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Incorporating ChatGPT as an automated written corrective feedback tool into L2 writing class[1]

Yifeng Zhang

Faculty of Arts, The University of Hong Kong, Hong Kong SAR, China

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Abstract

This review focuses on the use of automated written corrective feedback (AWCF) tools, particularly ChatGPT, in second language (L2) writing instruction. Writing is essential but challenging for L2 learners, and feedback plays a crucial role in enhancing writing skills. However, traditional teacher-provided written corrective feedback (WCF) faces challenges such as time constraints, cognitive overload, and inconsistency, especially in large classes. AWCF tools like Grammarly, Criterion, and ChatGPT help overcome these limitations by providing immediate and comprehensive feedback. The review begins by discussing the role of WCF in L2 writing, while highlighting the challenges associated with traditional feedback provision methods. It then explores the benefits and limitations of AWCF tools based on existing studies, noting their ability to offer instant feedback, reduce teachers' workload, and motivate learners. Focusing on ChatGPT, the review highlights its ability to generate contextually appropriate and personalized feedback. ChatGPT offers several advantages, including promoting learner autonomy, enhancing feedback literacy, and improving writing quality by providing immediate corrections and suggestions. Learners have also shown positive perceptions of ChatGPT's feedback in addressing grammatical errors and improving writing complexity.

Keywords L2 writing, written corrective feedback, automated written corrective feedback, ChatGPT, automated writing evaluation tools

1. Introduction

Writing is regarded as a crucial skill for L2 learners. However, it is also considered more challenging than other skills because the writer must first convey thoughts into words (Shang, 2022) and structure them in a specific manner to effectively communicate meaning and fulfill the writing's purpose (Farida & Rosyidi, 2019). Therefore, it is imperative that L2 writing teachers explore effective instructional methods to enhance their students' writing skills. A vital instrument frequently used by teachers for writing instruction is providing written corrective feedback (WCF) because they hold the belief that feedback, when delivered effectively, can enhance learners' writing skills (Tsao, 2021) as it provides evaluative and constructive insights into students' writing performance (Cen & Zheng, 2024). However, it is typical that in an EFL writing classroom, the teacher's main task is to provide feedback that corrects all the students' writing errors, which imposes a heavy workload on educators (Han & Sari, 2024). As a result, language instructors frequently consider providing feedback as one of the most demanding and exhausting aspects of their job (Lee et al., 2023). This is especially true in Mainland China, where teachers, due to limited time, often struggle with grading writing assignments and providing personalized feedback because they have to manage large classes sometimes with over 40 students.

Fortunately, advances in artificial intelligence and Natural Language Processing (NLP) have enabled the development of various computer-based tools for evaluating written texts, which helps to partially address these issues (Hassanzadeh & Fotoohnejad, 2021; Reynolds et al., 2021). These tools are termed automated writing evaluation (AWE) tools, whose use is on the rise in L2 classrooms due to their capability to deliver immediate automated written corrective feedback. Some of the most widely used AWE tools globally are *E-rater*, *Project Essay Grade* (PEG), and *Grammarly*, while in China, there has been a recent rise in domestically developed AWE systems such as *pigai* and *iWrite*. Educators can incorporate these systems into writing courses to expedite feedback delivery without adding to their workload (Zhai & Ma, 2022). In addition, students can also benefit from these tools because they allow them to upload their writing and access feedback at any time and place, even in the absence of human support (Liao, 2016).

Many studies have shown the effectiveness of AWCF

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systems in L2 writing instruction. For instance, they offer feedback on different aspects of learners' writing, such as content and organization, which helps learner improve their overall writing quality and enlarge vocabulary by offering multiple synonyms to avoid repetition (Wang & Han, 2022). They can also facilitate frequent revisions, boost students' writing motivation, and improved the accuracy of students' work from the rough draft to the final version (Li et al., 2015). However, there are also some criticisms levelled at AWCF. These include: (1) technological limitations lead to the huge variance in the quantity of useful information provided for different error types; (2) inaccuracies are inevitable in any tool that provides AWCF, potentially affecting students' motivation and ability to use the feedback; and (3) the feedback generated by such systems fails to consider individual differences among students.

It is worth noticing that while previous research has highlighted the affordances and drawbacks of some popular AWE systems, there has been little literature on the potential of ChatGPT as an AWCF tool since ChatGPT is quite new to the field. ChatGPT, short for Chat Generative Pre-trained Transformer, is an AI-driven chatbot created by OpenAI that can involve learners in conversations that mimic human interaction (Barrot, 2023). Its ability to generate idiomatic and coherent text instantaneously has sparked a fervent debate surrounding the acceptance or rejection of using ChatGPT in the field of academic writing, with some lauding the valuable resources it offers for outline preparation and corrective feedback and others warning the potential risks it poses such as promoting plagiarism (Su et al., 2023; Zou & Huang, 2023).

It is this gap in the literature that makes this topic worth exploring because it presents a unique opportunity to investigate the potential benefits and limitations of incorporating advanced AI tools like ChatGPT in educational contexts to complement writing teachers' feedback provision (Guo & Wang, 2023). From a practical standpoint, by evaluating the efficiency of ChatGPT-generated feedback, this article helps provide practical recommendations for educators looking for innovative methods to enhance writing skills among L2 learners in the era of AI.

