Regular Paper

The JALT CALL Journal ISSN 1832-4215
Vol. 18, No.2 Pages 286–315
https://doi.org/10.29140/jaltcall.v18n2.519

Castledown

Student engagement with computer-mediated teacher written corrective feedback: A case study

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Much of the research on the effectiveness of written corrective feedback (WCF) scope and strategies has been (quasi-)experimental, generating results peripherally related to authentic classroom contexts. Underpinned by a multidimensional conceptual framework of student engagement with WCF, this classroom-based study has explored the scope and strategies used by the teacher regarding WCF. It also investigated how two ESL university students behaviorally, cognitively, and affectively engaged with the scope and strategies of computer-mediated teacher WCF to improve the accuracy of the second draft of the introduction and methodology sections of their research proposal. Data from multiple sources, including students' written texts, screencasts that captured students' revision process, stimulated recall, and semi-structured interviews were analyzed. The findings revealed that the scope of computer-mediated teacher WCF was comprehensive, and the most frequently employed feedback strategy was direct WCF, often accompanied by metalinguistic explanation. Behaviorally, the students improved their drafts' accuracy based on such feedback; however, their cognitive engagement was mediocre. Although affectively the students often experienced positive reactions toward feedback strategies, they felt overwhelmed by a large number of comments.

Keywords: student engagement, L2 writing, computer-mediated WCF, feedback scope, feedback strategies

Introduction

Although a considerable body of experimental and quasi-experimental research has been conducted to determine the most effective scope (selective vs. comprehensive) and strategies (e.g., direct, indirect) of written corrective feedback (WCF) (e.g., Bitchener & Knoch, 2008; Ellis *et al.*, 2008; Van Beuningen *et al.*, 2012), the results of these studies are inconclusive. Lee (2020) calls for more qualitative research situated in authentic classroom contexts because (quasi-) experimental studies are "largely researcher-led, decontextualized, depersonalized, impractical, and unauthentic" (p. 3). Qualitative research, which is sparse in the existing WCF literature (Mao & Lee, 2020), can shed light on teachers' daily practices and individual students' engagement with teacher WCF. This can consequently enable a valid assessment of the effectiveness of scope and strategies of teacher WCF.

Cognizant of the importance of student engagement in investigating WCF, a number of studies have explored student engagement with computer-generated WCF provided by various automated tools (Koltovskaia, 2020; Zhang, 2017; Zhang & Hyland, 2018) and traditional handwritten-teacher WCF (Han & Hyland, 2015; Zheng & Yu, 2018). What lacks in these studies, however, is a detailed description of teacher WCF, particularly concerning feedback strategies and students' engagement with those strategies. Additionally, no studies to date have examined students' engagement with computer-mediated teacher WCF, despite electronic feedback being a common practice in second language (L2) writing classrooms, especially in university contexts (Ene & Upton, 2014).

This authentic classroom-based study explores the scope and strategies used by a teacher to offer computer-mediated WCF to students' drafts. Underpinned by a multidimensional conceptual framework of student engagement, this study then investigates two ESL university students' engagement with teacher WCF. This study contributes to understanding of how individual students use, process, and react to the scope and strategies of WCF offered by the teacher.

Literature review

WCF scope and strategies

Over the past two and a half decades, an extensive body of empirical research has been conducted on WCF since Truscott (1996) initiated a case for its abandonment. While there is affirmative evidence from a wide range of sources that WCF should indeed be provided to students' writing, the key concerns that remain are what amount of WCF (i.e., feedback scope) should be given to students' texts and what WCF strategies teachers should use (Ferris, 2014). Studies that aimed at addressing these concerns have been predominantly experimental and quasi-experimental.

Two feedback scopes have been examined in the literature: *selective* and *comprehensive* (see Appendix A for definitions). Studies on selective WCF (Bitchener, 2008; Bitchener & Knoch, 2010; Bitchener *et al.*, 2005; Shintani & Ellis, 2013; Shintani *et al.*, 2014) and comprehensive WCF (Bonilla López *et al.*,

2017; 2018; Van Beuningen *et al.*, 2012) suggest that they are effective. However, research on selective WCF is much limited compared to research on comprehensive WCF (Mao & Lee, 2020). Additionally, studies that compared selective and comprehensive WCF within a single research design are also limited and present inconclusive results (Ellis *et al.*, 2008; Frear & Chiu, 2015; Sheen *et al.*, 2009). Generally, those supporting selective WCF suggest that when students receive such feedback, they are more likely to detect an error as their attention is more focused, understand the error's cause/nature, and determine the appropriate revision. This ultimately can benefit their long-term learning and L2 development (Bitchener & Knoch, 2008; Ellis *et al.*, 2008; Ferris, 2014; Sheen *et al.*, 2009). Besides, selective WCF can be more manageable for students and is less likely to overload students' attention capacity (Lee, 2019). Those in favor of comprehensive WCF argue that feedback given on a few error types may help students progress only on those error types which means they will not get information about other errors in their writing and be able to improve written accuracy in general (Van Beuningen *et al.*, 2008, 2012).

As for feedback strategies, four have been investigated in previous studies: *direct, indirect, metalinguistic, and reformulation* (see Appendix A for definitions). A good number of studies have investigated the relative merits of direct and indirect WCF. They can be grouped according to those that compared direct WCF with indirect WCF (Chandler, 2003; Van Beuningen *et al.*, 2008; 2012), those that compared direct WCF with direct plus more explicit types of metalinguistic feedback (Bitchener, 2008; Bitchener & Knoch, 2010; Bitchener *et al.*, 2005), those that focused only on direct WCF (Ellis *et al.*, 2008; Sheen *et al.*, 2009), and those that solely concentrated on indirect WCF (Frear & Chiu, 2015; Truscott & Hsu, 2008). Cumulative evidence from these studies so far seems to suggest that direct WCF is effective (Bitchener, 2008; Bitchener & Knoch, 2009; Bitchener *et al.*, 2005; Ellis *et al.*, 2008; Sheen *et al.*, 2009) and even superior to indirect WCF (Van Beuningen *et al.*, 2008; 2012). However, it seems premature to make definitive conclusions based on the results of these studies, especially considering that earlier comparative studies had design issues and error codes (i.e., metalinguistic feedback) in some studies were referred to as indirect WCF (see Bitchener & Storch, 2016). Several studies have also compared the relative effectiveness of different types of metalinguistic feedback with direct WCF (Bonilla López *et al.*, 2018; Shintani & Ellis, 2013; Shintani *et al.*, 2014) and indirect WCF (Bitchener & Knoch, 2010), and studies also compared reformulation with direct WCF (Sachs & Polio; 2007) and indirect WCF (Storch & Wigglesworth, 2010). The results of these studies are also inconclusive. Broadly, those in favor of direct WCF claim that it (a) provides positive short-term (Ferris, 2006) and long-term effects (Ellis *et al.*, 2008); (b) could be more appropriate for untreatable errors (Ferris, 2014); (c) is easier to act on with information provided about how to correct errors (Chandler, 2003); and (d) can be appropriate for low language proficient students as they may lack linguistic competence to self-correct errors (Van Beuningen *et al.*, 2012). However, the main argument against direct WCF is that it requires less knowledge and minimal cognitive engagement from a learner (Ferris, 2014). Those supporting

indirect WCF suggest that it provides opportunities for deeper processing and "guided learning and problem-solving" (Lalande, 1982); therefore, it has long-term superiority over direct WCF (Lalande, 1982). However, indirect WCF may provide insufficient information to solve more complex errors; hence, it may not be beneficial to less proficient language learners. Advocates of metalinguistic WCF claim that it encourages greater depth of processing as learners have to work out how to self-correct an error (Shintani *et al.*, 2014). However, it may not be beneficial to low language proficient learners and learners with limited metalinguistic backgrounds (Bonilla López *et al.*, 2017). Those supporting reformulation claim that it provides "positive modeling of native-like writing" (Qi & Lapkin, 2001, p. 295) and promotes deeper cognitive engagement (Kim & Bowles, 2019). The main argument against reformulation is that the teacher may misinterpret student's intention when rewriting their text (Ferris, 2014).

