

Research Article

**The Effect of Technology-Mediated Written Corrective Feedback on
Vocabulary, Grammar, and Mechanics in EFL Writing**

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Abstract

This quasi-experimental study, grounded in cognitive theory, examined the impact of written corrective feedback (WCF) on specific components of writing: grammar, vocabulary, and mechanics. The research aimed to determine the effectiveness of targeted WCF on A2-level English language learners' writing proficiency. The participants comprised 110 secondary students enrolled in online English classes conducted via the SHAD application over a nine-month period. The students were randomly assigned to three treatment groups based on their availability, each receiving WCF focused on either grammar, vocabulary, or mechanics. To measure writing improvement, all participants completed the A2 Key examination as both the pre-test and post-test. The analysis of the gain scores indicated that technology-mediated WCF was generally effective in enhancing writing skills across all three categories. Specifically, improvements were observed in grammar, vocabulary, and mechanics following the intervention. However, the statistical analysis revealed no statistically significant difference in the effectiveness of WCF across the three error categories. This suggests that while WCF improved writing performance in all areas, the degree of improvement did not vary significantly depending on whether the feedback focused on grammar, vocabulary, or mechanics. These findings offer valuable insights for educators, students, teacher training programs, and curriculum developers, informing the design and implementation of targeted feedback strategies in online language learning environments.

Keywords: written corrective feedback, error, grammar, vocabulary, mechanics, writing

Introduction

Writing is generally considered the last achievable skill for foreign language learners. Written corrective feedback (WCF), defined as a written response from a teacher to students' errors in a written text (Bitchener & Storch, 2016), may help overcome the challenge of writing in an L2. The focus of previous studies has mostly been on the linguistic accuracy of learners, and many of them predicted that WCF fosters L2 development; however, the effectiveness of written error correction is still unresolved due to conflicting literature, and the issues associated with the design of the previous studies. One such problem is that changing the study condition limits the interpretation of the findings (Liu & Brown, 2015). That is, different results may be obtained based on the students' first languages, their nationality, and EFL or ESL context (Truscott, 1996). Another problem is related to the narrow and artificial design of the studies that are not relevant to the teaching process (Mohebbi, 2021). Most of the studies have a one-shot design and there are only few longitudinal studies. Therefore, the long-term effect of WCF has not been investigated extensively (Liu & Brown, 2015). Furthermore, WCF is provided just on a few linguistic errors (mostly English articles). Although this type of research enables researchers to measure changes in grammatical accuracy precisely, it is not what happens in a real classroom (Storch, 2018). Several studies have examined grammatical WCF (e.g., Boggs, 2019; Karim & Nassaji, 2018), and lexical WCF (e.g., Ko, 2019), albeit with limited scope. However, very few studies have investigated the effect of WCF on vocabulary, grammar, and mechanics simultaneously in a single study, allowing for comparison with each other. Moreover, limited studies took advantage of technology for providing WCF (Farrahi Avval et al., 2021; Shintani & Aubrey, 2016), and none of them used the SHAD application. The present study, therefore, aimed to explore the effect of technology-mediated WCF on grammar, vocabulary, and mechanics on the writing improvement of learners by taking advantage of the SHAD application. Mechanical errors in this study included errors in spelling, punctuation, capitalization, and paragraph indentation. This study was conducted within the framework of cognitive and sociocultural theory, and it was unique in the sense that it tried to investigate whether WCF is effective in the context of Iran and then compared three types of errors with each other. Filling this gap is helpful, especially in the context of Iran where class sizes are typically large and language teachers are required to teach in many classes. It imposes a heavy workload on teachers to provide WCF on every single error. In this situation, recognizing the effect of WCF on different

error categories can assist teachers in focusing only on those errors that can benefit from WCF.

Literature Review

Writing is commonly perceived as a challenging task, leading to frustration among learners when they are required to write (Graham et al., 2005, as cited in Arindra & Ardi, 2020). In this context, teachers are responsible for supporting learners and written corrective feedback (WCF) may serve as a potential solution. Consequently, researchers have begun to examine the effects of WCF on students' writing. The issue became more challenging when Truscott (1996) argued that WCF is ineffective and harmful. He claimed that those who talked about the effectiveness of WCF ignored the practical problems associated with it. Also, they overlooked the potential negative side effects of WCF since constant correction of students' errors can lead to demotivation and a loss of interest in writing. On the other hand, Ferris (1999) was the first scholar to strongly challenge Truscott's view. She argued that WCF is effective and Truscott (1996) had a biased view in his review article. Moreover, she stated that correcting the students' errors should be continued and further research should be conducted to examine the true effect of WCF (Ferris, 1999).

The debate further intensified the uncertainty surrounding the effectiveness of WCF rather than resolving it. Researchers have adopted various philosophical approaches in their studies, leading to inconsistencies since the selected philosophy can affect both the research methodology and the interpretation of the results (Ferris, 2010). Two philosophical approaches have been proposed for studying WCF. The first approach is Second Language Acquisition (SLA) approach. Studies based on SLA can be called 'writing to learn' (Van Beuningen, 2010). SLA researchers focus on the effect of WCF on the acquisition of specific linguistic features in new texts (Ferris, 2010; Sherpa, 2021). They measure the effect of WCF by comparing the performance of learners in the pre-test and post-test (Sherpa, 2021). Thus, they have an experimental design with a control group and one or more treatment groups (Ferris, 2010). Additionally, a specific type of error is chosen in this research for providing WCF (Ferris, 2010). SLA studies are rigorously designed but have little validity (Sherpa, 2021) because the tasks used for SLA studies are controlled tasks like picture descriptions (Boggs, 2019). As a result, they can hardly be generalized for all classes (Boggs, 2019). The second approach is the L2 writing approach. L2 writing studies can be called 'learning to write' (Van Beuningen, 2010). These types of studies focus on the impact of WCF on the

quality of students' written texts during the revision stage (Ferris, 2010; Sherpa, 2021). The design of these studies may or may not have a control group or pre-test-post-test (Ferris, 2010). L2 writing studies are valid because they are based on the class curriculum (Sherpa, 2021). Furthermore, the tasks are more personalized and different students may produce different content (Boggs, 2019). Nevertheless, L2 writing studies are criticized for considering successful revision as successful learning (Sherpa, 2021).