In the following sections, this article will first discuss key concepts involved in the title, including L2 writing, written corrective feedback, automated written corrective feedback, and ChatGPT. It will then delve into the relevant literature concerning the effectiveness of various types of teacher-provided written corrective feedback in L2 writing instruction, followed by an evaluation of the use of AWE tools, specifically ChatGPT in assessing students' written work and their impact on learners' motivation, writing accuracy and overall writing quality. In addition, learners' perceptions towards using ChatGPT as an AWE tool to provide feedback on writing will also be included.

2. Definition of Key Concepts

2.1. L2 Writing

L2 Writing as defined by Cumming (2002) is the ability to compose texts in a second language other than the first language. This includes the application of the language which is not familiar to the learner or also known as L1. It is comprised of features like grammatical accuracy, lexical resources, syntactic proficiency and coherence where it usually serves a significant part of second language learning (Crossley, 2020).

2.2. Written Corrective Feedback

Written Corrective Feedback (WCF) is a type of feedback that focuses on written works in a bid to provide an insight into areas of error or areas that requires improvement (Evans et al., 2010). This feedback can be direct where the author informs the learner of containing an error; indirect where the author informs the learner of the error, but not how to rectify it, and metalinguistic where in addition to pointing out the error, the teacher also gives instructions or rules of how to correct it (Bitchener, 2008).

2.3. Automated Written Corrective Feedback

Automated Written Corrective Feedback (AWCF) refers to the neutral feedback generated by an AWE tool which highlights the mistakes made by learners in their writing in terms of grammar, punctuations and spelling, without the interference of teachers' mood or their preference towards a particular student (Barrot, 2023). AWCF differs from WCF as it can detect a wide variety of errors instantly, which helps students to make corrections in a more efficient manner (Lee, 2017).

2.4. ChatGPT

ChatGPT is an advanced language modeling tool developed by OpenAI based on the GPT structure, which stands for Generative Pre-trained Transformer (Roumeliotis & Tselikas, 2023). The tool works based on deep learning and produces text that looks natural to the human reader given the input it generates. ChatGPT can be applied to a range of uses like offering automated feedback on written text and in this sense, ChatGPT may turn out to be useful when it comes to L2 writing and AWCF (Barrot, 2023).

3. Teachers' Written Corrective Feedback in L2 Writing

In this section, the author will first examine the significance of written corrective feedback in L2 writing in section 3.1. Following this, the challenges that teachers face when providing WCF in L2 writing classrooms will be addressed, which shows the limitations of this traditional feedback provision method (see section 3.2), which lays the foundation for the discussion of the value of AWCF that helps tackle these limitations.

3.1. The role of Written Corrective Feedback in L2 Writing

Writing plays a fundamental role in language learning (Kazemian et al., 2021). Yet, it is often seen as more difficult to master than other language skills (Lating, 2022). The acquisition of writing skills can be supported

by written corrective feedback (WCF) which has been identified as an essential element in the development of L2 writing competency. WCF concerns the feedback that learners get in response to the mistakes they make in their written production with the purpose of correcting them and preventing similar errors in future (Cao, 2021). This feedback can be direct, where the teacher provides the right way of doing the task, or indirect, where the teacher points out mistakes made without giving the right way. Corrective feedback gives immediate correction which can be helpful to low-intermediate student who do not possess the metalanguage needed for modifying errors (Ferris & Roberts, 2001). Because indirect feedback eliminates the need for immediate correction, learners can invest more of their cognitive resources in processing the information (Bitchener & Knoch, 2008). Thus, the main aim of WCF is the ability of the learner to recognize and correct his or her errors leading to enhanced language and writing ability (Ellis, 2009).

Systematic studies highlighting positive outcomes of the WCF differentiate between the short-term and the long-term results. Temporary research shows that WCF might result in enhancing the students' ability to write more accurately within the short term (Ferris, 2006). However, the consequences of WCF are more complex and mediated by factors such as the extent to which learners interact with the feedback, the nature and frequency of practice and revision activities, and learners' characteristics (Bitchener & Knoch, 2010).

WCF immediately informs learners of their mistakes, thus enabling the learner to comprehend the errors they are making. Such immediate feedback is important for strengthening the right forms and preventing the strengthening of the wrong forms (Ferris, 2004). Among the benefits of using WCF is that it draws learners' attention to their mistakes and offers prompt explanations regarding the rules and conventions they might not have thoroughly understood. This awareness is the beginning of self-regulation and the ability to learn without further input from the teacher (Bitchener & Knoch, 2010).

Receiving feedback at regular intervals enables learners to cultivate good grammatical and syntactical usage. This way, learners get to see where they went wrong and are therefore in a better position to grasp the structural features of the second language and take this into account in future writing assignments as proposed by Chandler (2003). WCF sometimes offers better or wider options for referring to the same concept, thus assisting the learners to not only expand their active vocabulary but also to describe things more accurately and variably (Ellis, 2009).