The question regarding the effectiveness of feedback scope and strategies still remains open. Since research on feedback scope and strategies is largely (quasi-)experimental (Mao & Lee, 2020) that generates results peripherally related to authentic classroom contexts, Lee (2020) calls for more qualitative and real classroom-based research. Unlike controlled research settings, real classrooms are reported to be dynamic in terms of teachers' use of scope and strategies (Lee, 2020), and teachers are found to be contextually driven when it comes to choosing WCF strategies (Aghajanloo *et al.* 2016). In a real classroom, teachers differ from each other in terms of their feedback decisions as their decisions are directed toward fostering student learning (Cheng & Zhang, 2022). Thus, more qualitative-oriented research situated in authentic classroom contexts is needed as such studies can broaden the methodological scope of WCF research (Lee, 2020) and can throw light on the comparability of such findings with those from experimental research (Li & Vuono, 2019), and facilitate valid assessment of the effectiveness of feedback scope and strategies. Besides, qualitative research should focus on individual students' engagement with the scope and strategies of teacher WCF because engagement has been claimed to "unlock the benefits of feedback" (Zhang & Hyland, 2018, p. 90). Zhang (2017) stated that careful investigation of students' engagement with WCF provides information on factors that facilitate or inhibit their productive response to feedback. Such information can contribute to the knowledge needed for the effective provision of WCF.

Concept of student engagement and empirical research

In previous research, student engagement has been operationalized as students' response to WCF (e.g., Hyland, 2003) and processing of WCF and uptake (e.g., Storch & Wigglesworth, 2010). The commonly accepted definition, however, was proposed by Ellis (2010), who viewed student engagement as students' response to both written and oral corrective feedback (CF) that has a manifestation in cognitive, behavioral, and affective perspectives. Ellis's componential framework formed the basis for several recent studies on student engagement with computer-generated WCF provided by various automated

tools (Koltovskaia, 2020; Zhang, 2017, 2020; Zhang & Hyland, 2018) and traditional handwritten teacher WCF (Han & Hyland, 2015, 2019; Moser, 2020; Zheng & Yu, 2018). However, because the framework was originally proposed for both oral and written CF, it had to be modified to uncover complexities and peculiarities of student engagement exclusively with computer-generated WCF and teacher handwritten WCF. These studies enriched the framework by identifying more sub-constructs in each dimension. The sub-constructs of the behavioral perspective are (a) revision operations (e.g., correct revision, rejection), (b) observable strategies used to improve the quality of writing (e.g., consulting the dictionary), and (c) time spent on revision. The sub-constructs of the cognitive perspective are: (a) awareness at the level of noticing and understanding and (b) use of meta-cognitive and cognitive operations. The sub-constructs of affective engagement are: (a) immediate emotional reactions upon receiving feedback and (b) attitudinal response to feedback.

Not only the aforementioned studies have expanded the multidimensional framework of student engagement, but also shed light on the complexities of individual students' engagement with computer-generated feedback and handwritten-teacher WCF. For example, Koltovskaia (2020) explored two ESL college students' engagement with automated feedback provided by Grammarly. The results revealed that the students had different levels of engagement with Grammarly feedback. While one student showed more extensive cognitive engagement because he questioned Grammarly feedback which resulted in the selective incorporation of feedback, the other's reliance on Grammarly feedback indicated more limited cognitive engagement which led to uncritical acceptance of feedback. Behaviorally, both students made moderate changes to their drafts. Overall, both students favored automated feedback. Han and Hyland (2015) explored four Chinese EFL college students' engagement with handwritten-teacher WCF. The findings revealed that the students' engagement with teacher WCF was complex, mediated by individual and contextual factors. One student was extensively cognitively, affectively, and behaviorally engaged with teacher WCF which was facilitated by attending teacher-student conferences. The second student was emotionally and cognitively overwhelmed with teacher WCF, resulting in minimal engagement with feedback and ineffective revision of her text. The third student had positive affective engagement but limited cognitive engagement with teacher WCF at the level of understanding, which still led to effective revision of her text. The last student was disengaged with teacher WCF and offloaded most of his revision workload to his peer. Moser (2020) also reports something similar on learner engagement with WCF. According to her, learners have individual feedback needs and their engagement depends a lot on to what extent the feedback caters to their individual needs. Another important claim made by Moser is that though teachers play a major role in how students engage with feedback, they may not be able to influence all learner engagement factors.

Although these studies provide interesting insights into how individual students engage with both computer-generated feedback and handwritten-teacher WCF, the majority of these studies lack a detailed description of the feedback

students engaged with. The studies particularly do not provide any information about the feedback strategies used by the teacher or delivered by the automated tool. Additionally, these studies focus on feedback provided by automated tools and by a teacher who uses the traditional feedback method, namely handwritten feedback. However, in the contemporary L2 writing classroom, especially in university contexts in North America, students are required to submit their written assignments through Canvas and Brightspace. Therefore, teachers often provide feedback on students' writing electronically in chats, forums, via SpeedGrader, or word-processing software (Ene & Upton, 2018) of which Microsoft Word's comments feature has been widely used. Surprisingly, research on student engagement with computer-mediated teacher WCF feedback is scant.

Against such a backdrop, the current case study gets a detailed look at teacher WCF and uses a multidimensional framework of student engagement with WCF to explore how two ESL university students engaged with the scope and strategies of teacher WCF provided by Microsoft Word's comments feature when revising their second draft in a real L2 writing classroom. The study addressed the following research questions:

1. What feedback scope and strategies does the teacher use to respond to students' second drafts?
2. How do students behaviorally, cognitively, and affectively engage with scope and strategies of computer-mediated teacher WCF on their second draft?

Methods

Research context, assignments, and feedback practice

The study took place in the Second Language Writing course for non-native speaker undergraduate students at a US university. This was a 16-week, three-credit research writing course that met three times a week for 50 minutes per class. The genre- and process-based writing course focused on three sections of a research proposal: introduction, literature review, and methodology. The three sections of the research proposal were two-draft assignments. Because students taking the course develop not only their writing skills but also their linguistic skills, the feedback provision often follows the principles of the process-writing pedagogy proposed by Zamel (1985). That is, the first draft often receives feedback on higher-order concerns (HOCs), such as content and organization, while the second draft receives feedback on lower-order concerns (LOCs), including grammar and mechanics. Additionally, the participating university uses a learning management system, Brightspace. Therefore, all the assignments are submitted electronically, and feedback is often provided electronically using Microsoft Word's comments feature.

