The Effects of Coded Corrective Feedback on Students' Writing Performance: A Scoping Review[1]

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Abstract

The effectiveness of written corrective feedback, WCF, has been much disputed even till the present day. Various strategies of WCF are still being developing with the aim to enhance students' writing performance especially in the English language. Coded corrective feedback, CCF, is classified as an indirect WCF method, and the studies of CCF are still limited despite more studies emerging in recent years. Most of these limited studies have found CCF to be effective, but a review of CCF studies has not been conducted to date. Therefore, this scoping review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) criteria with the purpose of determining the currently available information on the effects of CCF on students' writing performance of the English language. A total of 161 citations were identified across three databases, and only 20 articles were qualified for this scoping review. Most of the studies found that CCF is generally effective in enhancing students' writing performance, overall grammatical accuracy, target linguistic features accuracy, and syntactic accuracy in writing. A few of the studies also found out that CCF is able to retain its effect in the long-term. Current gaps and future directions for the study of CCF are also discussed in this article.

Resumen

La efectividad de la retroalimentación correctiva escrita, WCF, ha sido muy debatida incluso hoy en día. Varias estrategias de WCF aún se están desarrollando con el objetivo de mejorar el desempeño de la escritura de los estudiantes, especialmente en el idioma inglés. La retroalimentación correctiva codificada, CCF, se clasifica como un método WCF indirecto, y los estudios de CCF aún son limitados a pesar de que más estudios han surgido en los últimos años. La mayoría de estos estudios limitados han encontrado que la CCF es efectiva, pero hasta la fecha no se ha realizado una revisión de estudios de CCF. Por lo tanto, esta revisión de alcance se realizó de acuerdo con los criterios de los Elementos de Informe Preferidos para Revisiones Sistemáticas y la Extensión de Metaanálisis para Revisiones de Alcance (PRISMA-ScR) con el propósito de determinar la información actualmente disponible sobre los efectos de la CCF en el desempeño de la escritura de los estudiantes del idioma inglés. Se identificaron un total de 161 citas en tres bases de datos, y solo 20 artículos fueron calificados para esta revisión de alcance. La mayoría de los estudios han demostrado que el CCF es generalmente eficaz para mejorar el rendimiento de los estudiantes en la escritura, la precisión gramatical general, la precisión de las características lingüísticas objetivo y la precisión sintáctica. Algunos estudios también han demostrado que el CCF mantiene su efecto a largo plazo. En este artículo se analizan las deficiencias actuales y las futuras direcciones del estudio del CCF.

Introduction

Improving students' writing accuracy has always been a challenge for teachers (Al Harrasi, 2019). Coded corrective feedback (CCF) is one of the written corrective feedback methods that also aims to solve students' poor writing quality (Saukah et al., 2017). Most of the studies (Muth'im & Latief, 2014; Suh, 2014; Lee & Sim, 2019; Ekinci & Ekinci, 2020) were conducted to determine the short-term effects of the independent variable, CCF and the findings were controversial because it was found that CCF has different impacts on different dependent variables such as overall writing performance, grammar accuracy and syntactic accuracy. Furthermore, a few studies (Ahmadi-Azad, 2014; Doi et al., 2021; Sherpa, 2021) were conducted to determine the long-term or retention effects of CCF and these uncovered mixed results as their imposed time gaps after the exposure to the intervention were different. Additionally, recent studies have also attempted to study the effects of synthesized CCF and they found controversial findings (Mujtaba et al., 2020, Ogawa, 2021; Tang & Liu, 2018) due to the difference of methods used in the analysis.

Although the study of CCF is increasing over the years, the inconsistent findings in the literature causes a lack of understanding which makes it difficult for researchers to come to meaningful conclusions. Furthermore, there is still no existing scoping review that is focused mainly on the field of CCF to date. Because of that, there is a need to provide a systematic overview on the effects of CCF in English writing. Therefore, this current scoping review article maps the existing literature by identifying the key findings and the research gaps of CCF from 2012 to 2022 so that it can serve as a direction for future research studies on CCF to better understand its effects.

Review of the Literature

Among the four skills (listening, speaking, reading and writing) in learning English, writing is a difficult skill to learn and master (Al Harrasi, 2019; Doi et al., 2021; Tawfeeq & Abbas, 2018), and it is an on-going problem for students learning the English language. Even many tertiary-level students are unsure of how to

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apply grammar rules in writing, and they continue making errors (Fitrawati & Safitri, 2021; Setiyorini et al., 2020). As a result, researchers in the education sectors have conducted countless research studies on pedagogical strategies that enhance the writing ability of students. Written corrective feedback is one of these pedagogical strategies.

Written corrective feedback (WCF) refers to the provision of any comments, questions or correction of errors given by the teacher in written form on students' written work (Agbayahoun, 2016). WCF has been formally researched since the 1980s, and the studies (e.g., Fathman & Whalley, 1990; Ferris, 1997; Lalande, 1982; Lee, 1997; Sheppard, 1992) generally found positive effects in increasing students' accuracy in writing until Truscott (1996) published an article that reported controversial findings regarding the negative impacts of WCF. He argued that the practice of WCF should be halted. He also contended that there were studies (e.g., Kepner, 1991; Polio et al., 1998; Robb et al., 1986; Semke, 1984) that found little to no evidence that WCF would contribute to students' writing performance. This has led to heated debates among WCF researchers and resulted in a surge of WCF studies since then. Many recent studies were comparisons between the effects of direct and indirect WCF (Alrubai'Ey & Nassaji, 2013; Amin & Saadatmanesh, 2018; Dabboub, 2019; Karim & Nassaji, 2020; Sadat et al., 2015; Salimi & Ahmadpour, 2015).

