

## EXPLORING THE IMPACT OF COMPUTER-BASED HYBRID DYNAMIC ASSESSMENT ON EFL STUDENTS' ACADEMIC WRITING DEVELOPMENT

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Article Info	Abstract
<b>Article History</b> Received: December 2024 Revised: February 2025 Published: July 2025	<i>Little attention has been paid to the computer-based hybrid dynamic assessment (C-HDA) in the context of English as a foreign language (EFL) academic writing. However, This study aimed to examine the impact of C-HDA in improving the writing skills of Indonesian higher education students. A sequential explanatory mixed-methods design was employed. To gather quantitative data, one-group pretest-posttest research design was employed. Qualitatively, semi-structured interviews with the experimental group were also conducted to investigate the extent to of mediation benefited the participants during the teaching session. The interview was conducted after the post-test was completed accordingly. Eleven of twenty-two aged 19-20 years old enrolled in the Writing for Academic Purposes course and participated in this research project. The participants were required to write an argumentative essay of 150-300 words consisting of three paragraphs (introduction, body, and conclusion) and their essays were then assessed by using the recent C-HDA. All essays were, then, scored (by three raters) based on five criteria of academic writing, content, organization, language use, mechanics, and style. T-test and the thematic analysis were used to analyze the quantitative and qualitative data, respectively. The results showed that the the current C-HDA improved the participants' academic writing although no maximal score was achieved. In addition, the qualitative data found three themes, positive and negative perspectives, and suggestions that addressed the participants' perceptions toward the C-HDA. This study yields implications for academic writing teachers about the implementation of C-HDA in developing academic writing for low-competent students.</i>
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### INTRODUCTION

This study deals with the relationship between teaching and assessment of academic writing. This study investigated how academic writing assessment procedures can foster writing development including conceptual development (i.e., students' ability to write academically). Academic writing means academic text written by students in a particular discipline in higher education (HE). Academic writing is one of the important skills for educated people, and it is still viewed as a difficult task for EFL students (Rakedzon & Baram-Tsabari, 2017; Yeh, 2014). In the context of HE, academic writing is not only a written communication tool to present the results of thinking (coursework) and research (final project) but also a means to develop critical thinking skills and deeper knowledge in their academic careers. Therefore, HE students still need this competence (Schillings et al., 2020). In the Indonesian EFL context, there have been many studies on teaching writing at the higher education level, while studies on academic writing assessment are still few to date. This study explored academic writing assessment to fill

this gap. Academic writing assessment is conducted based on what have been taught in developing professional educators (Riahi, 2018). This study explores the application of dynamic assessment (DA) to promote the academic writing of English study program students. DA is an assessment approach that combines assessment with teaching in a single activity. Several previous DA studies in academic writing classes identify and support the need for learners to largely mediate and encourage the development of academic writing in macro and micro skills (including source materials, structure, text development, grammar, style, and presentation quality) (Shrestha & Coffin, 2012). Other DA studies also show that the use of dialogic teaching methods helps improve students' interest in writing and writing competence (Xiaoxiao & Yan, 2010). Furthermore, DA studies applying a group-based dynamic assessment (G-DA) format in writing contexts can diagnose writing difficulties and help to improve writing skills (Shabani, 2018). Further research also proves the effectiveness of DA in improving academic writing in terms of coherence and cohesion, lexicon, and grammatical range and accuracy (Ebadi & Rahimi, 2019) and other studies on DA, such as Shabani (2018), Xiaoxiao & Yan (2010), and Alavi & Taghizadeh (2014). More recent studies combine interactionist and interventionist into a single framework, hybrid DA (hereafter called HDA) has also been proposed and implemented in improving writing skills. The research results have proved that HDA has a positive impact on learners' ability to produce descriptive writing (Roohani & Rad, 2019; Sadek, 2015; Sadek, 2011). Of all these studies, the application of computer-assisted language learning (CALL) in HDA has not been widely investigated. In addition, written corrective feedback (WCF) into HDA has not also been discussed.