Teachers

The first author and another teacher (henceforth, will be addressed as "the second teacher"), both PhD students in Applied Linguistics at the university, co-taught the course as graduate teaching associates. Both of them researched writing and had more than 13 years of experience in teaching English as a foreign/second language, which comprised mostly teaching academic language skills. They were also familiar with the concept of WCF and offered it to students in their previous teaching contexts. They created the teaching materials and assessments and offered feedback to students collaboratively. While the first author graded the writing assignments of half of the students, the other teacher graded the other half. The teachers had regular discussions regarding students' progress and planned feedback strategies based on their students' needs. For the current study, only the second teacher's use of scope and strategies was analyzed as the two students were graded by her.

Student participants

Seventeen students enrolled in the course were recruited for the study of which four signed the consent form approved by the Institutional Review Board (IRB). However, only two participants' data were considered for this study as they successfully completed all the study requirements. The remaining two students either did not submit their screencasts or were absent during the interview. The two participating students were Kelsey and Walter (pseudonyms). Kelsey was from Saudi Arabia, and Walter was from South Korea. At the time of the study, the participants reported being in the US for two years. Kelsey and Walter were among the best students in class who were highly motivated and hard-working. Both students received entrance exam scores above the minimum required score for undergraduate students. Kelsey received the IELTS score of 6 (requirement 5.5), and Walter received the TOEFL score of 82 (requirement 61). Both students had an intermediate level of English proficiency which was based on their entrance exam score. Table 1 presents the participants' profiles.

Table 1. Background information of the participants.

Name	Gender	Age [a]	Country	L1 [b]	Class standing	Major	TOEFL/IELTS Score
Kelsey	Female	21 (1997)	Saudi Arabia	Arabic	Freshman	Computer Science	6 (IELTS)
Walter	Male	24 (1994)	South Korea	Korean	Junior	Marketing	82 (TOEFL)

[a]At the time of the study; [b] First language

Data collection

Procedures

For this study, the authors examined two students' engagement with teacher WCF given for the second drafts of the introduction and methodology sections of their research proposal. WCF was delivered by the second teacher. The teacher provided feedback as she normally would, and the students, who previously received electronic feedback on their writing from the same teacher, engaged with WCF as they normally would. The teacher first provided electronic feedback on HOCs on both assignments separately using Microsoft Word's comments feature. Upon receiving students' revised drafts of the introduction and methodology that were combined into one Word document, she provided feedback on LOCs, also electronically. Along with feedback on LOCs, the teacher provided feedback on HOCs if necessary (Figure 1).

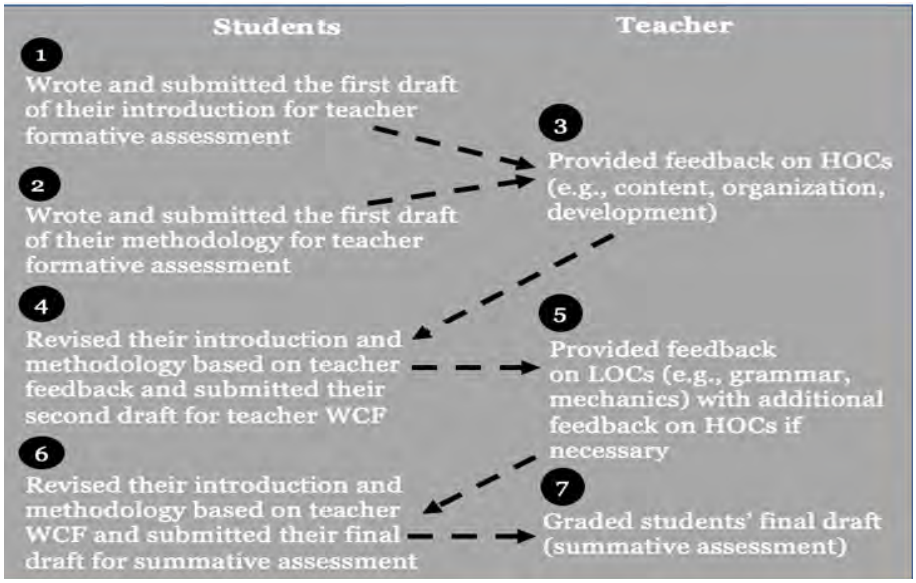

Figure 1. Overview of the revision process of the introduction and methodology.

When the students received their drafts with teacher WCF, they were asked to record a video of their computer screen with QuickTime player to capture their revision process. Before that, they had a QuickTime player training session during one of their classes. The screen capture method, which is often used by researchers working on computer-mediated WCF, was used to understand how the students behaviorally engaged with WCF. The revision activity was assigned as homework, and the students captured their revision process on the same day they received their drafts with teacher WCF. After the activity, the students submitted their final drafts for summative teacher assessment.

In the same week, the students had an individual stimulated recall interview with their teacher (Appendix B), which occurred within 24 hours of the revision process. This introspective method, which has been proved to be effective and used in studies conducted by Shintani and Ellis (2013) and Ellis (2010) among

others, was used to enable the researcher to gain insight into what the students were thinking and feeling at the time of correction of each error (Gass & Mackey, 2017) i.e., their cognitive and affective engagement with WCF, respectively. The students' screencasts served as the recall stimulus. Immediately after the recall, the students had a semi-structured interview that comprised nine questions about their affective engagement with WCF (Appendix C). The recall and the interview with each student were conducted in English and audio-recorded and lasted approximately one and a half hours.

Data analysis

Analysis of teacher's WCF. To identify the scope and strategies of WCF the teacher offered to students, the teacher's feedback was scrutinized. The authors extracted the teacher's feedback given to two participants' drafts from Microsoft Word and independently coded each feedback following the categories of WCF scope and strategies (Appendix D) generated based on previous research on the scope and strategies of WCF (e.g., Ellis, 2009; Lee, 2020). See Appendix D for examples that emerged from the data. While the scope was easy to determine, the authors had several rounds of discussion to determine the strategies used by the teacher. The authors also coded teacher's feedback for error types using the taxonomy of error categories (Appendix E) drawn from the previous literature (e.g., Ferris 2006; Han & Hyland, 2015) to explore what errors the teacher primarily focused on. The authors then counted how much feedback each participant received. After coding teacher's feedback independently and after rounds of discussion, the inter-coder agreement rate for feedback strategies and error types reached 94%, and 92% (based on simple percentage agreement), respectively.

Screencasts and written texts analysis

To profile the participants' behavioral engagement, their second drafts with teacher WCF, final drafts, and screencasts were analyzed. Following previous research on student engagement (e.g., Han & Hyland, 2015), behavioral engagement in this study concerned revision operations (i.e., any actions taken in response to WCF, such as correct revision, rejection), revision strategies (i.e., any actions taken to improve the accuracy of the draft, such as consulting the dictionary, using the Internet), and time spent on revision (i.e., the actual time spend on draft revision). The analysis included three stages. The first stage involved the identification of the participants' revision operations used in response to teacher WCF, drawing on topologies of students' response to feedback found in previous research (e.g., Ferris, 2006; Severino & Prim, 2015) (Appendix F). To achieve this, the participants' sentences before and after revision as well as their screencasts were analyzed. The second stage included the examination of any observable-in-the-screencast revision strategies that were taken to enhance the quality of the draft. This was further validated through

cross verification from the recall and interview with the participants. The last stage involved determining how much time each participant spent on revision.