The feedback that includes not only the correction of such important aspects as grammar and vocabulary but also the learners' macro- errors, such as organization, coherence, and argumentation improve learners' writing in general. This comprehensive approach allows the learners to foster the skills of writing coherent, logically developed, and argumentative texts (Hyland & Hyland, 2006).

Feedback that identifies areas where learners need improvement while encouraging them at the same time is very effective in enhancing their learning motivation. Offering praise, as well as focusing on the learner's strengths and weaknesses, helps to foster a positive learning experience (Shintani & Ellis, 2013). Feedback from a tutor supports the learners in continuing with the efforts that they have made in achieving their goals. Knowing that their work will be reviewed and guided helps them stay committed to the learning process (Hattie & Timperley, 2007).

Unlike generic feedback, WCF can be tailored to the specific needs and proficiency levels of individual learners. This personalized approach addresses each learner's unique challenges and promotes more effective learning (Ferris, 2011). Over time, consistent feedback helps learners identify their common errors and weaknesses, allowing them to focus their efforts on specific areas. This targeted approach accelerates progress and makes the learning process more efficient (Bitchener & Ferris, 2012).

However, it is worth noticing that WCF can only work effectively where the learners play an active role. The feedback given to learners should not only be provided but also explained and used in other writing endeavors. Learner activities including revision tasks, peer feedback and feedback writing activities can help in improving learner's participation and feedback reception (Storch & Wigglesworth, 2010). Moreover, there are other learner variables which have impact on WCF including proficiency in a particular language, motivation and the type of learning as well. Feedback can be made more effective when it is personalized according to the needs and abilities of the learners (Hyland & Hyland, 2006).

3.2. Challenges in Teachers' Written Corrective Feedback in L2 Writing

Traditional WCF provided by teachers is widely used in L2 writing classrooms. While giving feedback is beneficial because learners are able to make corrections while the learning context is still fresh in their mind as opposed to feedback that is given after some time, the act of giving prompt feedback may not be feasible, particularly with large groups of students (Bitchener & Knoch, 2008). Therefore, there are some factors that can affect the effectiveness of traditional WCF, including the kind of feedback that is given, the time feedback is given and also the number of times learners are given chances to revise and reflect. For instance, direct feedback may not be as effective in English as indirect or metalinguistic feedback when dealing with learners of different proficiency levels and learning preferences. There is also empirical evidence that providing multiple feedback types might be the most useful solution, but its practical application can be problematic at times (Ferris, 2004). Feedback can be most effective when given at the right time. Although WCF is crucial in learning feedback processes, learners must have chances to review their works as advised. In other words, the WCF provided by the instructors might be less effective as learners might never revisit the content, and even when they do, they might not apply the corrections as expected (Ellis, 2009).

Therefore, despite the clear advantages that it offers to learners in enhancing the accuracy and overall level of writing, there are several major issues arising from

applying traditional WCF. These challenges can hamper its efficiency and the overall learning process of the students. In this section, the major challenges of traditional WCF being discussed include cognitive overload, inconsistency and unfairness, negative emotional response, and practical constraints.

Cognitive load is a measure of the amount of brain resources that is needed to comprehend and interpret knowledge (Sweller, 1988). According to the Cognitive Load Theory proposed by Sweller (1988), the human cognitive system has a limited capacity in the working memory, which can be overwhelmed by high levels of cognitive load when approaching complex learning tasks.

Cognitive load can become a problem in the context of WCF, especially when feedback provided by the system is too detailed or complicated. In traditional WCF, students get to know many mistakes that they have made and it confuses them because it becomes difficult for the students to successfully process and respond to the errors that have been pointed out to them (Van Beuningen et al., 2012). When students receive feedback on all the mistakes, they are overwhelmed with too much information to process. Students may find it hard to concentrate on areas that need improvement when they are given many corrections and or explanations. This can lead to frustration, and consequently decrease the willingness of the receiver to engage in the feedback process (Ferris, 2006). Incorporating sufficient detail while at the same time not overwhelming the learners with too much information is key to creating effective WCF. This is a sensitive area since there are differences in what can be regarded as constructive feedback depending on the learner characteristics and their skill level (Ferris, 2011).

Maintenance of consistency and fairness in WCF is the key issue especially in large classes where the teacher is faced with the challenge of writing feedback to many students. Inconsistency in feedback frequency, feedback quality, and the extent of feedback given may have an impact on the students' performance and perception of fairness. Due to the time-consuming approach involved in writing detailed feedback, there might be differences. Teachers might not be equally considerate of the quality of work produced by each learner and might provide some students with more thorough feedback than others (Lee, 2008). Depending on the perspective of the teachers, there might be a lot of differences in the definition of errors and the subsequent approaches towards correction. This subjectivity can lead to the situation where students are given apparently contradicting advice, something that is detrimental and unhelpful (Hyland & Hyland, 2006).