Research findings regarding the impact of WCF on writing remain contradictory (Bagheri & Rassaei, 2022; Bitchener & Knoch, 2008; Bozorgian & Yazdani, 2021; Karim & Nassaji, 2018; Sherpa, 2021). Three types of WCF have received much attention. The first type is called direct WCF which identifies the location of the error and provides the correct form either above or near the error (Bitchener & Storch, 2016). Some benefits of direct WCF are reducing students' confusion, providing immediate feedback, providing information to solve complicated errors (Bitchener & Storch, 2016), and increasing grammatical accuracy (Shintani & Ellis, 2015). Furthermore, direct WCF is more effective than other types when the linguistic feature is complex and learners do not have enough knowledge about it (Shintani & Aubrey, 2016). The second type is called indirect WCF. Using indirect WCF, the errors are highlighted by underlying, circling, or showing the errors in the margin of the text. However, the correct form is not provided, and learners themselves need to correct the errors (Bitchener & Storch, 2016). This type of WCF involves learners in 'problem-solving and guided learning' (Lalande, 1982, p. 140). Also, it is time-efficient for teachers (Sherpa, 2021). However, as it does not provide any explanation, learners do not know why the correction is needed (Boggs, 2019). Therefore, it is not helpful for students with lower proficiency levels (Bitchener & Storch, 2016). Metalinguistic WCF is the third type of WCF. It provides explanations and some examples of the correct usage of the linguistic feature (Bitchener & Storch, 2016). It also mentions the reason for the error and the solution for correction (Bitchener & Storch, 2016). Metalinguistic feedback is helpful for students at any proficiency level. It teaches new points and raises learners' consciousness about what has been learned (Bitchener & Storch, 2016). Furthermore, it facilitates a higher level of cognitive engagement (Bozorgian & Yazdani, 2021). Metalinguistic WCF provides the opportunity for deeper analysis, but it does not guarantee taking up this opportunity (Boggs, 2019). Some of the researchers claimed that there is no significant difference between the three types of WCF and all of them are effective (Bitchener & Knoch, 2008;

Karim & Nassaji, 2018). Others, however, asserted that indirect WCF is more effective than direct WCF (Sherpa, 2021). On the other hand, some indicated an advantage for direct WCF over indirect WCF (Bagheri & Rassaei, 2022). Also, others claimed that direct WCF is more effective when it is integrated with a metalinguistic explanation (Bozorgian & Yazdani, 2021).

Scholars, also, have investigated the effect of WCF with respect to the feedback scope. The scope of feedback refers to the amount of WCF teachers should give to the students. That is, whether to respond to all the errors or do it selectively (Mao & Lee, 2020). Scholars have different classifications regarding this point, but most of them classify it into three categories: focused (selective), unfocused (comprehensive), and mid-focused. Focused or selective WCF focuses on some specific linguistic features and other errors will be left uncorrected (Van Beuningen, 2010). Mao and Lee (2020) reported that focused WCF is appropriate for lower proficiency-level students because it requires less cognitive load to process the information. Unfocused or comprehensive WCF involves the correction of all the errors in the students' writing without considering their category (Van Beuningen, 2010). If we consider feedback scope as a continuum, focused WCF is located at one end and unfocused WCF is at the other end. In this situation, mid-focused is situated in the middle of the continuum. It means that mid-focused WCF neither focuses on a single grammatical rule nor all the rules (Boggs, 2019). Liu and Brown (2015) define it as correcting two to five linguistic errors. This type of WCF is more practical because it has the ecological validity of the unfocused WCF and at the same time, it is not time-consuming (Liu & Brown, 2015). Ellis et al. (2008), for example, examined the effect of focused and unfocused WCF on the accuracy of writing considering English articles. It was found that WCF is effective and there is no statistically significant difference between focused and unfocused WCF.

Another topic for examining the effect of WCF is feedback timing, that is, to correct the errors synchronously or asynchronously. Synchronous WCF means that the teacher provides feedback online while students are writing their texts (Mao & Lee, 2020). Synchronous WCF is mostly used in a computer-mediated environment because, in this way, it has a long-lasting effect on the accuracy of written products (Mao & Lee, 2020). On the other hand, asynchronous WCF is provided after completing a piece of writing (Mao & Lee, 2020). It can be in the form of a paper-and-pencil writing task or a computer-mediated form (Shintani & Aubrey, 2016). Shintani and Aubrey (2016), for

example, conducted research in a computer-mediated environment on the effect of synchronous and asynchronous WCF on grammatical accuracy by using Google Docs. The results indicated that providing WCF in both synchronous and asynchronous modes is effective, but the synchronous WCF has a long-lasting effect in comparison to the asynchronous one.

The issue which is associated with feedback timing is the technology used for delivering the WCF. Learners who are born in the modern world prefer to learn new things via technology (Ko, 2019). Richards (2015) believed that social media can introduce new formats of writing and assist learners and teachers during the writing process. One of the advantages of using technology for providing feedback is that new technologies can overcome the problems associated with reading handwriting (Crook et al., 2012). Also, it may affect the quantity, quality, and nature of the given feedback (Bitchener & Storch, 2016). One of the applications used by all Iranian students is SHAD. It is introduced by the Ministry of Education after the widespread of COVID-19 to continue education in an online format. Teachers' instructional practices and students' attendance are all monitored by the school principal on this application (Abasi et al., 2020). SHAD can be used as a mediating tool for providing WCF to students. Reviewing literature revealed that a limited number of studies used technology for providing WCF. For instance, Ko (2019) delved into the students' attitudes toward using social media for providing feedback on vocabulary. The results indicated that providing feedback on vocabulary in a technology-enhanced environment had some advantages. It provided an active learning environment, increased interest, cooperation, and improved learners' word use. Thus, she found that technology was useful in providing high-quality feedback. Moreover, Farrahi Avval et al. (2021) compared the effect of CF provided through class discussion with that of online chatting. The results showed that both of them are effective, but online chatting is more effective than class discussion in improving students' writing quality in terms of accuracy, fluency, and complexity.