To ensure the reliability of data analysis, both authors coded the participants' data independently. The codes were then compared, and the agreement rate for revision operations was calculated, which was 97%. The authors agreed on the revision strategies as well as the fact that the time spent on revision should be determined based on the video length because the revision process was not interrupted.

Analysis of the recall and interview transcripts

To explore the participants' cognitive and affective engagement, the recall and interview data were analyzed. Following previous research, cognitive engagement concerned how deeply the participants processed feedback (noticing and understanding) and used metacognitive and cognitive operations. The affective engagement concerned the participants' immediate emotional reactions and attitudinal responses to feedback. First, audio-recordings were transcribed with Trint (https://trint.com). Both authors then checked the transcripts for accuracy against the original recordings. The participants' responses were then coded following the grounded theory approach of Corbin and Strauss (2008) – open, axial, and selective coding. In the open coding phase, the recall and interview data were repeatedly read line-by-line, and codes closely related to the original data were assigned. For example, one of the participants' comments "After I saw this amount of feedback, I got shocked" was assigned a code of "shocked" while the comment "The first thing that came to my mind was if I have these many mistakes. So, I felt disappointed" was coded as "disappointed." In the axial coding phase, these codes were linked together as they revealed the participant's emotional reactions to WCF. The codes then were assigned to the "emotional responses' subcategory. As this is one of the subcategories of affective engagement, these codes were attributed to the "affective engagement' category in the selective coding phase. Next, the codes were compared across the two cases and further refined. Lastly, the narratives for each case were generated.

The authors coded the participants' transcripts independently and then compared their codes. If there were disagreements in the codes and categories, they refined them after discussion. The final inter-coder agreement rates for cognitive and affective engagement were 91.5% and 98%, respectively.

Findings

Teacher's use of WCF scope and strategies

The first research question investigates the scope and strategies of computer-mediated WCF used by the teacher. In terms of feedback scope, the teacher offered comprehensive feedback, i.e., feedback on all errors (Figure 2) to both participants. The feedback given to the participants' second drafts was placed

in comment balloons in the margins using the review tool of Word. The participants received multiple comments in a single sentence, and Word did not display the full text of the comments in balloons due to their large number.

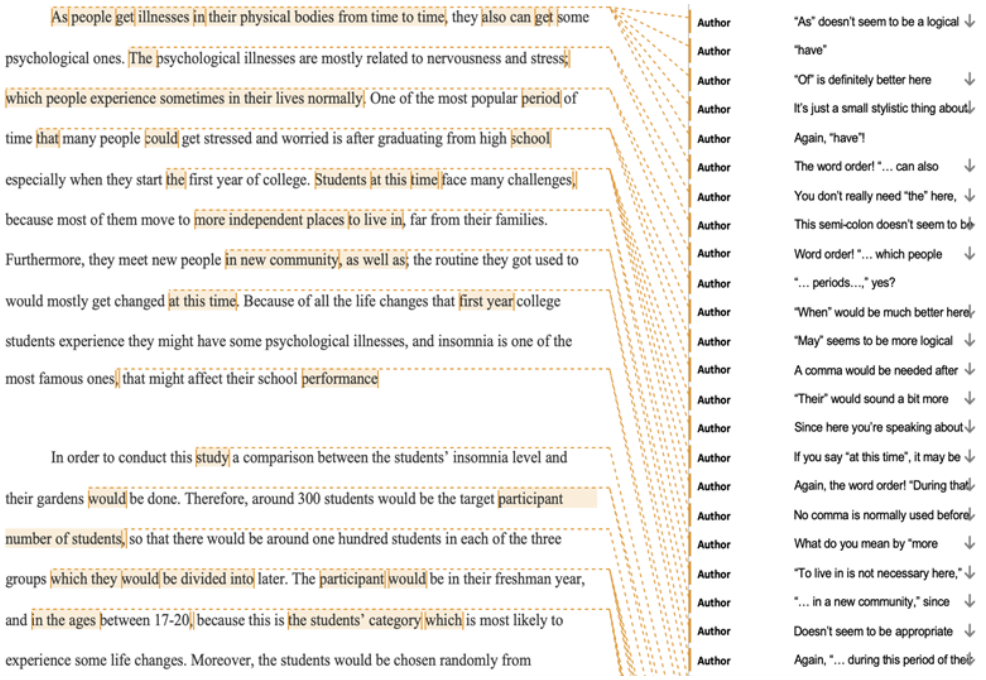

Figure 2. WCF given to one of the participants' drafts.

A total of 138 comments were given to two participants' writing. As shown in Table 2, 73% (100) of WCF focused on LOCs and 27% (38) focused on HOCs of which feedback on style was the most frequently provided feedback, followed by punctuation, clarity and understandability, prepositions, verb form, articles, and singular-plural.

Table 2. WCF on participants' second drafts.

	Two participants	Kelsey	Walter
HOCs			
Clarity & Understandability	14	1	13
Transitions	2	2	
Style	22	14	8
LOCs			
Sentence-structure	3	2	1
Subject-verb agreement	1		1
Word order	6	4	2
Verb form	11	6	5
Verb tense	5		5
Word form	3	2	1
Word choice	8	6	2
Repetition or redundancy	2	1	1
Singular-plural	10	3	7
Formatting	6		6
Articles	11	4	7
Pronouns	1	1	
Prepositions	11	4	7
Conjunctions	3	3	
Punctuation	18	12	6
Spelling	1	1	
Total errors	**138**	**66**	**72**
Essay length	**802**	**388**	**414**

Figure 3 demonstrates the teacher's WCF strategies as observed from the students' second draft. Based on the figure, 49% (68) of WCF given to participants' drafts were direct with some sort of metalinguistic explanation (ME). 24% (33) of WCF were direct. 13% (17) of WCF were reformations with ME. 6% (8) of WCF were direct with the error category (EC). 4% (6) of WCF were reformulations. 2% (3) of WCF were reformulations with EC. Another 2% (3) of WCF were direct with EC and ME (see Appendix D for examples).

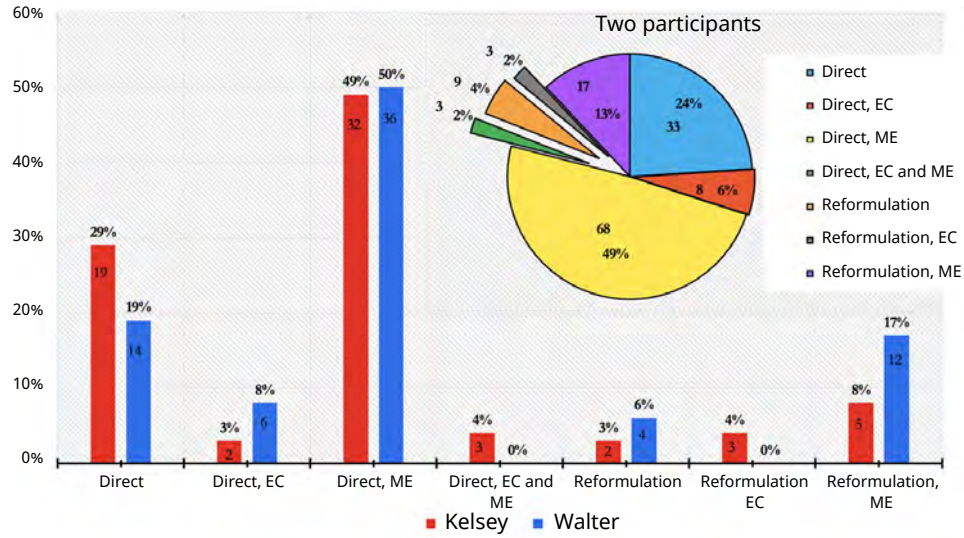

Figure 3. Feedback strategies used in two participants' drafts.

