledge about the corpus and data exploration skills. The teacher participant learnt about DDL from the author through the error correction activities, but she would still like to receive systematic training in DDL during her career. Crosthwaite, Luciana and Schweinberger (2021) implemented a training project in Indonesia for pre-service teachers. It included an online DDL course for academic writing, expert's comments on trainees' lesson plans and online workshops. This kind of training project can help teachers better understand and apply DDL in their daily practice. There are reasons to believe that after training, the issues reported in this study, such as increases in the teaching workload, can be addressed with more flexible solutions. However, cultural-level fears may be more difficult to resolve. These fears are often related to doubts about DDL as an approach rooted in the local EFL education system. Unlike Western, Educated, Industrialised, Rich and Democratic (WEIRD) contexts, the DDL practice in Asian countries is more challenging as there is an insufficient literature base and fewer supporting policies. One example in this study is that the teacher did not have access to a wide range of corpora or hear about relevant DDL research or practice occurring in the national education system. On the one hand, this calls for more local research focusing on the connection between DDL and the mainstream SLA theories that most teachers are familiar with (O'Keeffe, 2020). On the other hand, policymakers should realise the importance of improving ICT services and then encourage teachers and researchers to implement more DDL-relevant curriculum designs, teaching methods and assessment practices.

5. Conclusion

This study explored the effectiveness of DDL-mediated error correction in online EFL writing practice during the COVID-19 pandemic in China. The DDL material played a significant role in helping students correct the four most frequent types of lexico-grammatical errors, especially for errors of articles, while typical referencing resources, such as online dictionaries, were considered to have limitations in error correction activities. This study used stimulated recall to generalise the process of DDL-mediated error correction, which indicates that the DDL mediation not only helped students achieve better error correction, but also encouraged students

to utilise a series of cognitive strategies for inductively discovering or recalling the appropriate language use. More importantly, this study highlighted the positive function of DDL during the pandemic. DDL mediation was of great value in connecting students and teachers outside the class and promoting self-learning. Considering the success of applying DDL during the lockdown, both the students and their teacher in this study expressed the willingness to learn more about DDL in the future, although with some reservations. Overall, this study will hopefully encourage more local EFL teachers and researchers to embrace DDL and consider it as a powerful tool during and after the pandemic.

An obvious limitation of this study is that all the research data were collected online, raising potential issues such as participants not fully obeying the task instructions and not accurately self-reporting error correction processes. Another limitation of the present study is that due to the small sample size, the DDL-mediated error correction outcomes may not be representative of the actual classroom settings. It is therefore reasonable to conduct a follow-up study based on a real-world EFL class with a larger sample for better testing the DDL-mediated error correction efficiency and user experiences.

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Appendix A

Error correction spreadsheet (3rd round of writing)

No.	Error Area	How do you know about your error (Error type)?	Which consulting resources do you use for error correction?					Which resource is most useful?
			Online Dictionaries	Paper-based Tools	My Own English Knowledge	Peer Support	Guessing	
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

Appendix B

Semi-structured interview guide (For teacher)

1. How much do you know about language corpora and their application in language teaching?

2. How do you like the experience of using DDL and/or traditional referencing resources in your English writing teaching?

3. How would you describe the differences, if any, between using DDL and/or traditional referencing resources to correct errors in English writing?

4. Could you tell any difficulties or challenges if you teach with DDL and/or traditional referencing resources? If so, what are they? And why?

5. How do you like the DDL treatments in this research?

6. How would you describe your students when they were asked to use different referencing resources to correct errors?

7. Would you like to share any other observations, thoughts, or perspectives relating to any of the treatments in the research?

8. Would you consider adopting DDL, traditional consulting resources, or any combination of the two to teach English teaching in future? Why or why not?

Appendix C

Online questionnaire (adapted from Yoon & Hirvela, 2004)

○strongly disagree   ○disagree   ○neutral   ○agree   ○strongly agree

1. I felt confident in understanding the written corrective feedback in my assignment about my writing errors when I used concordances.

2. I felt confident in generalising the appropriate language usage through concordances and then applied it to correct my writing errors in the future.

3. Concordances are more helpful than a dictionary or other available reference material for my English writing error correction.

4. Concordances are more helpful than a dictionary or other available reference material for my English writing error correction.

5. Using concordances is helpful for learning the meaning of vocabulary.

6. Using concordances is helpful for learning the appropriate choice of vocabulary.

7. Using concordances is helpful for the usage of collocation.

8. Using concordances is helpful for learning grammar knowledge.

9. Having online assignment, receiving written corrective feedback electronically and using concordances are practical for improving my writing accuracy, especially during the pandemic of COVID-19.

10. I want to use the concordances in English writing error correction if possible in the future.

11. Besides error correction, I want to learn to use concordances in English writing for other purposes in the future.

12. If I learn more about concordances, I wish to do my own search in a language corpus based on feedback.

13. Learning more about concordances will enhance my confidence in producing English writing with fewer errors.

14. If I had learned to use concordances earlier, I would have had a better performance of writing in English tests.

15. The application of DDL should be introduced to my English courses.

16. I will recommend students using the DDL material for English writing in the future.

17. I had some difficulties in understanding the feedback (I did not know what kind of error I had even I received feedback) to correct my errors when using concordances.

18. I had some difficulties in connecting the feedback to concordances (I did not know how concordances provided can help me correct errors indicated in the feedback).

19. I had some difficulties in using concordances for error correction due to a lot of time and efforts spent reading the material.

20. I had some difficulties in understanding and using concordances due to unfamiliar vocabulary.

21. I had some difficulties in understanding and using concordances because the sentences were cut-off (not completed) without context.

22. I had some difficulties in understanding and using concordances because I did not get sufficient amount of lines to validate my hypothesis.