Direct WCF refers to teachers providing the correct linguistic form, and it is written on top of the linguistic error (Bitchener & Knoch, 2008; Ferris, 2003). Direct WCF also includes the insertion of necessary morphemes and words, as well as deleting unnecessary words (Gholaminia et al., 2014). Direct feedback has been found to be more advantageous especially to lower proficiency and beginner students as they need more explicit guidance to rectify their errors (Bitchener & Knoch, 2010; Ellis, 2009; Ferris & Roberts, 2001). On the other hand, indirect WCF is when the students' errors are indicated by the teacher without showing them the right form. Then, the students have to identify and correct the errors by themselves (Ellis, 2008, 2009). The use of indirect feedback depends on indicating the location of errors without providing the correct linguistic form, and can be made more explicit by circling, underlining and coding errors (Bitchener & Knoch, 2008; Ferris, 1995). Thus, indirect feedback has been found to be more beneficial to higher proficiency students (Ferris, 2010; Van Beauningen et al., 2012) as it encourages students to engage in deeper cognitive processing that has long-term effects (Ferris & Roberts, 2001; Ji, 2015). However, it is a disadvantage to lower proficiency students because of their limited linguistic competence (Bitchener, 2012).

Since both direct and indirect feedback have their own pros and cons, researchers have begun seeking ways to balance the explicitness between both feedback methods and one of them is by using coded corrective feedback. Coded corrective feedback (CCF) refers to the use of codes by teachers to indicate the types of errors found in the text (e.g., WW for wrong word; Art for article errors) (Saukah et al., 2017). The explicit nature of CCF helps students identify the types of errors more easily (Rizkiani et al., 2019), providing clues for students to self-monitor their learning. Self-monitoring assists students in identifying their errors and problems in the writing process which could improve students' writing performance (Estaji & Bikineh, 2022). Although studies of CCF started as early as the 1980s, the evidence produced was not compelling due to the absence of control groups (e.g., Lalande, 1982; Robb et al., 1986) and the small number of studies at that time. Since the debates about the relative effectiveness of direct and indirect feedback remained inconclusive, studies on the effects of CCF have caught the attention of WCF researchers (e.g., Ferdouse, 2012; Gholaminia et al., 2014; Salimi & Valizadeh, 2015) in recent years, especially since 2010.

CCF is still a rarely investigated branch of WCF (Salimi & Valizadeh, 2015). Furthermore, the use of CCF to support students' writing also remains one of the rarest methods in the literature (Ekinci & Ekinci, 2020). Therefore, the purpose of this study is to discover the currently available studies and to determine the overall effects of CCF on students' writing performance in these studies. This research is crucial for educators as they need to choose the most appropriate WCF (Ganapathy et al., 2020) in order to improve students' writing performance in terms of revising drafts and the production of new texts (Dabboub, 2019).

Research Method

The design for this scoping review adopted the criteria of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews, PRISMA-ScR. The Arksey and O'Malley's (2005) methodological framework as shown in Figure 1 was employed for the purpose of this scoping review with the following steps: 1) identification of research questions, 2) identification of relevant studies, 3) selection of relevant studies, 4) charting of the data, 5) collocation, summarisation and the reporting of the results.

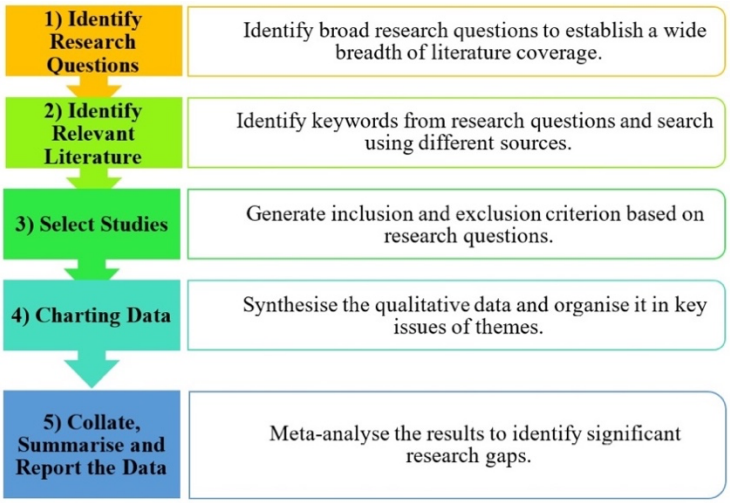

Figure 1: Methodological framework (Adapted from Arksey & O'Malley, 2005)

This scoping review was conducted to map the existing literature of CCF to inform practice and to determine the gaps in the research. Refer to Table 1 for the summary of the primary objectives and research questions in accordance with the Population-Concept-Context, PCC framework.