Apart from the feedback type, the error category has been another topic for investigation. Errors can be divided into different categories, however, the most frequent ones are grammatical, lexical, and mechanical errors. When correcting grammatical errors, teachers first consider the type of the error along the three dimensions of grammar (i.e. form, meaning, and use) before providing an appropriate WCF. *Form* refers to how a sentence is constructed, *meaning* focuses on the accuracy of the intended meaning of the message, and *use* relates

to the context in which the grammatical structure is used (Larsen-Freeman, 2014). Alshahrani and Storch (2014) found that most of the errors that occurred in grammar are related to verb tenses, articles, and prepositions. Regarding lexical errors, it is evident that when practicing the new words, the teacher's WCF is fundamental in enhancing the quality of students' written work (Ko, 2019). Alshahrani and Storch (2014) mentioned that most of the lexical errors are related to word choice and unclear meaning. Nevertheless, grammar and lexis are interdependent, and we cannot isolate them completely into different categories while correcting merely lexical errors (Larsen-Freeman & DeCarrico, 2020). Mechanical error is the other type of error. Mechanics of writing in the early stage of learning refer to letter recognition, word recognition, and basic rules of spelling. However, in the later stages, learners become familiar with punctuation and capitalization within sentences and paragraphs (Olshtain, 2014). Considering error correction, Applebee (1981, as cited in Robb et al., 1986) claimed that 80 percent of EFL teachers consider mechanical errors as the most important type of error to correct in the students' texts. Furthermore, most of the errors in mechanics are related to spelling and punctuation (Alshahrani & Storch, 2014). The good point about mechanical errors in comparison to other types is that retention of mechanical errors requires less effort whereas understanding and retaining feedback on morphosyntactic and lexical errors demands a higher level of engagement (Storch & Wigglesworth, 2010).

Most of the studies that investigated the effect of WCF targeted only linguistic errors rather than lexical or mechanical errors (Bitchener & Storch, 2016). Considering the studies focused on errors other than linguistic type, Robb et al. (1986) tried to ascertain the role of different types of WCF on writing accuracy, fluency, and complexity. They found that it is better not to spend a lot of time correcting surface errors. In other words, teachers should not provide highly detailed WCF on mechanics at the sentence level. In another study, Sheppard (1992) compared two groups; one receiving WCF on the form and the other group receiving holistic feedback on the meaning. The results indicated that focusing on the form has a significant positive effect on punctuation. Furthermore, those who received WCF on grammar did not have any improvement in grammatical accuracy in comparison to the group who did not receive any feedback. Further, Chandler (2003) conducted research to understand whether the correction of grammatical and lexical errors in students' assignments improves writing accuracy and fluency. Chandler found that WCF has a positive effect on the student's grammatical and lexical accuracy. On the

other hand, fluency was increased with and without providing WCF. Moreover, Bitchener (2012) claimed that few studies investigated the effect of WCF on lexical errors. However, those few studies found that correcting lexical errors does not improve the accuracy of students' written products. This may be due to the fewer uses of a specific word and as a result less exposure to the correct form. In another study, Alshahrani and Storch (2014) tried to examine Saudi Arabian teachers' WCF practices by considering the university guidelines, teachers' beliefs about the forms of WCF, and students' preferences. Teachers mostly provided feedback on mechanics than on grammar or vocabulary because identifying mechanical errors was easier than other types. Conversely, students preferred receiving WCF on grammar and vocabulary than on mechanics, since the students believed that they can correct their mechanical errors themselves.

A review of the literature revealed that the number of studies conducted on different error types is limited and that none of them compared various error categories directly. Furthermore, only a few studies have investigated the effect of WCF on beginner-level students within a real classroom setting where teaching writing is part of the curriculum (Liu & Brown, 2015). Hence, the current study aims to address some of the mentioned gaps by examining the effect of technology-mediated WCF on vocabulary, grammar, and mechanics in improving beginner-level Iranian students' writing during online instruction via the SHAD application. Unlike most of the previous studies that provided WCF in a single session, the students in this study received WCF throughout the entire school year as part of the writing curriculum. Additionally, a sufficient number of participants completed all the given tasks. It should be mentioned that variables such as students' proficiency level, their first language, and age were controlled in the study to increase the validity of the findings. Moreover, direct, mid-focused, and asynchronous WCF were used in the study to compensate for the shortcomings of the previous studies. Hence, the study aimed to address the following questions:

- RQ1. Does providing technology-mediated WCF on grammar significantly improve EFL writing?
- RQ2. Does providing technology-mediated WCF on vocabulary significantly improve EFL writing?
- RQ3. Does providing technology-mediated WCF on mechanics significantly improve EFL writing?

RQ4. Is there any significant difference in writing scores among the groups that received technology-mediated WCF on grammar, vocabulary, and mechanics?

Method

Participants

A total of 168 students from seven classes were given a placement test. They were those students who were available and expressed their willingness to participate in the study. From among them, 110 A2-level students were selected as the participants of the study. They were female Iranian EFL learners from two public high schools in Karaj, Alborz province. They were all 17-year-old 11th-grade students who were majoring in experimental science, mathematics, and humanities. They had middle and low socioeconomic status. The reason for choosing A2-level students was that they were required to write at the sentence level, and based on the definition of the Common European Framework of Reference (CEFR), A2-level students are those who can write “a series of simple phrases and sentences linked with simple connectors like ‘and’, ‘but’ and ‘because’ (Council of Europe, 2020, p. 66). After choosing the participants, the classes were randomly assigned into three treatment groups, each receiving WCF on one of the error categories. In these groups, 46 students received WCF on grammar, 32 of them received WCF on vocabulary, and 32 received WCF on mechanics.

Context

The participants began learning English four years prior to the study, starting in 7th grade. Online classes were held two sessions a week via the SHAD application, totaling 90 minutes a week. The study lasted a whole school year for 9 months. It must be mentioned that all of the participants were in the same language-learning program. They were all taught by the same teacher and received similar instructional materials.

Materials and Instruments

Student's Book and Workbook

The student's book, which is called Vision Book, was used for teaching new lessons to the learners. The student's book and workbook are published by the Ministry of Education for high school students in 2021. It has different lessons, and each lesson has various sections, namely vocabulary, reading, grammar, listening, speaking, writing, etc. The vocabulary section deals with some words with pictures and examples in sentences. The reading part assists learners to read

a passage, and it deals with the student's reading comprehension by teaching some reading strategies. The grammar section focuses on a specific type of grammatical rule based on the three dimensions of form, meaning, and function. The listening and speaking sections try to improve students' listening and speaking skills based on the grammar presented in the previous section. Finally, the writing section mentions some points about mechanics. Also, it teaches students how to write a sentence correctly. The workbook has some exercises for each lesson, and students should complete them for further practice.