Therefore, the rationals behind the current HDA research were (1) traditional assessments may not be suitable for all learners, (2) assessments should consider learners' future abilities (i.e., students' learning potential that can develop) rather than focusing (learning outcomes) on their past (e.g., actual development), (3) the result of traditional assessment (for instance, summative assessment) would not represent the learners' knowledge to construct knowledge and use it (Hadidi, 2023), (4) the application of computer-based written correction can help students revise better academic writing (Shang, 2024). Lastly, the majority of researchers investigating DA in the context of native speakers; very few have examined DA in argumentative essays, especially in Indonesian higher education as non-native speaker context.

This study examines DA) approaches and their potential to impact and inform assessment practice in higher education positively. As a further motivation, we know little about how DA is implemented in argumentative essays in how assessment and feedback could support learning, as lecturers, we encountered issues with students' academic writing when teaching and marking assignments in academic writing. The researcher sought to address this issue systematically and allowed us to investigate professional practice formally. The researchers assumed that such an investigation would be of benefit to academic writing lecturers and educators more broadly. With this in mind, we began this study intending to investigate DA implementations that could potentially meet students' academic writing development needs and align writing assessment with learning. This research study was conducted to answer the following questions:

- 1) What are the effects of C-HDA on EFL students' academic writing development?
- 2) What are EFL students' perspectives on the implementation of C-HDA in academic writing classes?

## **Literature Review**

### **Theory underpinning C-HDA**

DA comes from Vygotsky's theory on Sociocultural Theory of Mind (SCT). This view that instructional practice should impact learner development (Poehner, 2008). Cognitive development can be achieved through social interaction and physical and symbolic artifacts

(Widodo, 2016), which is known zone of proximal development (ZPD). The history of DA has been explored in many literature. In short, A.R Luria, as Vygotsky's closest colleague, views teaching and assessment not be separate parts but rather as unity in developing students' cognitive abilities. This concept is then known as dynamic assessment (Poehner, 2008). Practically, the role of the assessor or mediator is to help students solve problems (tasks) in the learning process. They are considered as a maturation in the learning process that still needs intervention (Vygotsky, 1978). Haywood & Lidz (2007) adds DA as an approach to psychological and educational assessment. This means a subset of interactive assessment that includes deliberate, planned mediational instruction and an assessment of the impact of that instruction on subsequent performance" (Haywood & Lidz, 2007, pp. 1-2). More specifically, Widodo (2016) views DA as a unit of pedagogy and assessment. He explains that DA seeks to discover learners' learning difficulties and improve their language skills by providing learners with adequate teacher mediation and peer assistance. DA's focus is not on the success or failure of test-takers in completing tasks given as summative assessments. Rather, it concerns the analysis of the amount and type of assistance (mediation) they need to achieve learning goals. From Vygotsky's perspective, the analysis of examiner-test-taker collaboration reveals the future performance of test-takers if they are given proper instruction (Vygotsky, 1978).

Furthermore, Poehner (2008) divides two main approaches of DA, interventionist and interactionist. The interventionist framework refers to psychometric testing such as services and programs that require IQ test scores, student skills, or language skills. This approach takes the form of static assessment. In other words, it uses standardized administration procedures and useful forms to produce easily measurable results that can be used to make comparisons between and within groups, in other words, used to make predictions about students' future test performance. The sandwich model is like an experimental design where there is a mediation phase between the pretest and posttest (pre-test - mediation - posttest). The results of the post-test are then compared with the pretest to see how much improvement the individual has obtained as a result of mediation. The cake model refers to the provision of implicit to explicit instructions and this level is calculated on each test item. To date, there have been studies using this approach (Alavi & Taghizadeh, 2014; Mauludin, 2018; Tang & Ma, 2023; Vakili & Ebadi, 2019). These experimental studies have proven that the interventionist approach is effective in improving writing skills (Alavi & Taghizadeh, 2014; Mauludin, 2018; Tang & Ma, 2023). Meanwhile, Vakili & Ebadi (2019) investigated the comparison between face-to-face (FTF) and computer mediation (CM). The findings revealed that FTF mediation tends to be collaborative writing and CM focuses on student engagement in writing difficulties and transferring development through other tasks. Both FTF and CM have the potential to guide students and overcome academic writing errors.