Research Objective	Research Question
1. To explore the geographical relationships and the context in which the development of the studies on CCF on students' writing performance.	1. How are the studies on the effects of CCF on students' writing performance distributed geographically?
2. To determine the distribution of different educational levels of participants selected in the past studies on the effects of CCF on writing performance.	2. What is the distribution of educational levels in the target groups of participants selected to study the effects of CCF on writing performance?
3. To determine other types of methods used to supplement the effects of CCF.	3. What are the other methods attempted by researchers to strengthen the effects of CCF?
4. To identify the main types of writing aspects used in the studies to determine the effectiveness of CCF.	4. What are the writing aspects used to examine the effects of CCF?
5. To summarise the overall effects of CCF on students' writing performance.	5. What are the overall effects of CCF on students' writing performance?

Table 1: Research questions derived according to the PCC framework.

The related studies were sourced from three databases (1. *Google Scholar*, 2. *ERIC*, 3. *Scopus*). The search was simplified by utilising relevant keywords and phrases, and Boolean operators as shown in Table 2.

Keywords and phrases	Search string
Coded corrective feedback Written coded corrective feedback Error correction codes Indirect coded corrective feedback Indirect correction codes Metalinguistic codes Indirect metalinguistic codes Writing correction codes	("Error correction code" OR "coded written corrective feedback" OR "Indirect coded written corrective feedback" OR "metalinguistic codes") AND ("Writing accuracy" OR "writing performance" OR "grammar accuracy")

Table 2: Keyword search string

The researcher instituted inclusion and exclusion criteria to simplify the search and exclusion of irrelevant studies. Duplicate entries were omitted and the remaining studies were examined for eligibility based on their titles and abstracts. Subsequently, the eligible studies were presented by using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow chart in accordance with the inclusion and exclusion criteria as shown in Table 3.

Inclusion Criterion	Exclusion Criterion
1. Articles published between 2012 and 2022	1. Articles published before 2012.
2. Students who study English as a second language, ESL and English as a foreign language, EFL.	2. Other languages than English.
3. Research designs must be related to studying the effects of CCF. A combination of other methods with CCF is also accepted.	3. Other non-coded feedback methods alone such as direct, indirect (e.g., underlining and circling of error), metalinguistic explanation, reformulation, electronic feedback, etc.
4. Investigated the effects of CCF on students' writing performance.	4. Investigated the attitudes/perception of students towards CCF only.
5. Studies conducted in a conventional classroom setting.	5. Studies conducted in an online classroom setting.
6. Studies focused on writing performance.	6. Studies focused on oral performance.
7. Individual written work.	7. Collaborative written work (e.g., pair work, group work, etc.).

Table 3: Inclusion and exclusion criteria

After the relevant studies were sourced, a data mapping process was conducted by selecting the relevant articles for data extraction. Subsequently, the extracted findings were tabulated in a research matrix and analysed in accordance with the inclusion and exclusion criteria before being converted into a report to produce the scoping review.

Results and Discussion

The search results from three databases revealed a total of 161 citations. A total of 65 articles were sourced from the *Google Scholar* database, 76 articles from the *Education Resource Information Center* (ERIC) and 20 articles from *Scopus*.

As shown in Figure 2, five duplicate entries were discarded. The remaining 156 articles were screened by their titles and abstracts before removing 71 irrelevant articles. Next, 85 articles were thoroughly examined for eligibility. After the articles were assessed, 65 articles were discarded due to the fact they were (a) studies on the types of WCF practised by teachers, (b) review papers of WCF, (c) direct vs indirect WCF, (d) effects of WCF in different contexts and levels, (e) other forms of WCF (e.g., colour-coded, focused vs unfocused, recasts, dynamic, electronic feedback). The remaining 20 studies were selected for inclusion in this scoping review.

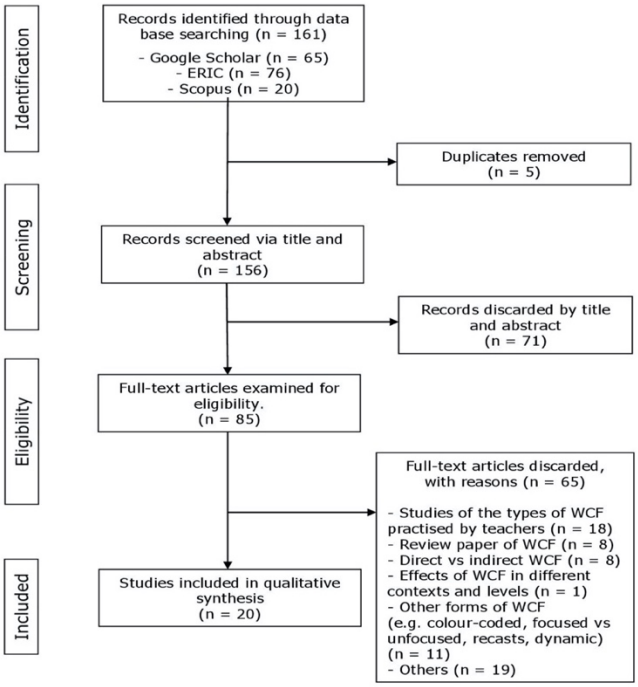

Figure 2: Scoping review flow diagram

Table 4 presents the papers reviewed for this study.