Learner perceptions and responses to WCF have a direct impact on the effectiveness of the system. There is evidence indicating that while negative feedback is likely to result in resistance, anxiety, and reduced motivation, positive feedback enhances engagement and learning achievements (Ellis, 2009). As with any other aspect of learning, the perceptions that learners have towards feedback depend on their past experiences, cultural implications, as well as personalities. Fear and resistance towards receiving feedback stem from past experiences which convinced people that feedback is punitive and corrective (Hyland, 2013). The negative emotional response to received feedback is a result of feedback that is perceived as criticism or as being excessively negative. This may result in reduced confidence and increased anxiety that will demotivate them from experimenting with language resources as they write (Truscott, 1996). Another factor that should be considered is how the feedback is given or presented influences its acceptance. Positive feedback given in a spirit of trying to help and teach is far likely to be received well than when negative feedback is given with the aim of pointing out mistakes (Hyland & Hyland, 2001).

Real-world conditions, including overcrowded classrooms, time constraints, and resources act as barriers to the successful application of traditional WCF. These constraints also prevent teachers from being able to give feedback in a timely manner and to each individual student. In a large class, there is a lot of work produced by the students, and it may be difficult for the teacher to individualize and comment on each piece of work. This may result to providing generalized or even vague feedback that may not be relevant to the learning needs of the individual learners (Lee, 2008). It is important to note that offering detailed written feedback is a time-consuming activity. Teachers are always busy with their other responsibilities such as teaching loads, administrative duties or other professional obligations thereby having limited time to offer feedback (Goldstein, 2006). Lack of resources like teaching assistants or technologies may also extend the limitation of what the teachers can do to deliver effective WCF. To clarify, while teachers can incorporate new forms of feedback in certain learning contexts, they might not have sufficient professional development or consultation to deliver such feedback properly (Ferris, 2014).

4. Automated Written Corrective Feedback Tools in L2 Writing

Having identified the drawbacks inherent in teachers' WCF, the focus will be directed to automated written corrective feedback tools with analysis of the affordances and limitations of some popular automated feedback tools, which present solutions to some of the challenges that are inherent in traditional WCF provided by teachers. The second half of this section will introduce ChatGPT as an innovative AWCF tool, highlighting its development, applications, and potential in L2 writing instruction.

Due to the development of artificial intelligence (AI) and natural language processing (NLP), the field of language education has been impacted greatly. The various AI technologies allow for the development of individualized learning environments. Implemented through machine learning algorithms, AI can process individual learner data and adapt educational content for each learner based on their requirements (Kulik & Fletcher, 2016). Such flexibility helps provide learners with the most appropriate and efficient guidance according to individual learning processes. Intelligent Tutoring Systems (ITS) that are artificially intelligent help students to develop an interactive and adaptive learning process. These systems can mimic one-on-one tutoring by providing feedback,

explanations, and instructions that are then followed in real time to assist the learner grasp difficult concepts with greater efficacy (VanLehn, 2011). Similarly, one common use of NLP in education is the use of an automated scoring system that can score essays or other compositions. AES systems employ NLP to assign quality marks to the essays written by students and also offer feedback on several aspects like organization, grammar, and semantics (Shermis & Burstein, 2013). This automation greatly helps in teachers' workload in terms of grading as well as assists students in gaining their results instantly. NLP lies at the heart of most language learning apps which assist learners in practice and enhancement of their language proficiency. These applications can successfully process learner input, give feedback or corrections and suggest exercises based on the learner's proficiency level.

In the landscape of L2 writing, there are also many computer-aided feedback provision systems, based on AI and NLP, offer timely feedback and are capable of responding to many students' requests at once (Wilson & Roscoe, 2020). There are applications such as Grammarly, and AI-based chatbots like ChatGPT, which can scan students' written work and offer feedback regarding multiple linguistic features at once. These tools can complement teacher feedback and help to ensure that every student receives sufficient and personalized attention (OpenAI, 2022). In section 4.1, some existing automated feedback tools, including *Grammarly* and *Criterion* will first be discussed. Following this, the focus will shift to the advent of ChatGPT in section 4.2, with emphasis laid on examining the effectiveness of ChatGPT as an automated written corrective feedback tool, highlighting its applications, potential benefits, and impact on student learning and engagement.

4.1. Affordances and Limitations of Existing Automated Feedback Tools

Modern technology has significantly transformed the nature of educational practices especially in language acquisition and developmental writing. Computer generated feedback systems have become indispensable support in WCF practices due to some of the challenges which are associated with teacher-generated feedback. Such tools include checker that checks on grammar and spelling errors to advanced systems that provide more detailed linguistic analysis.

First generation of automated feedback systems, for instance Microsoft Word spell check, were limited to pointing out mechanical level mistakes like spelling mistake and fundamental grammatical errors. These tools are easy to use and gives instant feedback that makes the work of students more professional and easily understandable. However, they only cover minor and straightforward errors and cannot address other linguistic problems and contextual errors (Grammarly, 2024).

There are more enhanced tools that have been invented over the years to offer enhanced feedback of various writing concerns. Tools, including Grammarly and the Revision Assistant by Turnitin, are not limited to pointing out common errors but also suggestions on style, tone, and coherence. For example, Grammarly highlights the issues related to the choice of words, sentence construction, readability, and even language tone, which makes it useful for all the users, including non-natives learning the English language (Grammarly, 2024). Turnitin's Revision Assistant works together with plagiarism checking solutions and assists students in avoiding accidental plagiarism as they learn to write better (Turnitin, 2024).