Student engagement with teacher WCF

The second research question explores student engagement with the scope and strategies of computer-mediated teacher WCF. The participants are discussed individually to profile their behavioral, cognitive, and affective engagement with WCF.

Kelsey – "I didn't like that there were lots of comments that i sometimes skip some of them like this, just by mistake". Kelsey received 66 teacher comments in her 388-word draft of which 26% (17) focused on HOCs and 74% (49) on LOCs (see Table 3). The most frequent errors identified by the teacher were errors on style and punctuation. Table 3 also illustrates Kelsey's revision operations used in response to WCF. According to the table, Kelsey corrected 59% (39) of the errors spotted by the teacher of which 53% (35) were fixed per teacher's marking and 6% (4) were eliminated by a correct substitution. Additionally, Kelsey incorrectly revised 17% (11) of the errors, and 24% (16) of the errors resulted in no revision of which 19% (13) were overlooked by accident and 5% (3) were rejected. The screencast analysis showed that Kelsey did not utilize any revision strategies to enhance the quality of her draft, and she spent a little over an hour (1 hour 4 minutes) on revision.

Table 3. Kelsey's revision operations.

Error type	WCF	Correct revision	Correct substitution	Incorrect revision	No revision	
					Missed	Rejected
HOCs						
Clarity & understandability	1		1[e]			
Transitions	2		1[c]	1[c]		
Style	14	3[ccg]	1[g]	2[eg]	6[acccfg]	2[aa]
LOCs						
Sentence-structure	2	1[a]		1[c]		
Word order	4	2[bf]		2[cf]		
Verb form	6	4[aaa]	1[c]		1[a]	
Word form	2			2[aa]		
Word choice	6	3[ccc]		1[c]	1[c]	1[a]
Repetition or redundancy	1				1[g]	
Singular-plural	3	3[abc]				
Articles	4	4[cccc]				
Pronouns	1			1[c]		
Prepositions	4	3[add]			1[a]	
Conjunctions	3	2[cc]			1[c]	
Punctuation	12	9[aaaccccccc]		1[a]	2[ac]	
Spelling	1	1[d]				
Total errors	66	35	4	11	13	3
Percentage	100%	53%	6%	17%	19%	5%

[a]Direct; [b]Direct, EC; [c]Direct, ME; [d]Direct, EC and ME; [e]Reformulation; [f]Reformulation, EC; [g]Reformulation, ME

While textual changes and the screencast show Kelsey's behavioral engagement with WCF, the recall uncovers Kelsey's cognitive engagement. As mentioned earlier, Kelsey accidentally overlooked 19% (13) of teacher comments. For the remaining 81% (53) of WCF, Kelsey reported detecting and understanding the majority of the errors. The example in Table 4 shows Kelsey's noticing and understanding of the error:

Table 4. Kelsey's noticing and understanding of the error (stimulated recall).

Sentence before	Teacher WCF	Sentence after	Kelsey's comment
In addition, in the survey students would have to decide if they accept that their grades in the psychologist class be used in the study or not.	A comma needs to be used after "in the survey," as it serves as an introductory phrase here.	In addition, in the survey, students would have to decide if they accept that their grades in the psychologist class be used in the study or not.	It is a comma! I added a comma because it is an introductory phrase.

In the recall, Kelsey said that her understanding of the errors largely benefited from direct WCF and direct with ME: "I understood what my mistake is, what I have to change, and why I have to change it." It is worth noting that 49% (32) of WCF in Kelsey's draft were direct with ME (see Figure 3). Kelsey explained that possibly because "there [was] an explanation for exactly why [she] should change [the marked text]," she did not use any revision strategies to improve the accuracy of her draft. Kelsey also reported occasionally experiencing some difficulties in understanding feedback that either had a very long ME or was given in the form of reformulation as in the example in Table 5.

Table 5. Kelsey's lack of understanding of the error (stimulated recall).

Sentence before	Teacher WCF	Sentence after	Kelsey's comment
The psychological illnesses are mostly related to nervousness and stress; which people experience sometimes in their lives normally.	Word order! "… which people normally experience in their lives sometimes/from time to time," OK?	Psychological illnesses are mostly related to nervousness and stress which people normally experience sometimes in their lives.	Because when I read it, I did not understand what she wanted me to change exactly. I read my sentence, and I did not find any mistakes.

Although the comment in the above example contains EC, Kelsey still struggled with comprehending teacher's reformulation and identifying the error. Such lack of understanding of WCF occasionally led to incorrect revisions (see Table 3). Upon opening her draft file, Kelsey began reading and addressing WCF without a planning technique. In the recall, Kelsey said she invested her time and effort into understanding feedback and determining appropriate revisions: "I took my time reading everything and understanding everything." She also added, "I made sure that every change that I make, every feedback that I either accept or not, I am sure about my decision." This was substantiated by the screencast, which showed the mouse pointer slowly moving over the text lines of the majority of teacher comments, suggesting Kelsey slowly and carefully read them. Another cognitive strategy that helped Kelsey process feedback and determine appropriate revisions was rereading WCF along with the sentence in which an error was spotted by the teacher. The recall also revealed Kelsey used the cognitive strategy of reasoning: "I am thinking that both 'that' and 'when' work in this sentence. But 'when' sounds better because I am talking about time here. So, I am accepting it." Throughout the revision process, Kelsey used a number of metacognitive strategies to regulate her mental effort. The recall disclosed that Kelsey occasionally employed the strategy of linking to prior knowledge: "I am thinking what I have learned before. I know that before 'which,' we can sometimes add a comma when what we are adding to the sentence is unnecessary, and we do not add a comma when it is necessary" (recall). Through self-monitoring, Kelsey understood that in many cases, rereading long teacher comments helps her understand them better; therefore, she used this cognitive strategy throughout the revision process. At the end of the revision

process, Kelsey quickly went over the entire paper to see if it "sounds good" (recall), and if there was anything else left to change. After that, she finished her revision process. Overall, Kelsey's cognitive engagement with WCF was moderate. As her main goal was to eliminate errors identified by the teacher, she put little mental effort to gain a deeper understanding of the language.