Key English Test (KET)

The writing section of the KET test, published in 2020, was used in the study for ensuring the homogeneity of the students (see Appendix A). Also, it was implemented as the pre-test and post-test. KET is a standardized test for examining speakers of other languages studying English as a foreign language. It is designed by Cambridge Assessment English to measure A2-level language learners' English proficiency level. It has two parallel versions: the computer-based version and the paper and pencil version. It must be mentioned that the paper and pencil version was implemented in the study due to the ease of administration and scoring. The test is made up of 3 papers: reading and writing, listening, and speaking. Only the writing section of the KET test was administered. In this section, they should write an email to a friend based on the given topic and write a story based on a series of pictures. After giving the test, the assessment scale published by Cambridge Assessment English was utilized to score the students' answers. The Cambridge Assessment Scale is an analytic marking scheme that encompasses different aspects of writing. The advantage of an analytic marking scale is that it gives reliable and valid results. The learners' answers were scored out of 30, and their levels were identified based on the given chart (see Appendix B). The KET test is a standardized test whose reliability and validity have been approved. The test has determined the construct validity based on the work of Canale and Swain (1980) and Bachman (1990) who emphasized on communicative language ability subdivided into skills and sub-skills. Moreover, the cognitive-related validity and context-related validity of the test is confirmed by the inclusion of different tasks and response types. The validity of the test is explained in detail by Cambridge English (Cambridge English, 2016). The reliability of the test for the writing section is 0.90 with SEM 3.12 (Cambridge English, n.d.). Also, the inter-rater reliability of the given scores was calculated. The inter-rater reliabilities of the pre-test and post-test scores were 0.87 and 0.85 respectively.

Writing Tasks

The instrument implemented as a treatment was a group of tasks and topics given to the students to write some sentences. According to the CEFR, A2-level students can produce pieces of writing related to everyday aspects of their lives (e.g. people, place, etc.), some events, and simple stories (Council of Europe, 2020). Therefore, when the students were ready to write, some of the related exercises in the Vision book and workbook, which ask students to write some sentences about themselves or their families, were given to them. Additionally, some topics were chosen based on the description of the CEFR (Creative WRI A2.1-4) and were given to the students for writing sentences (see Appendix C). Each session, a part of the class time was allocated to writing, and before the next session, direct, mid-focused WCF on a specific type of error was provided to the students in the form of written comments.

Scoring Rubric

Another instrument was a scoring rubric used to evaluate the students' written texts, helping them track their progress and stay motivated. Additionally, it was used as a guideline to identify the category of the errors written by the students to provide the most appropriate WCF to each group. This rubric is based on the CEFR descriptors (Avci, 2019). It has five different sections, namely content, organization, vocabulary, grammar, and mechanics. Each section has a score ranging from 0 to 2, 4, or 5 based on the category of the error (see Appendix D). The uneven distribution of scores is due to the level of importance of the category mentioned in the CEFR descriptors to make a total score of 20 for a writing task. Concerning the content, a 0 score is devoted to the content which is irrelevant to the task and a score of 5 is for those students who use a wide range of ideas and mention all the points completely. For the organization, a score of 0 means completely disorganized and no coherence, while a score of 5 means very organized, coherent, and fluent. About vocabulary, a 0 score means very poor knowledge of the vocabulary and using irrelevant words. On the other hand, a score of 4 indicates the usage of a wide range of appropriate vocabulary with no mistakes. With regard to grammar, a score of 0 indicates a lack of knowledge about simple language structures or using them with many errors, while a score of 4 means taking advantage of a wide range of appropriate structures. Finally, for mechanics, a 0 score means no control over spelling, punctuation, and capitalization. In contrast, a score of 2 means very few mistakes in spelling, punctuation, and capitalization. Hence, the students in each group received WCF and a score only on a specific error category based on the

mentioned guideline for that category, and other errors were ignored in their written texts.

Procedure

Before starting the study, a pilot study was conducted with seven students from the same school with similar characteristics to check the timing and administration of the test and overcome the possible problems. After that, the KET test was given to all the learners as a placement test via the SHAD to ensure the homogeneity of the participants. Based on the scores and purposive sampling, 110 A2-level students were chosen as the participants of the study, and others were disregarded without being aware. The KET test was also the pre-test for those 110 students. Then, the participants based on their availability were randomly divided into three groups: receiving WCF on grammar with 46 students, receiving WCF on vocabulary with 32 students, and receiving WCF on mechanics with 32 students.

After choosing the participants, the Vision book was taught to all the classes online via the SHAD application by the same teacher. After instruction began and the students were adequately prepared to write, a part of each class session was allocated to writing activities, that is, a topic was given to all three groups every session to write some sentences. Moreover, the exercises in the book and workbook that required the students to write sentences about themselves or their families were chosen as the writing tasks. The writing tasks were mostly related to the new lessons taught to the students. They had equal length and level of difficulty since the students were required to write 30 to 50 words. The students had three days to complete their tasks at home asynchronously, type them, or write them on a piece of paper and send the texts or their pictures as private messages to the teacher. Prior to the following session, the students received direct mid-focused WCF on one of the error categories as the treatment, whereas other errors were left uncorrected. Other errors were neglected due to the fact that mid-focused WCF refers to providing feedback targeting a specific linguistic area without addressing all the errors in the text. It means that a class that received WCF on vocabulary, focused merely on errors such as wrong words, word forms, or unclear meanings. The grammar group received WCF only on syntactic errors such as tenses, articles, pronouns, prepositions, etc., and the third group received WCF on mechanical errors in spelling, punctuation, and capitalization. Furthermore, WCF was provided merely on the points that the students had learned before, and their errors were underlined and corrected with a different color (see Appendix E). To identify the category of the error and give

a score to the learners, the CEFR scoring rubric was utilized. It was attempted to correct all the papers as soon as possible when the task was relatively fresh in the learners' memories. The study continued during the whole school year for nine months, and finally, the KET test was run as the post-test to measure the writing improvement of the students as a result of the treatment.

Results

Once the participants in all three groups took the KET test as the pre-test and post-test, the group's means and standard deviations were calculated (Table 1).