Another tool worth mentioning is *Criterion*, developed by Educational Testing Service (ETS), which provides integral feedback on student's essays. *Criterion* is a tool that employs NLP to analyze the written content according to various parameters such as grammar, usage, mechanics, style, and organization. The system then generates overall scores and diagnostic feedback, which makes students aware of facets that require improvement in writing.

There are several ways as to how automated feedback tools are effective. The first advantage is the possibility to get the feedback in real time. AWCF has various advantages over the traditional teacher-provided WCF, one of them being that while providing WCF, the teacher can run out of time and thus delay the corrections and revisions that students need to make on their papers (Attali & Burstein, 2006). This means that the immediacy of the feedback can promote more of an editing cycle in which the learners tweak their work as per feedback provided. Moreover, the use of automated tools ensures that the feedback given is consistent since variability in assessment may be experienced with human evaluators. This feature makes it possible for students to get the same experience on feedback irrespective of the number of students in a class, something that is very helpful when teachers cannot personally attend to each of the students in large classroom settings (Stevenson & Phakiti, 2014).

A number of researchers have also investigated the use of automated feedback instruments in learning environments. For instance, Attali and Burstein (2006) conducted a study on the effects of e-rater on the writing proficiency of the students. It was also evident from the results that the students who utilized e-rater as a writing tool received better grades compared to those students who did not use the tool at all. It also showed how the tool offered feedback that were instant and directed to specific lessons, making learning more cyclical. Wilson and Czik (2016) conducted another study on the utilization of Grammarly in a university writing course. The study established that Grammarly was accurate in detecting and correcting the surface-level issues contributing to grammatical inaccuracy in the students' essays. However, the study also pointed out that the feedback given by Grammarly on higher order aspects of writing were not as efficient as what a human might provide and therefore appreciated a human interaction for teaching writing.

Nevertheless, the employment of AWCF tools does not necessarily guarantee positive results. For instance, in a study using web-based essay marking system, no notable difference is discovered in the writing performance of those who use the system and those who do not (Lee et al., 2009). It is also crucial to note that while these tools help to correct some of the mistakes, they fail to correct higher levels of writing, such as the writing flow, or

argumentation, or critical thinking (Wilson & Czik, 2016).

Another issue with applying the approach is that it might lead to over-reliance on the tools offered by the software. Students may rely on these systems in catching errors, and thereby fail to foster their self-checking and proofing abilities. This reliance may adversely affect their capacity to self-monitor for and self-correct mistakes, which is a crucial part of the writing process (Hyland, 2003).

Additionally, the role and efficiency of innovative automated feedback tools can also differ based on the achievement levels of learners and their learning preferences. Thus, for some students, these tools may serve as a valuable source of structured and immediate feedback while for others, these tools could be less effective, or even frustrating in the case when the feedback given is too prescriptive (Ferris, 2003).

4.2. ChatGPT as an Automated Feedback Tool

At present, there has been a notable progress in the field of AI, hence the generation of enhanced language models such as ChatGPT. ChatGPT has been updated several times, and with each update, it got better in the way it comprehends and generates text more accurately and concisely (OpenAI, 2020). The GPT architecture proposed by OpenAI is based on transformer models that apply the self-attention mechanism for text input and output generation. The model is trained on general web text and then adapted to various tasks (Radford et al., 2019). There is the pre-training phase, where the model learns general features, and the fine-tuning phase, where the model is trained on specific datasets to achieve certain performance on certain tasks (Vaswani et al., 2017). ChatGPT has a seemingly unlimited range of functions and features. It can create grammatically correct and semantically relevant text depending on the prompts that have been fed to it, and thus, it can be used to write essays, answer questions, explain things, as well as for creative writing. Furthermore, ChatGPT can be aware of conversational context, which is crucial for any application that involves interactivity such as tutoring aid and virtual assistants (Brown et al., 2020).

The current generation of GPT is GPT-4, and it is a major advancement in the field of AI. GPT-4 has 175 billion parameters and is capable of producing text that is contextually appropriate and semantically continuous, which makes it highly suitable for intricate linguistic processes (Brown et al., 2020). Since ChatGPT is trained with text data to produce human-like responses, it has proved to be proficient in learning and producing texts resembling human-written ones, thereby becoming a useful tool in numerous fields, including education.

The best features that have been demonstrated by ChatGPT include context appreciation and proper response formulation. It can interact with users and respond to questions and even give explanations or advice in what can be considered as an effective tool for an interactive learning experience (Ray, 2023). It can be used for multidimensional educational needs, be it a simple answer to a student's question or a thorough analysis of a written work the student has submitted. It also makes it more adaptable for use in a variety of contexts since most aspects of education can be modified to incorporate technology to an extent.

In the following subsections, I will first introduce how ChatGPT is created and developed, after which the various ways ChatGPT has been integrated into educational practices will be discussed. Finally, this section will scrutinize the effectiveness of using ChatGPT as an AWCF tool and students' perception towards this practice.