References	Sample	Research Design	Research Purpose	Findings
Nia & Valizadeh (2021)	Language institute in Iran. 50 intermediate EFL Persian learners. Revision mediated indirect coded feedback, RICF. (n=25) Attention mediated indirect coded feedback, AICF. (n=25)	**Quasi-experiment** Pre-test–intervention-post-test–delayed post-test. Task: Argumentative essay topics chosen from different IELTS and TOEFL websites. Focused aspects: Syntactic accuracy.	To compare the effects of RICF and AICF on syntactic accuracy in writing.	There was no significant difference between the use of RICF and AICF although both methods were reported to have both positive short term and long-term effects in syntactic accuracy.
Doi et al. (2021)	University in Indonesia. 54 students enrolled in the English Literature Study course in Flores University. Coded CF (n=18) Non-coded CF (n=18) Control group (n=18)	**Quasi-experiment** Pre-test–intervention– post-test. Task: Free writing task from any one of seven chosen topics. Focused aspects: Grammar accuracy	To make comparisons between the effects of coded CF and Non-coded CF on students' grammatical accuracy in writing.	The indirect coded CF group outperformed the indirect non-coded CF group and control group in both the post-test and delayed post-tests.
Ogawa (2021)	University in Japan. 25 EFL 1st year English major students in a Japanese university. Coded CF + single metalinguistic explanation, ME in 2016 (n=22) Coded CF + repeated ME in 2017 (N=26)	**Action research** Pre-tests–intervention–second tests–intervention–post-tests. Task: Free writing Focused aspects: Grammar accuracy	To determine the effects of the combination of coded CF+single ME, and coded CF+repeated ME on students' writing accuracy.	Both groups' error means reduced gradually and significantly. However, there was no significant difference between the two groups.
Sherpa (2021)	Public middle school in Bhutan. 45 eight grade learners randomly assigned. Direct CF (n=15) Coded CF (n=15) Control group (n=15)	**True experiment** Pre-test–intervention–post-test–delayed post-test. Task: Narrative writing Focused aspects: Grammar accuracy	To compare the effects of direct CF and coded CF on the accuracy of past tense and articles in writing.	The indirect coded WCF group surpassed both the direct WCF and control groups significantly in the post-test. However, it did not show a significant difference in the delayed post-test result.
Ekinci & Ekinci (2020)	University in Turkey. 25 EFL pre-intermediate level students.	**Quasi-experiment** Pre-test – intervention – post-tests. Task: Writing achievement tests adopted from the 'Effective Academic Writing 1' book. Focused aspects: writing proficiency.	To determine the effects of coded CF on students' writing proficiency.	The comparisons between the post-test and the pre-test results revealed that the students made fewer mistakes after receiving the treatment of coded CF.
Mujtaba et al. (2020)	University in Pakistan. 90 undergraduate students majoring in business were randomly assigned. Coded CF + teacher's affective comments (n=45) Coded CF only (n=45)	**True experiment** 1st draft – Revision/ intervention stage – 2nd draft – 3rd draft (Rewrite). Tasks: Narrative compositions Focused aspects: Writing performance	To study the effects of the combination of coded CF with teacher's affective comments on students' writing performance.	The coded CF+teacher's affective comments group significantly outperformed the coded CF alone group.
Lee & Sim (2019)	University in Malaysia. 30 ESL students who were in the English for Academic Purposes, EAP course in Selangor.	**Mixed methods – Pragmatic worldview** Tasks: Expository essay, cause and effect essay, and a problem-solution essay. Focused aspects: Conjunction accuracy.	To investigate the effects of codes as metalinguistic CF on students' conjunction accuracy in writing.	The codes used as metalinguistic CF were able to enhance the students' accurate use of conjunctions gradually throughout the study.
Rizkiani et al. (2019)	University in Indonesia. 70 freshmen ESL students who enrolled in the English Study Program in Cimahi. Coded CF (n=35) Non-coded CF (n=35)	**Quasi-experiment** Pre-test–intervention–post-test. Tasks: Descriptive compositions. Focused aspects: Writing performance.	To compare the effects of coded CF and non-coded CF on students' writing score.	The coded CF group outperformed the non-coded CF group.
Tawfeeq & Abbas (2018)	University in Iraq. 105 EFL Kurdish third-year students from Sulaimani University and Charmo University. Randomly assigned. Direct CF (n=36) Coded CF (n=36) Control group (n=33)	**True experiment** Pretest–intervention – post-test–delayed post-test Tasks: Writing tasks taken from the Academic Writing Module Task 2 of IELTS. Focused aspects: Linguistic accuracy in writing.	To compare the effects of direct CF and coded CF on students' linguistic accuracy in writing.	The coded CF group outperformed the direct CF and control groups in both the post-tests and delayed post-tests.