Table 1

Descriptive Statistics based on the Groups

Group	N	Pre-test		Post-test	
		M	SD	M	SD
Grammar	46	28.652	2.496	32.978	2.333
Vocabulary	32	27.718	2.317	32.562	2.213
Mechanics	32	31.000	1.934	34.812	1.874

As it is shown in Table 1, the mean score of the pre-test for the grammar group was 28.65 (SD= 2.49), for the vocabulary it was 27.71 (SD= 2.31), and for the mechanics it was 31 (SD= 1.93). Considering the post-test, the mean scores of the grammar, vocabulary, and mechanics group were 32.97 (SD= 2.33), 32.56 (SD= 2.21), and 34.81 (SD= 1.87) respectively. As can be seen, the mean scores of the three groups increased in the post-test, indicating a general improvement in the writing scores of the learners after the treatment.

Results Addressing Research Question 1

To answer the first research question which addressed whether providing technology-mediated WCF on grammar significantly improves EFL writing, gain scores (post-test scores minus pre-test scores, Table 2) were calculated and a paired samples t-test was run (Table 3) using SPSS version 26.

Table 2

The Result of Gain Scores for the Grammar Group

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
grammar	46	4.3261	2.44998	.36123	3.5985	5.0536	-1.00	12.00

As Tables 1 and 2 show, the positive mean score ($M = 4.32$) with a 95% confidence interval ranging from 3.59 to 5.05 indicated that there was an increase in writing scores from the pre-test ($M = 28.65$, $SD = 2.49$) to the post-test ($M = 32.97$, $SD = 2.33$).

Moreover, the result of the paired samples t-test, $t(45) = 11.97$, $p = .00$ (two-tailed), confirms this point (Table 3), and the eta squared statistic (0.76) indicates a large effect size.

Table 3
Paired Samples t-test for the Grammar Group

				95% Confidence Interval of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
post-test – pre-test	4.326	2.449	.361	3.598	5.053	11.976	45	.000

Hence, the first null hypothesis that providing technology-mediated WCF on grammar does not significantly improve writing was rejected.

Results Addressing Research Question 2

To answer the second research question which examined the effect of technology-mediated WCF on vocabulary in improving the EFL learners' writing performance, the researchers calculated their gain scores (Table 4) and conducted a paired samples t-test (Table 5).

Table 4
The Result of Gain Scores for the Vocabulary Group

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
vocabulary	32	4.8438	1.79802	.31785	4.1955	5.4920	.00	8.00

Table 5
Paired Samples t-test for the Vocabulary Group

	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
post-test – pre-test	4.843	1.798	.317	4.195	5.492	15.239	31	.000

As Tables 4, and 5 indicate, the positive mean score (M= 4.84) with a 95% confidence interval ranging from 4.19 to 5.49 revealed that there was an increase in the writing scores from the pre-test (M= 27.71, SD= 2.31) to the post-test (M= 32.56, SD= 2.21), $t(31) = 15.23$, $p = .00$ (two-tailed). The eta squared was 0.88 indicating a large effect size. Therefore, the second null hypothesis that providing technology-mediated WCF on vocabulary does not significantly improve EFL writing was rejected.

Results Addressing Research Question 3

The third research question aimed to examine the effect of providing technology-mediated WCF on mechanics in the students' EFL writing by comparing the pre-test and post-test scores and calculating the p-value. For this purpose, gain scores were calculated (Table 6), and the paired samples t-test was conducted (Table 7).

Table 6
The Result of Gain Scores for the Mechanics Group

gain-scores	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
mechanics	32	3.8125	1.82169	.32203	3.1557	4.4693	.00	8.00

Table 7
Paired Samples t-test for the Mechanics Group

				95% Confidence Interval of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
post-test						11		
– pre-test	3.812	1.821	.322	3.155	4.469	.8	31	.000
						39		

The results showed that there was an increase in the scores from the pre-test ($M=31$, $SD=1.93$) to the post-test ($M=34.81$, $SD=1.87$), $t(31)=11.83$, $p=.00$ (two-tailed). The increase in the mean of the writing score was 3.81, with a 95% confidence interval ranging from 3.15 to 4.46. The calculated eta square was 0.81, indicating a large effect size. Hence, the null hypothesis that providing technology-mediated WCF on mechanics does not significantly improve writing could be rejected. Tables 1, 6, and 7 represent the results.

Results Addressing Research Question 4

The fourth research question concerned whether there was a significant difference in writing scores across the groups that received technology-mediated WCF on grammar, vocabulary, and mechanics. A one-way between-groups analysis of variance (ANOVA) was run to compare the effect of three different interventions on the writing improvement of the students (Table 8).

Table 8
The Result of ANOVA

gain scores					
	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	17.016	2	8.508	1.924	.151
Within Groups	473.202	107	4.422		
Total	490.218	109			

As illustrated in Table 8, there was not a statistically significant difference at the $p < 0.05$ level in the gain scores among the three groups that received technology-mediated WCF on grammar, vocabulary, and mechanics, $F(2, 107) = 1.92$, $p=0.15$. The effect size, calculated using eta squared, was 0.03. Based

on Cohen (1988, as cited in Pallant, 2011), the effect size was small. Hence, the last null hypothesis that there is not a significant difference in the EFL writing scores among the groups that received technology-mediated WCF on grammar, vocabulary, and mechanics, was accepted.

Discussion

Considering the long debate on the effectiveness of WCF in second language learning (Truscott, 1996, 2004; Ferris, 1999; Bruton, 2009; Mohebbi, 2021), the current study aimed to explore the effect of technology-mediated WCF on grammar, vocabulary, and mechanics on the EFL writing improvement of learners by taking advantage of the SHAD application. This study was conducted within the framework of cognitive and sociocultural theory. As it was expected, the findings of the first three research questions demonstrated that the performance of the learners in all three groups receiving technology-mediated WCF on grammar, vocabulary, and mechanics improved significantly from the pre-test to the post-test. The findings are obviously in line with the cognitive and sociocultural theory. Both of these theories suggest that WCF is useful and essential for the writing development of L2 learners. Concerning cognitive theory, it attributes the usefulness of WCF to the explicit knowledge it provides to the students (Bitchener & Storch, 2016). Based on this theory, the writing improvement of the students in all three groups proves the substitution of the wrong data with the correct one in their interlanguage (Spada & Lightbown, 2008). The notion of transfer-appropriate processing is also part of the cognitive theory, which asserts that remembering the knowledge we have learned will be much easier if learning tasks resemble the natural language used in the real-world context (Lightbown, 2008). Based on the mentioned point, WCF was effective since the students tried to communicate with the reader naturally by writing about their ideas on a topic, and WCF just helped them to express their thoughts and feelings accurately by focusing on the correct forms and meanings. The findings were also in line with the sociocultural theory. This theory focuses on the student's life experiences and the notion of scaffolding and ZPD (Brown, 2014; Lee, 2019). Also, the sociocultural framework defines two features for the provided feedback. The first one is related to the amount of feedback which should not be too much or too little, and the second feature emphasizes that the provided WCF needs to be based on the students' needs and proficiency levels (Bitchener & Storch, 2016; Storch, 2018). In light of the aforementioned points, it can be argued that providing technology-mediated WCF on grammar, vocabulary, and mechanics was effective since the teacher scaffolded the