Interactionist, on the other hand, refers to the mediation by identifying difficulties that occur in individuals or groups of students in the same grade or level over time and provides the quality and amount of mediation 'without concern for predetermined end point' (Poehner, 2008, pp. 18–19). In this case, learners receive mediation based on their ability level or needs. However, the amount and type of mediation can vary according to the needs of the student (Burns, 1984). Many studies have explored the effectiveness of this approach (Anton, 2009; Kao, 2015; Khoshsima, Saed, & Mortazavi 2016; Shabani, 2018; Xiaoxiao & Yan, 2010). Anton (2009) investigated the effect of interactionist DA in diagnosing speaking and writing and the findings showed that this DA model has a better understanding of learners' abilities.

Similarly, Xiaoxiao & Yan (2010) conducted a study to examine the effect of using DA on the writing skills and motivation of EFL students in China by involving teachers and peers in providing mediation. The writing problems experienced by students arose in the topic of writing so the teacher taught as a whole class. After learning, students were asked to revise their topics and then the topics were reviewed collaboratively to find better topics. In this way, the

results of the study showed that writing skills improved in terms of language form and content. In addition, students' interest and self-confidence also increased.

Furthermore, Shrestha & Coffin (2012) also used a qualitative study to examine higher personal mental functions through interactionist DA and the research findings revealed that most of the mediations identified in the field of business writing and individual responses to learners' needs can develop academic writing skills. In addition, Kao (2015) successfully used dialogic mediation in DA procedures to understand and encourage the development of Mandarin rhetorical structures in written form by students although her study found that a teacher failed to develop writing skills due to inappropriate assistance. On the other hand, Khoshima et al. (2016) conducted a different study from Anton, Xiaoxiao & Yan, and Kao. Their experimental study tested interactionist DA by implementing corrective feedback by negotiating students' writing errors and revising them. The results of this study showed that the experimental group performed better than the control group in the post-test. In a recent study, the DA framework of academic writing was developed to integrate the assessment and mediation aspects of DA in different contexts and essay types.

Lastly, the use of two approaches of DA (interactionist and interventionist) integrated in a single framework, called hybrid DA (hereinafter HDA) has also been proposed and implemented by Sadek (2011, 2015) in improving writing skills. Her research proved that HDA has a positive impact on learners' ability to produce descriptive writing. Likewise, mixed method research conducted by Rad (2021) and Roohani & Shafiee Rad (2019) has also proven the effectiveness of mobile-assisted HDA in helping learners' ability to write descriptive texts.

Previous studies have proven its efficacy in encouraging student development. Unlike traditional or non-dynamic assessments that aim to obtain high grades as educational goals (Bailey, 1996), DA focuses on analyzing the number of mediations by teachers or more competent peers to assist the students in achieving their ZPD. To date, there has been little research investigating the use of C-HDA. However, this current mixed-method study will provide multifaceted insights into DA practices in an Indonesian context. The study also highlights the potential contribution of C-HDA English education programs in guiding EFL novice teachers to improve their assessment performance in promoting students' ZPD.

### **Academic writing in higher education**

The existence of academic writing in higher education (HE) plays an important role in preparing students to become effective users of written English (Hirvela, 2017; Pessoa et al., 2017) because it is a key element at the university level (Zhao, 2017). Academic writing refers to academic texts produced by students of a university, such as essays, papers, research papers, term papers, argumentative papers/essays, analytical papers/essays, informative essays, and position papers (Whitaker, 2009). It is different from non-academic writing because academic writing involves several aspects: 1) organizing ideas following a formal order or structure, 2) ideas must be supported by academic literature references, and 3) academic writing is related to the theory and causes of the topic. Giving and exploring alternative explanations for the theory or event, 4) academic writing follows a certain tone, which uses concise, formal, and objective language, and 5) academic writing also adheres to traditional conventions of punctuation, grammar, and spelling (Centre for Learner Success, 2018). More specifically, academic writing is seen as an argument (Irvin, 2010). This means that academic writing presents a point of view from an organized presentation value and is supported by strong evidence that aims not to win the argument but to consider the reader from the writer's point of view. In this sense, there are at least two important elements in academic writing, first, writing is an activity of conveying ideas that are organized or well-organized according to traditional conventions (grammar, clauses, punctuation, spelling). Second, argumentation with strong evidence is one of the characteristics of academic writing that aims to persuade the reader to agree with the writer's point of view (Liu & Stapleton, 2014). Arguing in writing essays is a