When Kelsey saw a large number of comments in her draft, her initial emotional reactions were shock and disappointment. Kelsey was shocked because she thought she would have to rewrite the entire paper. This consequently made her feel disappointed in herself as a writer: "When I first opened the file, I felt that I do not know how to write in English" (recall). However, when Kelsey started addressing comments, she realized that the majority of WCF focused on "not that big mistakes such as 'in', 'on', or a comma" (recall). This made her feel better because she knew those were quick fixes. Throughout the revision process, Kelsey experienced various emotional reactions toward WCF. As was noted earlier, she appreciated comments with ME because they facilitated her understanding of the errors. She often felt frustrated with a large number of comments because they made it difficult for her to locate some of them: "I did not like that there were lots of comments that I sometimes skip some of them like this, just by mistake" (recall). The process of locating comments was further complicated by the appearance of more balloons which appeared after Kelsey carried out revisions. It happened because the track-changes feature in Kelsey's document was enabled. Kelsey could have removed comments after addressing them but in the recall, she said that she did not know how to do that. All of this, consequently, made her overlook 19% of the teacher comments. Kelsey was also displeased with feedback on style because she thought such feedback was unnecessary as her sentences were grammatically correct. Kelsey even rejected two comments on style and one on word choice, justifying this in the recall as follows: "I did not want it to be like it was not my writing. I still wanted it to be my style." Despite having negative feelings toward such feedback, Kelsey corrected and attempted to correct the style errors. She did not maintain her agency throughout the revision process because she found teacher feedback authoritative. In the interview, she said, "she is a professor, and she knows more than I how to make the paper sound better." Although Kelsey was rather frustrated with computer-mediated teacher WCF, generally, Kelsey's attitude toward WCF was positive. Kelsey valued feedback on content, grammar, and mechanics because she believed such feedback helped her improve her writing.

Walter – "The Length of Feedback was Kind of Overwhelming Sometimes". Walter received 72 WCF in his 414-word draft of which 29% (21) focused on HOCs and 71% (51) on LOCs. The most frequent errors identified by the teacher concerned clarity and understandability. As follows from Table 6, Walter managed to make accurate changes in his draft in response to 85% (61) of WCF: 81% (58) of those accurate changes were made per teacher's marking and 4% (3) of them were correct substitutions. Additionally, Walter incorrectly revised 7% (5) of the errors identified by the teacher, and he also accidentally missed 8% (6) of WCF. Similarly to Kelsey, Walter did not use any specific revision strategies

to improve his writing. Although Walter received more comments than Kelsey, he spent 37 minutes on revision.

Table 6. Walter's revision operations.

Error type	WCF	Correct revision	Correct substitution	Incorrect revision	No revision Missed
HOCs					
Clarity & understandability	13	7[acccdee]	2[ee]	3[dee]	1[e]
Style	8	7[acccdde]		1[e]	
LOCs					
Sentence-structure	1	1[e]			
Subject-verb agreement	1	1[c]			
Word order	2	1[e]	1[c]		
Verb form	5	5[acccc]			
Verb tense	5	4[cccc]			1[c]
Word form	1	1[a]			
Word choice	2	2[ac]			
Repetition or redundancy	1				1[b]
Singular-plural	7	6[abbbbb]		1*	
Formatting	6	6[aaaaac]			
Articles	7	6[cccccc]			1[c]
Prepositions	7	7[aaaccce]			
Punctuation	6	4[cccc]			2[cc]
Total errors	72	58	3	5	6
Percentage	100%	81%	4%	7%	8%

[a]Direct; [b]Direct, EC; [c]Direct, ME; [d]Reformulation; [e]Reformulation, ME

In the recall, Walter reported detecting and understanding many of the errors spotted by the teacher. An example of his noticing and understanding of the error can be seen in Table 7.

Table 7. Walter's noticing and understanding of the error (stimulated recall).

Sentence before	Teacher WCF	Sentence after	Walter's comment
Empathy is a mental process to feel others' emotion and internalizing it as one's own feeling.	If "emotions," then certainly "them" instead of "it," as we guess.	Empathy is a mental process feeling others' emotions and internalizing them as one's own feeling.	Because I changed "emotion" to "emotions," so I had to use "them" instead of "it."

Walter also noted that many errors, especially errors on singular-plural and formatting, were "quite obvious. So [he] accepted feedback on those errors." This is because the teacher gave feedback on the same error category multiple

times. Thus, Walter did not even read feedback because he already knew how to fix those errors as in the example in Table 8.

Table 8. Walter's automatic acceptance of his teacher feedback (stimulated recall).

Sentence before	Teacher WCF	Sentence after	Walter's comment
A group of children who were raised with pet dogs over 5 years and the other group of children who were not raised with pet dogs were compared to find differences in empathy ability.	The numbers between 0-9 are usually spelled out in official texts (so not "5" but "five"), OK?	A group of children who were being raised with pet dogs during five years and the other group of children who were not raised with pet dogs were compared to find differences in empathy ability.	Because she said if the number is between 0 and 9, I should write it in English. I have the same problem several times below. I just accepted the feedback if it was the same problem. It was obvious.

Like Kelsey, Walter mainly received direct WCF and direct with ME (see Figure 3). He said that these feedback strategies helped him understand his errors. However, he occasionally experienced difficulties in understanding WCF with very long ME with unfamiliar metalanguage. For example, he did not know what "indefinite article" or "infinitive" meant. Still, he made accurate revisions because he was given the correct form or structure. Additionally, the teacher's use of quotes in her comments confused Walter. In the recall, he said, "quotes were a little bit confusing me to understand what she was saying because I was confused if she was talking about my writing or it was just her recommendation." Walter also did not always understand reformulations: "I did not really understand this comment but I knew she wanted me to add more details." Instead of copying reformulations into his text, Walter tried to fix errors "on [his] own way;" however, this often resulted in incorrect revisions. Like Kelsey, Walter overlooked 8% (6) of the errors identified by the teacher, by accident (see Table 6). He also did not know how to delete comments after addressing them which made the process of locating some comments difficult. Walter also addressed errors without a plan, and his primary goal was to eliminate errors. Walter's cognitive engagement with feedback seemed superficial as he did little to gain in-depth understanding of the language. According to Walter, he put more effort into revising his paper this time because there were a lot of comments, and that made him feel the teacher was not satisfied with his writing. Throughout the revision process, Walter used few cognitive strategies to process WCF and determine appropriate revisions, and metacognitive strategies to regulate his mental effort and emotions. Akin to Kelsey, Walter reasoned, "I am thinking the 'process' summarizes all the processes mentioned above, but because she wants me to describe more, I am going to add some more details," and he also reread WCF. Unlike Kelsey, Walter did not read his sentences after fixing errors. However, if feedback required him to change "a sentence, not just a word," he read that sentence to ensure his revision was appropriate. While at the beginning of the revision process, Walter was more cognitively engaged

with WCF, his cognitive engagement declined closer to the end of the revision process. Walter saw the rest of the comments at once in a very long comment balloon. In the recall, Walter said he got so exhausted reading very lengthy comments and addressing them that he wanted to "to finish revising as fast as [he] could." However, Walter did not quit. He collected himself and addressed all the remaining comments. After that, he scrolled up to see if everything looked good and then finished revising.