Tang & Liu (2018)	Middle school in Taiwan. 56 7th grade Chinese EFL learners. Randomly assigned. Coded CF + teacher's affective comments (n=28) Coded CF only (n=28)	**True experiment** 1st draft–Revision/intervention stage–2nd draft 3rd draft (Rewrite). Tasks: Narrative compositions with three same pictures. Focused aspects: writing performance.	To study the effects of the combination of coded CF with teacher's affective comments on students' writing performance, uptake and motivation.	Although both groups made progress in writing accuracy, the coded CF + teacher's affective comments group did not outperform the coded CF alone group. However, the affective comments did boost their motivation to learn.
Saukah et al. (2017)	High school in Indonesia. 53 11th grade students from Singaraja, Bali. The same students were treated with both coded CF and non-coded CF in two separate rounds.	**Repeated measurement** 1st round: Draft–coded CF–revised draft. 2nd round: Draft–non-coded CF–revised draft. Drafts from the 1st and 2nd round were compared. Tasks: Analytical exposition writing tasks. Focused aspects: Writing performance.	To study the effects of coded CF and non-coded CF on students' writing performance.	The coded CF method outperformed the non-coded CF method.
Wagner & Wulf (2016)	High school in USA. 33 ESL students from Northern Virginia. Randomly assigned. Low proficiency students: G1: control group (n=9) G2: coded CF (n=8) High proficiency students: G3: control group (n=8) G4: coded CF (n=8)	**True experiment** Four written drafts. In between each draft, the interventions were administered. All four written drafts results were compared. Tasks: 200-word elicitation paragraph writing. Focused aspects: Grammar accuracy.	To study the effects of coded CF on students' overall writing accuracy.	Although it was expected that the high proficiency students wrote more accurately than the low proficiency students, both high (G4) and low (G2) proficiency students who were treated with coded CF outperformed the control groups (G1 & G3).
Salimi & Valizadeh (2015).	High school in Iran. 30 pre-intermediate Iranian EFL students. Randomly assigned. Coded CF (n=15) Non-coded CF (n=15)	**True experiment** Pre-test – intervention – post-test – delayed post-test. Tasks: 150-words written compositions selected from the 'Pre-intermediate Students' book. Focused aspects: Grammar accuracy.	To study the longitudinal effects of coded CF and non-coded CF on students' writing accuracy.	The coded CF group outperformed the non-coded CF group longitudinally.
Sadat et al. (2015).	Language institute in Iran. 91 intermediate EFL students. Coded CF (n=30) Non-coded CF (n=31) Control group, direct CF (n=30)	**Quasi-experiment** Pre-test–intervention– post-test– delayed post-test Task: Writing of English conditional sentences type 1, 2 and 3 Focused aspects: Writing accuracy of the English conditional sentences type 1, 2 and 3.	To investigate the effects of coded CF and non-coded CF on the accuracy and retention of producing English conditional sentences for type 1, 2 and 3.	The coded CF group outperformed the other two groups in both the post-test and delayed post-test.
Gholaminia et al. (2014).	University in Iran. 60 out of 91 students were selected from two classes due to the homogeneity results. Coded CF (n=30) Control group, underlining of errors (n=30)	**Quasi-experiment** Pre-test–intervention– post-test. Task: Paragraph writing tasks. Focused aspects: Writing ability.	To determine the effects of metalinguistic coded CF on students' writing ability.	The metalinguistic coded CF group outperformed the control group who just had their errors underlined.
Muth'im & Latief (2014).	University in Indonesia. 54 students were selected from the Writing IV course. Randomly assigned. End sample comment, SEC (n=19) Coded CF (n=17) Non-coded CF (n=18)	**True experiment** Pre-test (1st draft – intervention–post-test (5th draft). Task: Expository essays (Different topics for each group). Focused aspects: Writing performance.	To study the effects of different written corrective feedback on students' writing performance.	All three feedback methods were able to increase the students' writing performance. However, there were no significant differences between them.
Suh (2014)	University in South Korea. 43 intermediate Korean EFL students from Seoul. Direct CF (n=12) Coded CF (n=15) Control group (n=16)	**Quasi-experiment** Pre-test–intervention–post-test. Task: Guided story-retelling task. Focused aspects: English past counterfactual conditional.	To investigate the effects of direct CF and coded CF on students' writing performance in the production of English past counterfactual conditional sentences.	The direct CF method were discovered to be more effective than the coded CF method in the post-test.

Ahmadi-Azad (2014)	Language institute in Iran. 54 Pre-intermediate EFL learners from Shokuh Language Institute. Randomly assigned. Coded CF (n=27) Non-coded CF (n=27)	**True experiment** Pre-test–intervention– post-test–delayed post-test. Task: 150-words descriptive writing tasks. Focused Aspects: Writing accuracy.	To compare the effects of coded CF and non-coded CF on the students' writing accuracy.	The coded CF group outperformed the non-coded CF group in both the post-test and delayed post-test.
Zareil & Rahnama (2013)	University in Iran. 164 lower intermediate to intermediate Iranian EFL learners majored in English Translation. Randomly assigned. Direct CF (n=30) Coded CF (n=39) Non-coded CF (n=16) Control group (n=79)	**True experiment** Pre-test–intervention– post-test. Task: 150 to 200-words essay writing tasks. Focused aspects: Grammar and lexical accuracy.	To study the effects of different corrective feedback on students' grammatical and lexical accuracy in writing.	Direct CF was more effective than the other feedback methods in grammar accuracy. The coded CF group showed no significant difference when compared to the other feedback groups in grammar accuracy. All three groups (DCF, CCF, and NCF) outperformed the control group in lexical accuracy.
Ferdouse (2012)	University in Bangladesh. 20 students from Stamford University who enrolled in the English composition course. Coded CF (n=10) Indirect CF, underlining of errors (n=10)	**Case study** Three writing and feedback sessions. The initial drafts and the revised drafts of the three paragraphs were compared. Task: Three written paragraphs as writing assignments. Focused aspects: Grammar accuracy	To investigate the effects of coded CF to increase students' ability to self-correct their mistakes in writing.	The coded CF group outperformed the indirect CF group by being able to self-correct their errors in all the revision drafts.