4.2.1. Development of ChatGPT

Building on the Generative Pre-trained Transformer (GPT) concept, ChatGPT is an enhanced language model that was created by OpenAI. This model uses deep learning to produce text that mimics a human's language and can be used for almost any type of application, including answering questions and having a comprehensive conversation. ChatGPT has been updated several times, and with each update, it got better in the way it comprehends and generates text more accurately and concisely (OpenAI, 2020). The GPT architecture proposed by OpenAI is based on transformer models that apply the self-attention mechanism for text input and output generation. The model is trained on a very large text corpus and learns syntactic structure, facts and a small measure of reasoning. There is the pre-training phase, where the model learns general features, and the fine-tuning phase, where the model is trained on specific datasets to achieve certain performance on certain tasks (Vaswani et al., 2017). ChatGPT has a seemingly unlimited range of functions and features. It can create grammatically correct and semantically relevant text depending on the prompts that have been fed to it, and thus, it can be used to write essays, answer questions, explain things, as well as for creative writing. Furthermore, ChatGPT can be aware of conversational context, which is crucial for any application that involves interactivity such as tutoring aid and virtual assistants (Brown et al., 2020).

4.2.2. ChatGPT's Educational Applications

Several studies have been conducted to understand the applicability of ChatGPT in different educational environments and its advantages and limitations. Research has established that ChatGPT can complement language acquisition by offering prompt feedback and increasing student participation in classroom activities and homework assignments (Praphan, 2023).

The areas which have been impacted most by the presence of ChatGPT are language learning and writing assistance. ChatGPT can be used as an automated writing tutor that can help review written work, spell check, and layout to ensure the written work is coherent and has proper grammar and style. For instance, Zhai (2022) illustrated how using ChatGPT can assist the students in enhancing their writing efficiency by highlighing the mistakes and giving prompt feedback and advice on how to rectify them.

Besides tutoring services, ChatGPT has also garnered much interest from the researchers when it comes to text generation. In a study by Wenzlaf and Spaeth (2022), the researchers find that ChatGPT's capabilities of writing an explanatory response match that of humans, with the chatbot's output being lauded for its originality (Yeadon et

al., 2022). The studies indicated that using ChatGPT, it would be possible to help with student's written work, offering comments and suggestions as human evaluators. This capability can also help in student-centered learning since it can provide feedback and learning experiences that are relevant to the individual student (Li et al., 2023). This kind of approach can provide for enhanced student independence and self-organization and can help learners to engage in education actively (Kuhlthau et al., 2015).

It can also be seen that ChatGPT can only produce effective results when it is incorporated into blended learning models. Integrating computer technology and artificial intelligence within the conventional classroom teaching and learning process creates a balanced approach. For example, ChatGPT can be used to provide extra teaching and feedback in addition to those provided in the classroom, during the time when formal learning is not taking place. That way, educators can take advantage of the benefits associated with both artificial intelligence and traditional teaching (Bonk & Graham, 2012).

It is imperative that the implementation of ChatGPT in the education system should be followed by constant assessment and fine-tuning processes. It is crucial to ascertain whether the tool is performing optimally in achieving the intended education objectives through periodic examinations of efficiency, precision, and on-student learning influences. Students and educators can share their experience which can be used to improve the use of the tool and solve new problems (Popham, 2008).

4.2.3. Effectiveness of ChatGPT as an AWCF Tool

Due to its ability to give responses based on the user, ChatGPT can provide personalized solutions, explanations, and suggestions for each student. This makes it easier to meet the needs of students who may have different learning needs, needs and proficiency levels, thus improving the learning outcomes (Guo & Wang, 2023).

ChatGPT can also learn from the writing produced by the students and prompt corrections and explanations of the mistakes made by the students so that the students can improve their writing skills (Bitchener & Ferris, 2012). The use of ChatGPT in education systems can help reduce teachers' burden in terms of automating routine activities such as grading and feedback. This makes it possible for teachers to spend more time on important things like tutoring and other classroom activities (VanLehn, 2011). Based on a review of studies carried out to investigate the effectiveness of using ChatGPT to provide automated feedback on writing, it is shown that this tool can have following benefits:

One of the most valuable uses of ChatGPT in L2 writing will be to give immediate feedback to the students, assisting learners to know their errors and rectify them within a short time, thus enhancing their learning experiences (Guo et al., 2022). This immediacy is particularly important for language learners because mistakes can be immediately corrected, and the learning process reinforced. The literature shows that feedback delivered instantly assists the learner to incorporate the changes more efficiently (Zou & Huang, 2023). The feedback includes correction in grammar, vocabulary, syntax as well as coherence and is therefore comprehensive. In fact, such comprehensiveness is not limited to word or sentential level but can well extends to different stages of writing. For instance, when fed with prompts that ask it to generate comments on students' written work, ChatGPT is shown to be an effective virtual tutor by providing feedback at every phase of the writing process, guiding students from the initial preparation stage to the final reflection stage of their argumentative writing process (Su et al., 2023).