challenge for EFL learners because learners need to be trained or developed in determining selecting, and utilizing literature sources to be quoted, summarized, and paraphrased (Hirvela & Du, 2013) to support arguments. Meanwhile, in terms of ability, students who study abroad (for example in Australia) are assumed to have better writing skills than students who study domestically, but in reality, they have obstacles in writing arguments in their theses (Holliday, 2001). Therefore, argumentative essay is one of the most important aspects of writing theses. For this reason, this study used argumentative essays to train students to argue, and think critically, and prepare them to write a research thesis.

### **Computer-based academic writing instruction**

Computers can facilitate comment and track of student writing progress in a course and make instant decisions based on their current performance. As a result, many classroom instructors have turned to online, attempting to transfer standard classroom methods to the computer environment. Although the results have sometimes been less impressive (e.g., many students fail to participate in discussions, if student participation is part of the course requirement, and the amount of writing produced by students in online discussion courses can be overwhelming for instructors) (Pear & Crone-Todd, 2002). On the other hand, the current previous studies show that computer-assisted language learning (CALL) is effective in providing feedback with innovative strategies and adjusting classroom conditions (Sarré et al., 2019; Smet et al., 2012). One of the computer features in word processing (e.g. Microsoft Word) is *Review*. It provides the reviewer or lecturer with the commenting and tracking on the students' documents. These activities allow the students to engage in learning, and improve the writing revision, and the language skills (Pham, 2019). Another well-known application that can assist the students to correct the language form (e.g. vocabulary, grammar, spelling, etc.) is *Grammarly*. This computer-based application improves the writing process (Giray, 2024) since the students can identify and correct grammar errors (Ebadi, Gholami, & Vakili, 2022) and revise their drafts. Another computer feature, social networking applications is one of the tools that has recently been investigated in language learning, for instance, WhatsApp. To date, several studies have shown its potential to improve university students' writing (Khurram, Palpanadan, & Chachar, 2024). To add, WhatsApp is a highly useful learning tool for improving students' critique writing proficiency (Awada, 2016) and writing performance accross gender (Bataineh, Al-Hamad, & Al-Jamal, 2021). Another study also highlights the benefits of using WhatsApp for writing instruction as technology integration in education develops, offering an invaluable and approachable resource for EFL students in a variety of cultural and linguistic situation (Khurram, Palpanadan, & Chachar, 2024).

To conclude, the features of CALL provide beneficial activities in assisting and improving learning and text revision. Reviewing and WhatsApp were applied in this current study within the C-DA framework. With reviewing, the students received feedback, corrections, and comments on their drafts and WhatsApp is used for online communication to support the writing instruction.

### **Corrective Feedback in Academic Writing**

In a higher education context, corrective Feedback (CF) in academic writing plays an important role in writing instruction because feedback can help improve linguistics accuracy and written text revision (Ferris, 2010). In addition, CF can reflect on their progress so that they can take action to further improve their learning (Weaver, 2006). CF is an important tool for implementing DA in academic writing. Several studies conceptualize CF into DA procedures. Poehner (2005) is probably the first researcher who systematically and extensively applied CF in DA procedures in micro language skills (e.g. verb tenses). Another study by Shrestha (2011) developed the previous concept and applied broader micro and macro writing skills to business writing (case study). Both researchers (Poehner & Shrestha) used CF as a mediation tool to help

develop students' writing. With this in mind, this study also developed CF in the recent DA procedure. Tutors or researchers can use protocols to record teaching strategies or interventions. To implement it, tutors can adapt the description of the protocol supported by feedback that has been developed by two researchers, Poehner (2005) and Shrestha (2011). In addition, the concept of CF emphasizes the development of individual students in their writing drafts, where this assistance is given to individuals when they encounter learning problems (Poehner, 2008). Developing the students beyond their current ability, the mediator role provides hints or prompts in which CDA has been reframed to improve their text revision in this research context. With this in mind, CF is relevant to be included in the current C-HDA for the participants in helping text revision.