Much like Kelsey, Walter was shocked to see so many comments. He immediately thought there was something wrong with his writing. As soon as he started revising his paper, Walter experienced both positive and negative reactions toward WCF. Walter liked that the teacher often commented on the same issue several times, as such feedback, according to him, "stays in the memory" (recall). In the recall, he also added that he would never forget that numbers below ten should be spelled out in APA Style. As for negative reactions, Walter did not like long comments because they made him feel "guilty or something" (recall). In the interview, he said: "I felt like she was judging me so hard." He also added that "the length of feedback was kind of overwhelming sometimes." Additionally, Walter did not like feedback that required more work from him, such as feedback on clarity and understandability or word order because, as he said in the interview, "with those kinds of comments, if I change the sentence then I have to change a sentence before this sentence." Generally, however, Walter had a positive attitudinal response toward WCF. He thought WCF helped him improve the accuracy of his writing. Like Kelsey, Walter found teacher feedback authoritative. He also thought that feedback on style was not important as his sentences were grammatically correct. However, he revised his text based on teacher feedback. In the interview, he said: "I felt like she is probably going to read my paper again after I submit it, and because she is not just a random person, I meet her three times a week, I felt like I did not want to reject her recommendations." He also added that if he did not consider teacher WCF, it would probably affect his grade.

Discussion and conclusion

Informed by the conceptual framework of student engagement with computer-generated WCF (e.g., Zhang, 2017) and traditional handwritten – teacher WCF (e.g., Han & Hyland, 2015; Zheng & Yu, 2018), the study first explored the scope and strategies of computer-mediated teacher WCF provided in a naturalistic classroom-based setting. The study then investigated how two university ESL students, Kelsey and Walter, engaged with teacher WCF to improve the accuracy of their second draft.

The findings revealed that the scope of computer-mediated teacher WCF was comprehensive. Comprehensive WCF has been reported to be a common practice in L2 writing classrooms (e.g., Ellis *et al.*, 2008; Ferris, 2014; Lee, 2020, Mao & Lee, 2020), and the study's finding corroborate this claim. The teacher's decision to offer comprehensive feedback could be motivated by her awareness of students' needs and English language proficiency as well as the requirements

of the course. It must be noted that the teacher knew her students well. Thus, her decision to provide comprehensive feedback could be justifiable and is in line with the finding of Cheng and Zhang (2022). The teacher employed a combination of different feedback strategies, which indicates the dynamic nature of WCF in the real classroom (Lee, 2020; Mao & Lee, 2020). It is noteworthy that the overwhelming majority of teacher WCF was direct, often provided in combination with metalinguistic explanation (ME). In line with previous research (e.g., Ferris, 2006), the study shows that direct WCF is a common feedback strategy used by L2 writing teachers.

As for students' engagement with teacher WCF, both participants had various levels of engagement at the behavioral, cognitive, and affective levels. Behaviorally, one participant made more successful changes to his draft than the other participant. Walter correctly revised 85% of WCF, thus significantly improving his draft. This could be due to the fact that he mainly received direct WCF that provides a correct form or structure and involves mere copying or transcribing of the teachers' suggestions into the draft (Ferris, 2006). Previous studies suggested that direct handwritten-teacher WCF and direct computer-mediated teacher WCF lead to successful revisions of one draft of a paper to the next (e.g., Ene & Upton, 2014; Ferris, 2006), and the above fining also shows that direct computer-mediated WCF leads to the improvement of the draft. However, caution should be made in generalizing this finding as it is based on only one case. Nevertheless, the finding still provides interesting insight which is in line with previous research (e.g., Chandler, 2003; Van Beuningen *et al.*, 2008; 2012). Unlike Walter, Kelsey made somewhat moderate changes to her draft (53%), and this was because she accidentally overlooked 19% of WCF due to their large number. Similar to previous claims (e.g., Lee, 2019), this finding suggests that students may have hard time focusing on revision when comprehensive WCF is provided. Additionally, behaviorally, two participants did not use any revision strategies (e.g., consulting the dictionary) to enhance the accuracy of their draft. As Kelsey noted, this could be because direct WCF was often accompanied by ME. It appears that the provision of metalinguistic explanation with direct WCF helped the participants understand the cause or nature of their errors; therefore, they did not feel a need to consult other sources. This indicates a facilitative nature of ME as a feedback strategy.

The two participants had mediocre cognitive engagement with teacher WCF. This could be partially explained by the feedback strategy the teacher employed. Research shows that direct WCF requires less knowledge and minimal cognitive engagement from a learner because students do not have to resolve the problem on their own because the solution is provided (Ferris, 2014). Moreover, the participants occasionally experienced difficulties in understanding long ME that contained metalanguage with which they were not familiar. Such a lack of understanding of feedback sometimes resulted in incorrect revisions. In line with previous research, it appears that students with limited metalinguistic backgrounds may not benefit from metalinguistic explanation (Bonilla López *et al.*, 2017). Additionally, long ME appears to be overwhelming for students to process and comprehend. Reformulations were also challenging for

participants to understand despite the correct structure being provided. This also corroborates previous research that demonstrated that reformulations are not effective (Sachs & Polio, 2007; Storch & Wigglesworth, 2010).

Affectively, the participants were satisfied with the feedback they received, especially direct WCF. This is not surprising because direct WCF provides a solution for students, and they do not have to use a lot of cognitive resources to resolve the issue. Both participants exhibited negative reactions toward comprehensive feedback as they were overwhelmed by the amount of comments they received. Comprehensive feedback was reported to be overwhelming and even discouraging for students (Lee, 2019; 2020). The above finding corroborates this claim; however, the participants of this study were not discouraged by comprehensive feedback despite being overwhelmed by it because they regarded teacher feedback authoritative. They were afraid that if they did not address all or the majority of teacher comments, this would affect their grade negatively. Besides, they appreciated teacher WCF because they believe it helps them improve their draft. Interestingly, the study also showed that the participants experienced adverse emotional reactions toward feedback on one error type, namely feedback on style, as they thought such feedback was unnecessary because their sentences were grammatically correct. Previous research also emphasized the fact that feedback on style is often not appreciated by L2 learners (Ferris, 2014).

The study extends the current research on student engagement with WCF in several ways. While previous research on student engagement with WCF claimed that students' effective engagement could be affected by students' individual differences, L2 proficiency, and context, this study demonstrates that students' engagement with feedback can also be affected by feedback's scope and strategies. Additionally, this study is among few studies that employed a multidimensional framework of student engagement to explore how two university students engaged with the scope and strategies of computer-mediated teacher WCF in the ESL context. Much of the research on student engagement with WCF was conducted in the EFL context, particularly in China (e. g. Han & Hyland, 2015; Zhang, 2020; Zheng & Yu, 2018).

The study does not aim at prescribing how teachers should provide computer-mediated WCF as this study is based on two cases. Instead, by demonstrating how two students engage with teacher WCF, the study allows teachers to reflect on their WCF practices and hopes they will adjust them to maximize student learning.

Certain limitations of this study must be acknowledged. First, the study investigated one computer-mediated WCF-revision cycle that does not reveal changes in the teacher's use of feedback scope and strategies in subsequent drafts and in students' engagement with WCF over time. Therefore, future classroom-based studies should be longitudinal. Second, it would be interesting to investigate teacher beliefs about feedback scope and strategies and whether their beliefs align with their WCF practices. Additionally, future qualitative classroom-based research could further explore students' engagement with

focused computer-mediated teacher WCF as research shows that such feedback could be more beneficial.