Table 4: Literature matrix of selected articles

Distribution of studies on the effects of coded corrective feedback on students' writing performance

Of the total of twenty studies on the effects of CCF on students' writing performance between 2012 to 2022 identified for this review, the majority found had been conducted in Asia.

Country	Number of CCF studies conducted throughout the years (2012-2022)											Total
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	
Bangladesh	1	-	-	-	-	-	-	-	-	-	-	1
Bhutan	-	-	-	-	-	-	-	-	-	1	-	1
Indonesia	-	-	1	-	-	1	-	1	-	1	-	4
Iran	-	1	2	2	-	-	-	-	-	1	-	6
Iraq	-	-	-	-	-	-	1	-	-	-	-	1
Japan	-	-	-	-	-	-	-	-	-	1	-	1
Malaysia	-	-	-	-	-	-	-	1	-	-	-	1
Pakistan	-	-	-	-	-	-	-	-	1	-	-	1
South Korea	-	-	1	-	-	-	-	-	-	-	-	1
Taiwan	-	-	-	-	-	-	1	-	-	-	-	1
Turkey	-	-	-	-	-	-	-	-	1	-	-	1
USA	-	-	-	-	1	-	-	-	-	-	-	1
Total	1	1	4	2	1	1	2	2	2	4	0	20

Table 5: Distribution of studies on the effects of CCF on students writing performance

As shown in Table 5, the highest number of CCF studies were identified in Iran, where six were included (Ahmadi-Azad, 2014; Gholaminia et al., 2014; Nia & Valizadeh, 2021; Sadat et al., 2015; Salimi & Valizadeh, 2015; Zareil & Rahnama, 2013). The second highest number of studies on CCF with a total of four articles were found in Indonesia Doi et al., 2021; (Muth'im & Latief, 2014; Rizkiani et al., 2019; Saukah et al., 2017).

As for the other Asian countries, there was only one article discovered for each country (Ekinci & Ekinci, 2020; Ferdouse, 2012; Lee & Sim, 2019; Mujtaba et al., 2020; Ogawa, 2021; Sherpa, 2021; Suh, 2014; Tang & Liu, 2018; Tawfeeq & Abbas, 2018) and only one article found in the Western hemisphere (Wagner & Wulf, 2016).

Distribution of coded corrective feedback research across different educational levels

It is crucial for teachers to take into account the different ages and education levels of their students to provide the most appropriate WCF. This is because the utilisation of feedback methods and the focus on writing aspects is different according to students' level of education. Lira-Gonzales and Nassaji's (2020) study uncovered that teachers tended to provide a more direct method of feedback to students at the primary level, and feedback was given more on grammar mistakes in writing because students tended to make more mistakes in that area. On the other hand, indirect feedback methods were used more with university students and lexical errors received more focus.

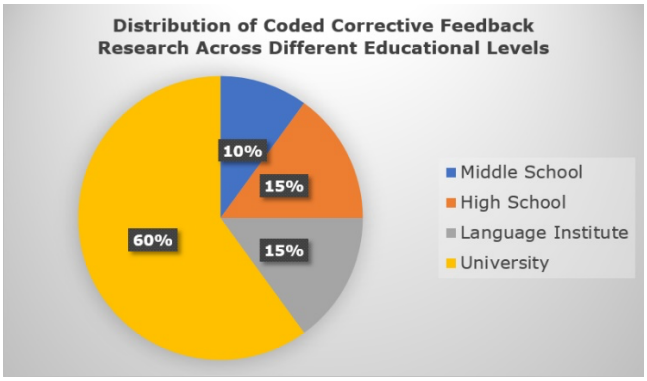

Figure 3: Pie chart of CCF research across different education levels and context

The chart in Figure 3 shows the distribution of different education levels in studies on the effects of CCF on students' writing performance. The chart shows that the majority of the studies (n=12) (Doi et al., 2021; Ekinci & Ekinci, 2020; Ferdouse, 2012; Gholaminia et al., 2014; Lee & Sim, 2019; Mujtaba et al., 2020; Muth'im & Latief , 2014; Ogawa, 2021; Rizkiani et al., 2019; Suh, 2014; Tawfeeq & Abbas, 2018; Zareil & Rahnama, 2013) were conducted on students at the university undergraduate level. There were only a few studies (n=3) (Ahmadi-Azad, 2014; Nia & Valizadeh, 2021; Sadat et al., 2015) that were conducted in the context of language institutes where the students were a combination of high school and adult learners whose ages were between 14 and 20. Furthermore, there were a few studies (n=3) (Salimi & Valizadeh, 2015; Saukah et al., 2017; Wagner & Wulf, 2016), which were conducted on high school students. The lowest number of studies (n=2) (Sherpa, 2021; Tang & Liu, 2018) in this review were carried out on middle school students.