## RESEARCH METHOD

### Research Design

This study employed a sequential explanatory mixed-method design, in which quantitative and qualitative data sources were collected. This design allowed the researchers to highlight a deeper understanding of the phenomenon through quantitative and qualitative data analysis (Dornyei, 2007). To do so, the QUAN→QUAL design was used in which quantitative data were collected first, then follow-up interviews were conducted to investigate respondents' attitudes toward their experiences (Dornyei 2007; Riazi 2016). To collect quantitative data, one-group pretest-posttest research design experiment research was employed with a pre-test, post-test, and a mediation process online in terms of giving hints, comments, and CF on the student worksheets recorded during the treatment session. This study did not only measure the effectiveness of the current C-DA but also the extent of 'quality of mediation needed to prompt the performance has changed' (Lantolf et al., 2015). With this in mind, the study investigated the mediation during the DA procedure with computer assistance. Additionally, to fill the limitation of this study, in-depth semi-structured interviews with the group were employed to validate the intervention result used during the teaching session. The interview was conducted after the post-test was completed accordingly.

### Research Participants

The study involved eleven homogenous participants ( $p\text{-value} > 0.050$ ) majoring in the English Education Study Program at one of the private elite Universities in Kalimantan Barat, Indonesia. Eleven (3 males, 7 females) of twenty-two who ranged 19-20 years old and enrolled in this course participated in this research project (see Figure 2.1). The homogeneity was taken from the results of three raters' scores of pre-test and examined by Barlett formulas. All low-competent participants voluntarily joined the research project after accepting the research invitation and consent forms. They were invited to the study to gain benefits for this project, for instance, knowledge of writing an academic essay (argumentative essay). Therefore, the roles of researchers, collaborators, and students varied. The researcher's role was not only to collect data for research purposes but also to provide brief directions (short workshops) on the present C-HDA procedure to collaborators so that collaborators gain new insights about the current assessment model and the development of academic writing tests. Furthermore, students could also benefit when they were involved in this study, for instance, they gain new knowledge about learning to write an argumentative essay through this DA procedure. In other words, everyone involved in this study benefits.

### Instruments

The test was developed based on indicators in the current argumentative essay. The researcher used two different tests, pre- and post-test. To achieve feasible instruments, validity and reliability (in terms of construction and content) were also conducted where two English Education experts (in the field of EFL academic writing) and the researchers. The validity and

reliability were gathered from three interraters and calculated by using Pearson correlation and Cronbach's alpha, this instrument was then tested on the eleven homogenous (see Figure 2 for the result).

During data collection (pre-test), the student participants could choose the topics according to their interests. They were asked to write an argumentative essay of 150-300 words consisting of three paragraphs (introduction, body, and conclusion) and their essays were assessed (by three raters) based on five criteria of academic writing, content, organization, language use, mechanics, and style (Widodo, 2006) (see Table 1 for more detail). After the students completed the writing tasks, they submitted their work through a link (Google form) that had been prepared by the researchers. Additionally, the researchers provided mediation and scores on the students' drafts and sent them personally through WhatsApp. Each student had a similar opportunity to chat with the researchers when he/she needed further hints and was given three days for revision. Poehner's (2005, p. 160) mediation moves (implicit-to-explicit) were provided for each student's draft.

Moreover, the mediation was recorded both online (the students' drafts and WhatsApp chat). To improve the writing quality, three times revisions were also provided during the mediation session. Another instrument, the semi-structured interview, was also used to explore in-depth qualitative data about the implementation of the current DA. The questions developed by Ebadi & Bashir (2020) were adapted because they were relevant to the present study. In addition, these questions were elaborated based on the data provided by the student participants.