students' knowledge by providing WCF on each piece of writing during the whole school year through the SHAD to help them reach their potential level of writing with fewer errors. Moreover, WCF was provided based on the student's proficiency levels on the points that they had learned in their books from 7th grade to 11th grade. Also, the number of errors corrected in each paper was reasonable in order not to demotivate the students. Considering the subcategories of sociocultural theory, mediated learning experience asserts that the student's cognitive development is associated with tools, and WCF as a tool affects the thinking process and interaction (Bitchener & Storch, 2016; Lee, 2017; Storch, 2018). In this theory, the tool should have three main criteria, namely intentionality, transcendence, and meaningfulness (Lee, 2017). In the present study, all these criteria were met. The WCF was intentional, as each group received WCF on a specific error category, and other errors were left uncorrected. Transcendence was fulfilled by asking the students to pay attention to the correct forms and try not to repeat their errors in subsequent texts. Meaningfulness was also applied by providing direct WCF and giving a score to each piece of writing based on the scoring rubric to show the students' progress.

Not only are the findings consistent with the related theories but also they are in agreement with previous studies. Despite Truscott's (1996, 1999, 2007) claims that correction of grammatical errors is useless and should be abandoned, the majority of the previous studies supported that providing WCF on grammar significantly improves writing (e.g. Fathman & Whalley, 1990; Bitchener, 2008; Bitchener & Knoch, 2008; Ellis et al., 2008; Shintani & Aubrey, 2016; Boggs, 2019; Rastgou et al., 2020; Bagheri & Rassaei, 2022; Bozorgian & Yazdani, 2021). Providing technology-mediated WCF on grammar can help students learn complex forms (Kim, 2014, as cited in Altamimi & Masood, 2021), and grammar is one of the frequent areas of focus in technology-mediated WCF (Ene & Upton, 2014). Among the reviewed studies, Shappard (1992), however, found that the group who received WCF on grammar did not have much improvement in grammatical accuracy in comparison to those who didn't receive WCF. Also, the grammar group used the avoidance strategy in their written texts. The problem of the mentioned study was that only verb forms were considered a sign of grammatical accuracy. Also, the other group had negotiation of meaning in the class although they didn't get WCF directly. Despite Sheppard's study, the present study focused on several grammatical points and specific topics, thus using the avoidance strategy was impossible for the students.

Following Truscott (2001), who claimed that the discreteness feature of lexical errors makes them suitable for correction, the present study found that providing technology-mediated WCF on vocabulary significantly improves writing. The results fully corroborate with most of the previous studies (e.g. Chandler, 2003; Hartshorn & Evans, 2012; Zarei & Rahnama, 2013; Ko, 2019). However, Ferris (2006) claimed that providing WCF over a semester reduced the university students' verb errors considerably and lexical errors slightly, yet sentence structure and article errors got worse. The finding of the present study partially supports Ferris (2006) since in the current study, the students' errors in tenses, agreement, number, word order, articles, pronouns, and prepositions were considered as grammatical errors, and it was revealed that correcting grammatical errors improved learners' writing. On the other hand, Ene and Upton (2014) claimed that teachers mainly focus on word choice and phrasing while correcting lexical errors via technology, but errors in meaning, word form, usage, collocation, association, and translation-based errors were corrected in the present study.

Considering mechanical errors, it was found that providing WCF via the SHAD on mechanics significantly improved writing. This result is in line with Truscott's (2007) claim that mechanical errors can benefit from WCF since they are simple and discrete. Also, some of the previously mentioned studies investigated the effect of mechanical errors as a subcategory for grammar, and they found it effective (e.g. Chandler, 2003; Hartshorn & Evans, 2012; Zarei & Rahnama, 2013). However, the result of the current study runs counter to Sheppard (1992), who found that providing WCF on mechanics will not guarantee fewer mechanical errors in writing.

It should be mentioned that the inconsistencies obtained regarding the findings of the present study (i.e. the effectiveness of WCF on all the three error types) and some of the previous ones may be due to the design of the studies. As Van Beuningen (2010) pointed out, many of the previous studies provided WCF treatment for a short period on only one or two error types. This kind of treatment does not reflect what actually happens in a real classroom. Despite those studies, the current study lasted for nine months, and learners received WCF as part of the learning process in a real class.

The result of the fourth research question interestingly demonstrated that there was not any significant difference in writing scores between the groups that received technology-mediated WCF on grammar, vocabulary, and mechanics. The fact that all three groups had some improvement and there was not any

significant difference between them indicates that technology-mediated WCF is effective and its effectiveness is independent of the category of the error. This finding is not consistent with that of Applebee (1981, as cited in Robb et al., 1986) who claimed that most EFL teachers believe that mechanical errors are the most important type of error for correction. Despite this view, the present study revealed that grammatical and lexical errors are as important as mechanical ones.

There may be some explanations for the similar performance of the three treatment groups in the current study. It is possible that providing any type of WCF to lower-proficient learners is more important than the category of the error corrected in their writing (Bitchener & Knoch, 2009) since a learner at the beginner level commits many errors. The second reason can be the sufficient time spent on conducting the study. Probably the adequate time allocated to teaching the Vision book, the language features covered in the book, the amount of time given to the students to write about a topic and send it via the SHAD application, the duration of the study that lasts for nine months, and the correction of every piece of writing carefully as soon as possible based on the scoring rubric before asking the students to write another text made all the three types of WCF effective without any difference between them. Another possible reason is ignoring the editing stage in the study since direct WCF was provided, and the students were required to pay attention to the correct forms themselves. Moreover, utilizing the SHAD application for teaching and providing WCF might influence the results. Nevertheless, the strength of the present study was its validity. Unlike many of the previous studies that provided WCF on a single error (e.g. Bitchener, 2008; Bitchener & Knoch, 2008; Bozorgian & Yazdani, 2021) or only one or two writing tasks (e.g. Truscott & Hsu, 2008; Shintani & Aubrey, 2016), the current study spent an entire school year focusing on three error categories. As a result, many grammatical points, various vocabulary, and different mechanical errors were corrected. Additionally, the study was conducted in a real classroom at two public schools, and the researcher herself was the teacher and the provider of the WCF. Therefore, the obtained findings were not the result of a short-term, unsystematic treatment of a single error type; rather, they were the result of a long-term treatment of different errors in EFL learners' writing.