Besides improved writing accuracy, ChatGPT also has a positive effect on other aspects of writing as well as the language complexity of L2 learners. It provides recommendations for improving the quality of the sentences, and the use of less common words. Recent research by Yan (2023) revealed that students who used ChatGPT to obtain feedback on their writing improved their lexical density and syntactic variety in their work. The author also points out the fact that ChatGPT does not only correct mistakes but also assists learners to improve their overall quality of writing. In this study, student's enhanced vocabulary learning resulting from interaction with ChatGPT is in tandem with the literature covered in MAAL 6018 *Vocabulary Teaching and Learning*. Gu and Johnson (1996) posit that vocabulary is mainly taught through the use of word lists in traditional classrooms, which is lacking in contextual learning strategies. Learners typically find this method ineffective because while word lists seem to help increase learners' vocabulary repertoire (Mizumoto & Takeuchi, 2009), it is challenging to memorize words presented to students in isolation devoid of context (Nation, 2009). However, the feedback generated by ChatGPT regarding the vocabulary usage often include sentences that help students understand how these words are used in real-life contexts, thus helping them remember new vocabulary better.

Concerning writing quality, the experimental study revealed that students who received feedback from ChatGPT had lower levels of grammatical errors compared to those with teacher feedback. For instance, Nugroho et al. (2024) revealed that the frequency of students' mistakes in the spelling, Grammar Syntax, and vocabulary use dropped after using ChatGPT. Specifically, participants generally point out that they are quite amazed at how this AI-based chatbot can be used to fix inconsistencies in tense and inappropriate transitional phrases. This attribute helps students improve their grammatical accuracy owing to ChatGPT's constant and accurate error identification features that assist learners in avoiding repetitive mistakes. The finding of this study is in line with that of Kasneci et al. (2023), who demonstrate that ChatGPT is capable of recommending improvements in grammar and style by highlighting erroneous words or phrases.

In addition to evaluating the effectiveness of AWE tools on L2 students' writing performance, scholars have also delved into the ways learners engage with automated feedback, which demonstrates their feedback literacy. Recent studies have confirmed that using ChatGPT can boost the motivation of learners and increase their engagement with feedback (Ghafouri, 2024; Mohamed, 2024). For instance, participants in Tam's (2024) study are found to actively ask for clarifications and reflect on their work when receiving feedback from the chatbot. This

enhanced feedback literacy further emphasizes the importance of using technology to facilitate students' engagement with feedback. According to Carless and Boud (2018), learners' feedback literacy involves four dimensions: appreciating feedback, making judgements, managing affect, and taking action. While feedback is considered an essential element for enhancing students' learning outcomes (Bloxham & Boyd, 2008), only when students actively engage with the given feedback can the positive effects of feedback on learning be fully realized (Cavaleri et al., 2019). To put it in other words, the feedback provided by the instructors is deemed effective when it visibly impacts the behavior of students (Sadler, 1998). This is where AI technology can come into play. To begin with, the use of technology in feedback provision can help students better appreciate feedback as students generally welcome technology-based feedback due to its promptness and convenience, which enables them to have a more efficient exchange of comments (Carless & Boud, 2018). In light of this, the integration of automated feedback systems such as ChatGPT into L2 writing class can yield promising results as automated feedback tools can prevent some issues associated with written feedback, such as illegibility, variability in quality among different tutors, and the absence of specific suggestions for improvement in future assignments (Duncan, 2007). Furthermore, this method also makes learners realize that feedback has different forms and can be derived from various sources (Carless & Boud, 2018). Therefore, by engaging students in interactive dialogues with ChatGPT, it not only allows for a better appreciation of feedback but also actively involves learners in the feedback process, thus improving their feedback literacy (Little et al., 2024).

Acting on feedback is another crucial aspect of learners' feedback literacy. In order to respond to the feedback effectively, students should be motivated and given enough opportunities to take action (Karunarathne et al., 2023). Using ChatGPT for feedback provision can significantly prompt learners to act on the feedback because students can seek clarification and further guidance on their performance at any time, which improves their motivation (Ebadi & Amini, 2022). Such claim is consistent with the study conducted by Wilson et al. (2024), which investigates how English learners in an elementary school interact with automated feedback provided by *MI write*, an AWE tool delivering automated feedback and scores to students through use of the Project Essay Grade (PEG) scoring engine (Wilson et al., 2021). Their finding reveals that students, regardless of the level of their language proficiency, generally viewed AWE positively, with proficient language learners showing marginally stronger positive reactions than other groups. Similarly, research has indicated that students who write with ChatGPT tend to undertake cyclical writing processes and to rewrite their material based on the comments they receive (Hyland & Hyland, 2006).

4.2.4. Comparison of ChatGPT as an AWCF Tool with Traditional WCF

Traditional WCF provided by teachers has been widely accepted, but there are various drawbacks such as inconsistency in quality due to factors such as fatigue and teacher's feedback. In addition, the nonhuman nature of ChatGPT, referring to its ability to provide accurate and neutral feedback at any time of the day and without being influenced by the previous papers reviewed, helps reduce the anxiety of learners (Zhang et al., 2023). This makes it possible for all the students to be given equal detailed and bias-free feedback which is important in fair and effective learning (Van Beuningen, 2010).