### **Data Analysis**

The quantitative data was analyzed utilizing the Minitab version 17. To compare the pre-test and post-test values, the paired sample t-tests were calculated to identify the differences between pre-and post-test. To do so, the validity, reliability, and normality of the data were also examined. Further, interviews with 4 participants (2 males and 2 females) of the experimental group were audio recorded, transcribed, and analyzed using thematic analysis methods. Interview transcripts were read repeatedly and carefully to identify and code the emerging themes to address the second research question. The findings of the analysis from these four participants were triangulated to solve the limitations of each participant's report.

## **RESEARCH FINDINGS AND DISCUSSION**

### **Research results**

#### **Quantitative results**

After calculating the normality test (see Figure 4), we examined the difference between the pre-and post-test of the group. Figure 5 showed that there was a significant difference between the average pretest and posttest scores ( $\text{sig} > 0.05$ ) (see Figure 5 for more details). The results revealed that the current C-DA was effective in enhancing the EFL students' abilities to produce argumentative essays.

#### **Qualitative results**

This recent study also explored the students' perspectives on the impact of C-DA. There were seven student volunteers to be interviewed. Having analyzed and coded the interview transcripts, three themes emerged (positive and negative perspectives, and suggestions for improvement) and elaborated them based on the extracts of interview data.

#### *Positive perspectives*

Positive perspectives relating the difference between the previous assessment method and the current one (C-DA). They indicated that the current C-DA helped enhance their revision.

*I think the current method was more effective because of what I thought was right but with assistance from you, I could identify the writing errors that I needed to be revised. With this, I could improve or correct my writing [student K].*

*In my opinion, this method was effective, besides knowing how to construct arguments, I knew my mistakes and what to do then because of your intervention to indicate my writing errors, for instance, introduction part [student A].*

*In my opinion, this assessment was more effective because it made me more enthusiastic to revise, for example, so I know where my writing errors were [student L].*

Another perspective related to the clearness and appropriateness of mediation in terms of hints, comments, and suggestions, the students clarified that the mediation was easy to understand. With this in mind, they could know what to revise.

*In my opinion, your comments were very clear [student N].*

*The suggestion was already clear when you gave us more examples, sir. So, I know what to do [student A].*

The current C-DA could also motivate the students to revise their writing because of the mediation provision.

*I think this method was very helpful because your meditation could motivate me to write better [student A].*

Lastly, the students also felt that they could improve their vocabulary, content, and organization in writing argumentative essays.

*I know how to write a correct conclusion and the body of the paragraph as suggested and My vocabulary also improved because I found new words that I didn't know before [student E].*

*Content and organization. After you gave me the hints, I understood, it wasn't like that before [student N].*

### *Negative perspectives*

Written-based mediation of the current C-DA paid little attention to grammar correction since students were instructed to use the grammar-checker application on their word program or another application such as Grammarly. However, the students expected grammar correction also needed to be mediated, which led to negative perspectives among the students.

*Your mediation was good enough, but here I needed more grammatical corrections [student K].*

*My grammatical errors still had little attention to be mediated [student E].*

*My grammar still needs to be corrected more, sir [student A].*

### *Suggestion for improvement*

Lastly, this current study did not pay much attention to grammatical mediation since the students were permitted to use a grammar checker application, for instance, *Grammarly* (for free version). However, all students proposed grammatical errors should also mediated. With this in mind, they would understand the reasons of being mistaken for such things. In other words, the explanation of grammatical errors would be useful for them.