Conclusion

The result of the present study suggests that providing technology-mediated WCF on all three error categories, including grammar, vocabulary, and

mechanics, was effective in helping learners improve their EFL writing. Moreover, there was not any significant difference in the writing scores among the groups that received technology-mediated WCF on grammar, vocabulary, and mechanics. What is evident is that providing WCF through social media, such as the SHAD application, decreases grammatical, lexical, and mechanical errors and improves writing. This finding is highly profitable for the body of knowledge in the SLA field. It can inspire researchers to investigate WCF from a new perspective and resolve all controversies associated with that. Also, teachers can use the findings to incorporate technology-mediated WCF into the classroom milieu. Providing technology-mediated WCF can also assist learners in becoming aware of their problems and trying to solve them in the following writing. It would also be desirable for EFL teacher trainers to utilize these findings and provide insightful guidelines to both pre-service and in-service teachers about the effectiveness of technology-mediated WCF in their teaching practices instead of traditional ways to develop the writing skill of the learners. Additionally, course designers can utilize the findings of the present study in designing courses.

Even though the results give a remarkable insight into error correction, some limitations exist in the present study that deserves further research. The first limitation was the time constraint for the administration of the delayed post-test. Future studies can investigate the long-term effect of providing technology-mediated WCF on different error categories. Also, the study can be replicated in various educational contexts with a larger sample size to make the findings more generalizable. Moreover, this study was carried out on female beginner-level students. Further research can be conducted on other proficiency levels, and the progress of both genders can be compared with each other. Furthermore, direct asynchronous WCF was employed in the study which was provided through the SHAD application. Utilizing other types of WCF, such as indirect synchronous WCF for higher proficiency levels may vary the results. Furthermore, this study was conducted based on the product-based approach. Future studies can take advantage of the process-based approach and add an editing stage to the intervention. Additionally, other technologies and applications can be utilized for further research. Mixed method research can also investigate learners' attitudes toward SHAD as the mediating tool for WCF provision.

Conflict of interest: None

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Biodata

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Appendix A

Writing Section of the KET Test

Part 6

Question 31

You are going shopping with your English friend Pat tomorrow.
Write an email to Pat.

Say:

- where you want to meet
- what time you want to meet
- what you want to buy.

Write **25 words** or more.

Part 7

Question 32

Look at the three pictures.

Write the story shown in the pictures.

Write **35 words** or more.



پژوهشگاه علوم انسانی و مطالعات فرهنگی
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Appendix B Cam



Cambridge
English Qualifications

A2 Key and A2 Key for Schools for exams from 2020

Reading
The Reading section consists of Parts 1–5 of the Reading and Writing paper. Correct answers in Parts 1–5 are worth 1 mark each. There are 30 possible marks in the Reading section.

Writing
The Writing section consists of Parts 6 and 7 of the Reading and Writing paper. Candidates' answers in the Writing paper are marked by trained examiners who are certificated to mark at the level. Parts 6 and 7 are marked using assessment scales which are linked to the CEFR. 0–5 marks are given for each of the following criteria: Content, Organisation, and Language. There are a possible 15 marks for Part 6 and 15 possible marks for Part 7. Whole marks only are awarded; there are no half marks given. Marks for each of the criteria are combined to give 15 possible marks for each part. In total, there are 30 possible marks in the Writing paper.

Listening
Correct answers in the Listening paper are worth 1 mark each. There are 25 possible marks in the Listening paper.

Speaking
Candidates take the test in pairs, but are assessed on their individual performance by trained examiners certificated to examine at the level. Candidate speaking performances are assessed using scales which are linked to the CEFR. The assessor gives 0–5 marks for each of the following criteria: Grammar and Vocabulary; Pronunciation; and Interactive Communication. Marks for each of these criteria are doubled. The interlocutor gives a mark of 0–5 for Global Achievement. This mark is then multiplied by three. Examiners may award half marks. Marks for all criteria are then combined, meaning there are 45 marks available in the Speaking test.

Practice test score	Cambridge English Scale score	CEFR level
28	140	Level B1
20	120	Level A2
13	100	Level A1
7	82*	–

*Minimum score reported for A2 Key

Practice test score	Cambridge English Scale score	CEFR level
26	140	Level B1
18	120	Level A2
12	100	Level A1
8	82*	–

*Minimum score reported for A2 Key

Practice test score	Cambridge English Scale score	CEFR level
23	140	Level B1
17	120	Level A2
11	100	Level A1
6	82*	–

*Minimum score reported for A2 Key

Practice test score	Cambridge English Scale score	CEFR level
41	140	Level B1
27	120	Level A2
18	100	Level A1
10	82*	–

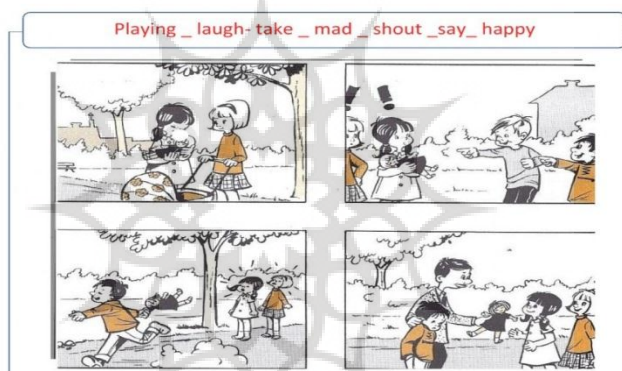
*Minimum score reported for A2 Key

bridge Assessment Scale

پژوهشگاه علوم انسانی و مطالعات فرهنگی
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Appendix C Writing Topics

1. Write about one of your past experiences.
2. Imagine you went shopping. What would you buy?
3. Write five sentences with gerunds about yourself.
4. Write about the things you have not experienced yet.
5. Write about your hobbies.
6. Write about a party you have gone and describe it.
7. Write about your best school day.
8. Write about a thing that you are scared of and why?
9. Write about your Norouz holiday. What did you do?
10. Write a story based on the given pictures.