Distribution of studies on the effects of coded corrective feedback on different writing aspects

Writing performance includes a variety of aspects including grammar, lexicon, mechanics, pragmatics, content, etc. Therefore, researchers need to select the writing aspects that were used as the dependent variables to test the effects of WCF including CCF.

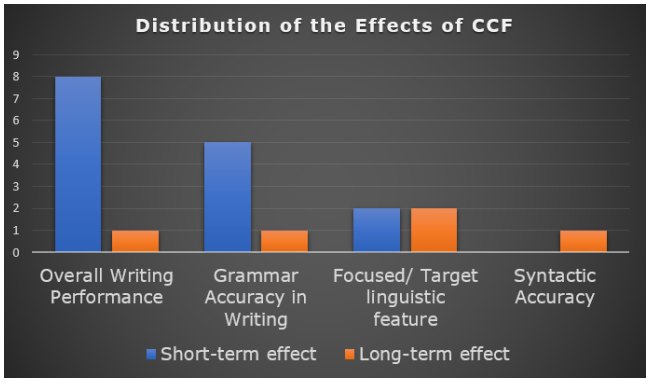

Figure 4: Chart of the distribution of the effects of CCF

According to Figure 4, four main effects of CCF were identified across the reviewed studies. Many of the studies (n=9) tested the effects of CCF on students' overall writing performance such as increasing scores on writing assessments (Ahmadi-Azad, 2014; Ekinci & Ekinci, 2020; Gholaminia et al., 2014; Mujtaba et al., 2020; Muth'im & Latief, 2014; Rizkiani et al., 2019; Tang & Liu, 2018; Tawfeeq & Abbas, 2018; Zareil & Rahnama, 2013). Several studies (n=6) investigated the effects of CCF on increasing overall grammar

accuracy in writing (Doi et al., 2021; Ferdouse, 2012; Ogawa, 2021; Salimi & Valizadeh, 201; Saukah et al., 2017; Wagner & Wulf, 2016). A few studies (n=4) tested the effects of CCF on certain target linguistic features such as conditional sentence types 1, 2 and 3 (Sadat et al., 2015), past tense and articles (Sherpa, 2021), past counterfactual conditional (Suh, 2014) and conjunctions (Lee & Sim, 2019) in writing. Only one study investigated the effects of CCF on syntactic accuracy alone in writing (Nia & Valizadeh, 2021).

All twenty of the studies investigated the short-term effects of CCF by giving either a post-test or a subsequent writing task immediately after the treatment period. However, within the 20 studies, there were seven that administered a delayed post-test by imposing a certain time gap after the end of the treatment period to determine whether the students were able to retain the effects of the feedback. Three out of the seven studies were found to have administered a delayed post-test after one month (Ahmadi-Azad, 2014; Nia & Valizadeh, 2021; Salimi & Valizadeh, 2015). while two of the studies administered the delayed post-test after two weeks (Sadat et al., 2015; Tawfeeq & Abbas, 2018) and two remaining studies imposed just a short time gap of one week (Doi et al., 2021; Sherpa, 2021).

Overall effects of coded corrective feedback on students' writing performance

Most of the studies were mainly conducted to determine the general effects of CCF and most of them (n=16) found that CCF was effective. According to the studies of the short-term effects of CCF, six studies found CCF to be effective (Ekinci & Ekinci, 2020; Ferdouse, 2012; Gholaminia et al., 2014; Lee & Sim, 2019; Rizkiani et al., 2019; Saukah et al., 2017).

There were also some studies (n=5) that tested and compared different types of CCF and their effects other than merely determining the effects of CCF on students' writing ability. For instance, Nia and Valizadeh (2021) studied the effects of CCF between two groups of students. The experimental group was treated with repeated-mediated indirect CCF method whereby the students had to revise their writing based on the coded feedback provided. The control group was treated with attention-mediated indirect CCF whereby the students just needed to study the coded feedback received without having to revise the text. Although the effects of both groups did not differ significantly, they still managed to make improvements in both their short-term and long-term syntactic accuracy in writing.

Ogawa (2021) compared two groups of students in which the experimental group was treated with the combination of CCF with repeated metalinguistic explanation, while the control group was treated with a combination of CCF with a single metalinguistic explanation. The results showed that these two methods did not produce significantly different outcomes, although both methods were able to increase students' grammar accuracy in writing.

Tang and Liu's (2018) study attempted to determine the effects of adding short affective comments from the teacher, to enhance the effects of CCF on middle school students' writing performance. They discovered that the group who received CCF plus their teacher's written affective comments did not differ significantly when compared to the group who received CCF alone. However, both groups were still able to improve their writing accuracy. Mujtaba et al. (2020) replicated the study but they conducted the study on university students instead. Their findings differed from those of Tang and Liu's above as they found that the group who received the combination of CCF plus teacher's written affective comments significantly outperformed the group who received just CCF alone in their writing accuracy.