*The grammatical errors should be mediated more since I received little mediation [All students].*

*I also need more grammar to be checked since my grammar understanding is still weak. [student A].*

## Discussion

This study aimed to explore the impact of C-DA on the academic writing skills (argumentative essay) of EFL students by involving online mediation (on the students' writing drafts). The use of the *Review* menu on Microsoft Word and WhatsApp chat was effective in promoting text revision and writing ability. We employed a sequential explanatory mixed-method design to collect and analyze data. The quantitative results of this study showed that C-DA was effective in improving text revision and writing quality. In particular, text-based mediation within the DA framework showed a significant difference between the mean score of the pre-and post-test of the group. Although the mean of the post-test did not meet the maximum rate, the recent C-DA had an impact on cognitive development in academic writing. As Vygotsky (1978) claims, even a slight change in a human's abilities is also an indicator of development. Further, this research results were related to the learning media (CALL) which employed the grammar checkers application and communication via WhatsApp as support to the mediation in the current DA. By implementing this current C-DA, the students had a better understanding of revising texts and improving their writing ability. Previously, the students claimed that they had no experience in this kind of intervention-based assessment practice through online text mediation on their drafts and communication via social media such as WhatsApp. A similar idea was also put forward by Shresta & Coffin (2012) their research findings showed that students' writing ability maturity (ZPD) was achieved through text mediation.

To add, although WhatsApp chat was not the priority of mediation practice in the current study, it also helped the students to communicate their writing difficulties to the tutors (researchers) when needed. With this in mind, the students were also supported with text mediation. These findings also corroborated Ebadi & Bashir (2020) and Rassaei (2020). Rassaei found that mobile-mediated DA could improve L2 vocabulary learning by EFL learners. Learners could interact through mediated prompts and the results showed that text mediation outperformed learners who received ready-made definitions for the same unknown words. Ebadi & Bashir (2020) employed three groups (one control and two experimental groups). They examined the voice- and text-based mediation in improving writing skills. Although voice-based mediation performed better, text-based mediation could also improve the students' writing skills on the post-test compared with the pre-test.

The exploration of learners' perspectives showed that EFL learners had both positive and negative perspectives toward mediation. The EFL students expressed effectiveness, ease, and clarity in mediation. This finding is in line with the study of Estaji & Ameri (2020) on computer mediation. Estaji & Ameri found that Iranian EFL students had a positive view of computer-based mediation in grammar instruction. On the other hand, negative perspectives also emerged on the mediation needs, especially grammar correction. The current study provided little attention to that language form since the researcher assumed the computer application assisted them in self-correction in checking grammar. The researchers found some grammatical errors and indicated them with explicit mediation. Despite the mediation provided it did not help the students to write accurately. Similarly, Estaji & Ameri (2020) found that the students also had negative attitudes toward pre-intermediate learners because they may not only benefit from newer techniques but also think that traditional techniques would be more helpful. Therefore, it seems that individual differences may play a role in implementing new ways of teaching and assessing. On the contrary, Ko's study (2022) showed that self-correction feedback provided

by the system revealed to be more useful for higher-proficiency levels. In this study, the effectiveness of mediation is not only attributed to C-DA (Yang & Qian, 2019), but human mediation is also important to implement. The study by Andujar (2020) revealed the effectiveness of C-DA and humans in improving grammar and vocabulary. This calls for EFL teachers to consider students' abilities and needs when choosing mediation strategies in C-DA.

Further, the research findings also challenge the view that cognitive development is the result of a gradual accumulation of discrete changes (Kushki et al., 2022). The research findings confirm Vygotsky's (1978) argument that development results from a complex dialectical process with periodicity and unevenness in the development of various functions.

## CONCLUSION

This study highlighted the significance of C-HDA through multiple interventions such as text-based mediation through human and computer (for instance grammar checker applications, as well as WhatsApp chat, can contribute to EFL academic writing teaching and learning. The results showed that integrating C-HDA into teaching and learning is more effective than using only teaching and traditional assessment. Although the current study discussed mixed methods employing one-group pretest-posttest research design and was conducted in the Indonesian context, the findings have pedagogical implications for teachers in implementing C-HDA to enhance academic writing ability, especially in English study program contexts. The results of this study also recommend that EFL teachers utilize C-HDA in their classes either in individual or group formats to improve students' writing skills and reveal their ZPD levels. Limitations of the study include, first the absence of a control group, as well as a relatively small sample; further research can explore the effects of the current C-HDA by involving a control group with more samples. Second, because this study only involved low-competent students, the more competent participants also need to be investigated to what extent the current C-HDA affects their ability to complete more difficult writing tasks.

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