11. Write a story based on the given pictures.



12. Who is your favorite actor, actress, or singer? Why?

Appendix D

Scoring Rubric Based on the CEFR Descriptors (Avci, 2019)

	0	1	2	3	4	5
Content	<ul style="list-style-type: none"> • Hardly any or no relevance to the task • Hardly any or no valid ideas in completing the task 	<ul style="list-style-type: none"> • Few content points mentioned • Few valid ideas and/or iterative ones in completing the task 	<ul style="list-style-type: none"> • Some content points mentioned • Some valid but insufficient ideas in completing the task 	<ul style="list-style-type: none"> • Several content points mentioned • Reasonable attempt to have sufficient, valid ideas in completing the task 	<ul style="list-style-type: none"> • Most content points mentioned • Sufficient, valid ideas in completing the task 	<ul style="list-style-type: none"> • All content points fully mentioned • Wide range of valid, relevant ideas in completing the task
Organization	<ul style="list-style-type: none"> • Completely disorganized • No unity, coherence and logical sequencing 	<ul style="list-style-type: none"> • Considerably disorganized • Mostly incoherent; ideas disconnected • Incorrect or rare use of simple linking devices 	<ul style="list-style-type: none"> • Inadequately organized ideas • Considerably incoherent; ideas are not well connected 	<ul style="list-style-type: none"> • Adequately organized valid ideas • Mostly coherent and fluent • Some simple linking devices 	<ul style="list-style-type: none"> • Clearly well-organized valid ideas • Coherent and fluent • Appropriate linking devices 	<ul style="list-style-type: none"> • Effectively organized valid ideas • Very coherent and fluent • A wide range of appropriate linking devices
Vocabulary	<ul style="list-style-type: none"> • Very poor / insufficient knowledge of basic vocabulary • Irrelevant words 	<ul style="list-style-type: none"> • Narrow, inadequate range of words • Translation-based errors • Mistakes in using some simple, short everyday chunks 	<ul style="list-style-type: none"> • Limited range of vocabulary choice that is relevant to the content • Mistakes in linking groups of words with simple connectors 	<ul style="list-style-type: none"> • Good range of appropriate vocabulary • Some mistakes of word, but no obscure in communication • Few mistakes in linking groups of words with simple connectors 	<ul style="list-style-type: none"> • A wide range of appropriate vocabulary • Hardly any mistakes in the word choice • Hardly any mistakes in linking groups of words with simple connectors 	
Grammar	<ul style="list-style-type: none"> • Serious lack of some simple language structures 	<ul style="list-style-type: none"> • Inadequate range of structures • The language is rarely clear • Frequent mistakes in the use of simple structures 	<ul style="list-style-type: none"> • Limited range of structures • Mistakes in forming simple sentences • Occasional mistakes; mostly interference from mother tongue 	<ul style="list-style-type: none"> • Good range of appropriate structures • Generally accurate language • Few mistakes in forming simple sentences and phrases 	<ul style="list-style-type: none"> • A wide range of appropriate structures • Simple phrases and sentences linked well with simple connectors • Systematically basic mistakes 	
Mechanics	<ul style="list-style-type: none"> • No control over spelling and punctuation, capitalization, and paragraph indentation etc, 	<ul style="list-style-type: none"> • Occasional mistakes in spelling, punctuation, capitalization, paragraph indentation, etc., 	<ul style="list-style-type: none"> • Very few mistakes in spelling, punctuation, capitalization, paragraph indentation, etc 			

Appendix E

Sample of Corrected Papers

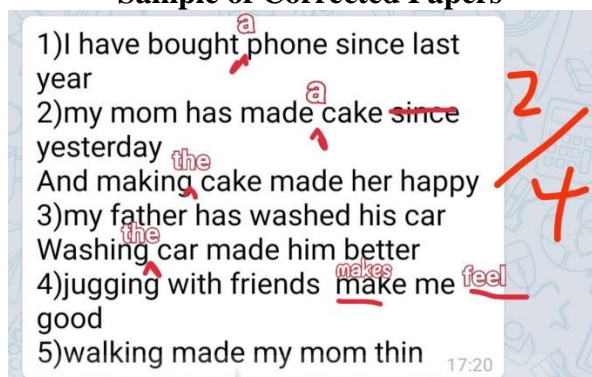


Figure E1: Correction of Grammatical Errors

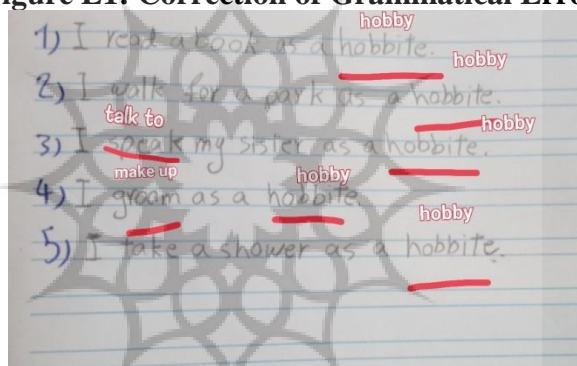


Figure E2: Correction of Lexical Errors

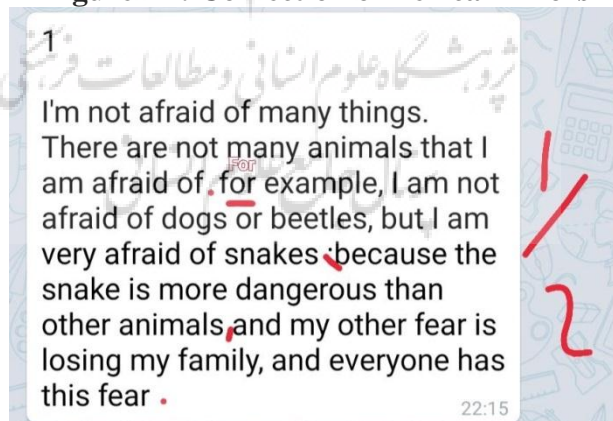


Figure E3: Correction of Mechanical Errors