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Appendix A

WCF scopes and strategies

WCF scope	Description
1. Selective WCF	It has been interchangeably used with *focused* WCF. In the literature, it has been often defined as selecting specific error types (one or two) that are the most frequent and serious errors in students' writing (Ferris, 2014; Lee, 2020).
2. Comprehensive WCF	It has been often synonymously used with *unfocused.* WCF. However, while unfocused WCF has been defined as targeting a range of errors (often five) in some studies (Sheen et al., 2009), comprehensive WCF has been defined as targeting all errors in each piece of students' writing in other studies (Van Beuningen et al., 2012). Therefore, Lee (2020) stated that these two terms should not be used interchangeably. Lee (2020) proposed that feedback scope should be viewed on the "comprehensive-focused/selective" (p. 3) spectrum with comprehensive WCF targeting all errors at one end of the spectrum (and hence, highly unfocused) and selective feedback targeting one error category at the other end of the spectrum (and hence, highly focused). The more errors feedback targets, the less focused its scope becomes.
WCF strategy	**Description**
1. Direct WCF	The teacher identifies an error and gives the correct form or structure, and the student is expected to simply copy the correction into her/his text (Bitchener & Storch, 2016; Ellis, 2009; Ferris, 2014).
2. Indirect WCF	The teacher indicates that an error has been made by circling, underlining, or highlighting the erroneous form instead of providing a correction, and the student is expected to diagnose and correct the error on her/his own (Bitchener & Storch, 2016; Ellis, 2009; Ferris, 2014).
3. Metalinguistic WCF a. Use of error code/ category b. Brief metalinguistic explanation	It is an additional form of direct WCF. It is when the teacher does not supply the student with the correction but provides: – metalinguistic clues such as the use of error codes (e.g., art = article) or error category (e.g., articles!). – a brief grammatical description of the nature of the error (Bitchener & Storch, 2016; Ellis, 2009; Ferris, 2014).
3. Reformulation	The teacher rewrites the portion of the student text to make it sound native-like while preserving the student's idea as much as possible (Bitchener & Storch, 2016; Ellis, 2009; Ferris, 2014).

* Adapted from Ellis (2009)

Appendix B

Stimulated recall script and questions

B.1. Stimulated recall script.*

We are going to watch the video of your error correction process. As we watch the video, I will be asking you questions about what you were thinking. As you watch your error correction process, try to recall what you were

* Adapted from Gass and Mackey (2000)

thinking at the time of error correction. Try to put your mind back into the task. Anytime you remember something, say it, interrupt me, ask me to stop the video if you want.

I am interested in finding out what you were thinking when you were correcting each error identified by your teacher and why you accepted/rejected/ignored teacher feedback. It does not matter at all to me if those thoughts were silly or profound. I will audio-record our conversation so I do not have to divide my attention by taking notes. At the end of our stimulated recall, I will ask you a few questions about your opinion regarding teacher written corrective feedback.

I am going to put the computer mouse on the table here and you can pause the video any time you want. So, if you want to tell me something about what you were thinking, you can click on the mouse to pause the video. If I have a question about what you were thinking, then I will click on the mouse to pause and ask you to talk about that part of the video. Is everything clear? Are you ready? Let's get started!

B.2. Stimulated recall guiding questions.

1. What were you thinking when you saw this number of teacher comments?
2. What were you thinking right then when you were reading the feedback/ when you paused after reading the feedback/ when you were correcting your error?
3. Why did you reject/accept/ignore teacher feedback?
4. What did you think of the teacher feedback?
5. How did you arrive at accepting/rejecting/ignoring teacher feedback?
6. Did you always understand teacher feedback? Why or Why not? [NUM]

Appendix C

Semi-structured retrospective interview questions.

1. What is your overall impression of teacher feedback?
2. In general, what do you think of the teacher feedback on the errors you made?
3. Were you satisfied with the feedback? Why or why not?
4. How do you think teacher feedback helped you produce text with fewer errors?
5. To what extent did teacher feedback help you understand why you made errors?
6. Can you tell me a little bit about your proofreading strategies? Did you use the same strategies this time? Why or why not?
7. How much time do you usually spend on proofreading your paper? Did the time change when you were proofreading your paper this time? Why or why not?
8. What do you think of Word document comments feature? Did you

encounter any problems when proofreading your paper electronically? Can you identify the strengths and weaknesses of electronic feedback?

9. Is there anything else you have noticed about teacher feedback that you would like to say?

Appendix D

Teacher WCF strategies identified in data

WCF strategies	Examples
Direct	"have."
Direct plus metalinguistic (a) (i.e., error categories)	"The word order! '… can also have…'.
Direct plus metalinguistic (b) (i.e., metalinguistic explanation)	" 'Who' would be much more logical here, as that part of the sentence which follows it refers to people (namely, to students)."
Direct plus metalinguistic (a) and metalinguistic (b)	"Prepositions! 'At' would be more appropriate here, as in this case, you refer to [X] as to an educational institution but not to its building or campus, for instance. (It's probably the main reason why we usually say 'to study/to work at school/at the university' but not 'to study/to work in (the) school/in the university.')."
Reformulation	"'… the number of families raising their children… is increasing…,' – is this what you probably mean here?"
Reformulation plus metalinguistic (a)	"Word order! '… which people normally experience in their lives sometimes/from time to time,' OK?"
Reformulation plus metalinguistic (b)	"Doesn't make sense, I guess. Something with the opposite meaning (for example, '… individual features can be grouped into psychological, physical, and social types of features') would probably be closer to what you want to say here."

Appendix E

Taxonomy of error categories generated from data*

Error type	Description
Higher-order concerns (HOCs)	
Clarity & understandability	A sentence needs details to ensure clarity and understandability
Transitions	Misuse of transition words and phrases that weaken the internal cohesion of writing
Style	Grammatically correct sentence but quite infelicitous stylistically; missing words or unnecessary words and phrases which do not affect the structure and the meaning of the sentence
Lower-order concerns (LOCs)	
Sentence structure	Includes missing or unnecessary words and phrases that affect the syntactic structure of the sentence. Excluded repetition and redundancy
Subject-verb agreement	Excluded other singular-plural or verb form errors
Word order	Wrong arrangement of words in phrase, clause, or sentence
Verb form	Excluded verb tense and aspect errors
Verb tense	Tense and aspect errors
Word form	Excluded verb form errors and verb tense errors
Word choice	Excluded spelling errors, preposition errors, pronouns, informal and idiomatic usage
Repetition or redundancy	Repetition of words and phrases conveying similar ideas in different parts of the same sentence, paragraph, or text
Singular-plural	Noun ending errors
Formatting	APA documentation style errors
Articles	The misuse of zero, definite, and indefinite articles
Pronouns	The misuse of pronouns
Prepositions	Inappropriate choice of prepositions
Conjunctions	The misuse of conjunctions
Punctuation	Inappropriate choice of punctuation marks. Excluded run-ons and fragments
Spelling	Misspelled words

* Adapted from Ferris (2006) and Han and Hyland (2015).

Appendix F

The participants' revision operations identified in data*

Type of the revision operations	Description
Correct revision	Error was corrected per teacher's marking.
Correct substitution	Triggered by the teacher's suggested correction, the marked text was correctly substituted by the student's own correction.
Incorrect revision	Error was addressed incorrectly.
No revision	No response to the correction was apparent due to accidentally overlooking teacher feedback or rejecting teacher feedback on purpose.

* Adapted from Ferris (2006), Hand and Hyland (2015), and Severino and Prim (2015).