Wagner and Wulf (2016) compared the effects of CCF with high and low proficiency learners, and they discovered that CCF group showed enhanced grammatical accuracy in writing. The high proficiency learners achieved better accuracy than the lower proficiency students.

As for the studies that investigated both the short-term and long-term effects of CCF, five studies discovered that the students were able to retain the effects of CCF in their writing of new drafts after a certain time gap (Ahmadi-Azad, 2014; Doi et al., 2021; Sadat et al., 2015; Salimi & Valizadeh, 2015; Tawfeeq & Abbas, 2018).

On the other hand, there were only two short-term CCF studies which reported that CCF was less effective when compared to direct CF, and one study found that CCF was not significantly different when compared to the other feedback methods, although all the methods, including CCF, did improve students' writing ability at the post-test (Muth'im & Latief, 2014). As for studies on the long-term effects of CCF, only one study found that the students were unable to retain the effects of CCF after imposing a time gap (Sherpa, 2021).

Gaps and Future Directions

This section will highlight some of the gaps and future directions indicated by this scoping review. This review has shown that the studies on the effects of CCF were mostly conducted in Iran (n=6) and Indonesia (n=4). Only one study was identified in each of the other countries. Therefore, more studies should be conducted in different countries to investigate the effects of CCF in different settings. This is because the difference in contexts affects the way teachers and students behave in response to corrective feedback (Lira-Gonzales & Nassaji, 2020). Hence, it would be useful to discover how effective the use of CCF might be with students in different contexts especially in the ESL and EFL contexts. In particular, there are still no studies of CCF in the Latin American context to date.

It is apparent that most of the investigations (n=12) were conducted with university students. There were very limited studies carried with on secondary school students (middle, n=2, and high, n=3). Therefore, more investigations of CCF are needed on students at the secondary school level. Moreover, no studies of CCF with primary or elementary school students have been conducted to date Thus, future studies should consider investigating the effects of CCF especially at the primary or elementary school level to find out whether younger students are able to benefit from this feedback method.

As for the different focus on writing aspects, it seems that most of the research studied the effects of CCF on students' overall writing performance (n=9) and overall grammar accuracy (n=6) in writing. There were only a few studies (n=4) that tested CCF by targeting certain linguistic features and only one study investigated the effects of CCF on syntactic accuracy in writing. Therefore, more studies should target other linguistic features that are difficult for learners to learn such as simple present tenses, (simple, past, future) continuous tenses, and prepositions, to determine which linguistic features can be more effectively treated with CCF.

There were several studies (n=7) that investigated the long-term effects of CCF. More future studies should investigate the effects of CCF beyond the revision stage and post-test stage in order to determine whether students are able to retain the effects of CCF after a time gap imposed. The time gap can be extended beyond one month to find out whether the effects of CCF can be retained at a longer time.

The review also discovered only a few studies (n=5) that investigated the effects of different CCF methods, rather than just comparing CCF vs. non-CCF. Since a majority of the studies have found that CCF is generally beneficial to increase writing performance, more studies should consider combining CCF with other methods to determine how these combinations could further enhance the effectiveness of CCF on students' writing performance.

Furthermore, since only one CCF study was found to have separated the participants into lower and higher proficiency learners in this review, more studies should be done in this area by comparing the results of CCF for students at different proficiency levels. This is to determine whether the use of CCF can be advantageous to students of different proficiency levels especially to lower proficiency students so that they can perform self-editing more easily and effectively with the guidance of CCF clues to enhance their writing performance.

Conclusion

This review article synthesised the existing literature on the studies of coded corrective feedback, CCF, on students' writing performance in recent years, from 2012 to 2022. This was done by analysing 20 published articles on the effects of CCF and other methods that were combined with it to promote students' writing abilities such as overall writing accuracy, overall grammar accuracy, target linguistic features, and syntactic accuracy in writing.

Most of the studies generally compared CCF with non-CCF while a few studies combined other methods with CCF to strengthen its effects. These studies indicated that CCF was beneficial in enhancing students' writing quality. A few studies also showed that the effects of CCF can be retained for a period of time after the treatment period. Therefore, the study of CCF is useful to both researchers and educators since it can be used as an effective feedback method to optimise students' writing performance.

Although more CCF studies are emerging in recent years, they are still quite limited. Since there are many English language learners in Asia, more research on CCF should be conducted in different Asian regions, because regional differences can be a factor in producing different results. In addition, CCF should be tested on younger students especially at the middle school and primary school levels to determine how well CCF works on their writing performance. Furthermore, other linguistic features (e.g., simple present tense, continuous tense, perfect tense, prepositions, subject and object pronouns) should be tested with CCF to determine its effectiveness. Moreover, more studies on the long-term effects of CCF should be conducted to

discover how long students can retain the effects of CCF effectively. In addition, more CCF studies should be conducted on students at different proficiency levels to determine whether there are differences in terms of effectiveness across different proficiency levels. Lastly, future studies should consider combining CCF with other feedback methods to find out how efficient the combinations can be in enhancing the effects of CCF. Therefore, it would be beneficial to further the investigation into this branch of feedback. A deeper and more thorough understanding of the effects of CCF needs to be obtained as this method of feedback can benefit students by helping them develop their writing performance.

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