The conventional WCF approaches have drawbacks and are sometimes cumbersome to the instructors, causing delays in response time to the students. This delay can also be counterproductive since students are unlikely to remember the context of their mistakes by the time they get corrected. This problem is greatly solved by ChatGPT since it provides immediate feedback. A study by Jeon and Lee (2023) revealed that utilizing ChatGPT lessened the time spent by educators on developing teaching materials and assessing students' performance, thus freeing up their valuable time for delivering instruction and other educational endeavors.

ChatGPT is very proficient in offering prompt and comprehensive feedback on mechanical errors made in the writing (Zadorozhnyy & Lai, 2023). Moreover, the feedback offered by ChatGPT is typically more detailed and logical compared with human feedback (AlAfnan et al. 2023). Researchers point out that there are also several factors that can influence the quality of feedback generated by ChatGPT. To begin with, learners play a crucial role in affecting the output of the chatbot because the way they select keywords and offer background information in the prompts, coupled with whether they verify the feedback and ask follow-up questions can all have a bearing on feedback quality (Tam, 2024).

4.2.5. Learners' Perceptions towards the use of ChatGPT as an AWCF tool

Generally speaking, learners regard ChatGPT as a highly usable and lowly intrusive means of getting feedback on one's writing because the user interface of ChatGPT is straightforward, and it can generate much information within seconds, which is in stark contrast to the shortcomings associate with previous chatbots such as being unable to generate multiple sentences at the same time or provide irrelevant responses (Huang et al., 2022). The idea of receiving feedback immediately is one of the features students like because corrections and enhancements can be made on the spot. This eliminates the delay usually associated with the traditional paper-based feedback process where the recipient has to wait for their feedback.

Another advantage that learners also appreciate is the comprehensive and well-explained feedback that ChatGPT offers. The opportunity to identify individual mistakes, including spelling and grammatical ones and provide detailed feedback regarding them is another advantage mentioned quite often. The study by Zou and Huang (2023) revealed that students expressed their satisfaction with the specificity and clarity of the feedback given by ChatGPT explaining that they received the understanding of the mistakes made and how to avoid them in future.

The usefulness of ChatGPT as seen by learners further goes beyond the mere identification of errors. Students

also suggest that feedback from ChatGPT aids in enhancing their comprehension of language usage and conforming to writing rules. For instance, users can request the tone of the output to be academic or casual, which familiarizes themselves with the different linguistic features associated with various genres (Yan, 2023). This educational role of the process of feedback is essential for language learning and overall development of writing abilities.

In summary, while the literature has investigated the impact of using ChatGPT on students' writing performance and learners' perception of this type of feedback, there are some evident limitations in the current research. Firstly, the researchers in the extant studies only use fixed prompt to elicit feedback from ChatGPT. That is, they key in exactly the same prompt to elicit feedback from ChatGPT for every student's work. These prompts do not include learners' personal information, which leads to the chatbot being unable to produce personalized feedback on writing. Secondly, there is a lack of research examining whether the provision of such personalized feedback from ChatGPT can significantly affect learners' writing performance or how they perceive this type of automated feedback.

To conclude, this section specifically looks at the role of AWCF tools in L2 writing instruction. The section begins with an introduction of the advantages and drawbacks some popular automated feedback tools like *Grammarly* and *Criterion*. The highlight of this section is the introduction of the advent and application of ChatGPT in the field of L2 writing pedagogy. The benefit language instructors are likely to derive from implementing ChatGPT in L2 writing classes is the provision and immediate feedback. This is due to the fact that a typical teacher feedback is often provided after several hours and this disrupting the learning process since the students have moved to the next level in their work (Innaci & Jona, 2024). ChatGPT, in contrast, allows students to receive immediate feedback in order for them to edit their work and correct their mistakes as they write. This immediacy can increase the speed of the learning process and correct improper use of language as opposed to conventional teaching methods. Moreover, ChatGPT's feedback is effective in the promotion of learner autonomy because the learners are likely to assume more individual responsibility for learning. This means that while interacting with an AI, a student has a possibility to make several attempts at using certain linguistic options and receive feedback on it, without necessarily including the teacher (Zhang, 2024). It may also help the students to take more responsibilities in seeking assistance and dealing with their writing challenges. In this way, the development of students' self-directed learning skills is facilitated. Overall, the integration of technology, especially AI-based chatbots in teaching L2 writing has been a groundbreaking shift in education practice, with ChatGPT functioning as a powerful to provide automated written corrective feedback (Yan, 2023).

Yifeng Zhang is currently pursuing a master's degree in the field of applied linguistics at The University of Hong Kong. He holds a Bachelor of Arts in English Education from Shanghai Normal University. His research interests lie in language testing, second language acquisition, and AI-assisted language learning, reflecting his passion for advancing technology-enhanced language education. Yifeng has authored some educational materials, including the forthcoming Shanghai College Entrance Examination English Vocabulary Handbook, and led impactful research projects, such as exploring multilingual competence among students in Shanghai.
Email: zhangyifeng_1998@163.com

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Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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