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Exploring Learners' Perceptions of Automated Corrective Feedback in Enhancing Critical Thinking in Academic Writing:

The Case of Third-Year License EFL Students at Larbi Tebessi University

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Abstract

Technological tools such as Automated Corrective Feedback (ACF) systems have become vital resources in supporting academic writing development, especially in English as a Foreign Language (EFL) context. This study explores the perceptions of EFL students regarding the use of ACF and its role in fostering critical thinking in academic writing. The main objective of the study is to examine how students interact with ACF tools, assess their perceived effectiveness, and determine the extent to which these tools support the development of higher-order thinking skills in writing skills. The study employed a mixed-methods approach, combining surveys of 43 university students with interviews conducted with EFL teachers to gather both quantitative and qualitative data. The analysis revealed several key findings: a) ACF tools were widely appreciated for improving surface-level writing features such as grammar and punctuation; b) many students reported increased confidence and independence in their writing; and c) both students and teachers noted that while ACF is helpful, its impact on promoting critical thinking is limited when feedback is used passively. The study further found that students who actively engaged with ACF were more likely to perceive improvements in both writing quality and critical thinking. These results suggest that ACF can contribute meaningfully to writing development when used thoughtfully. The study concludes by recommending the integration of human guidance with automated feedback and highlights the importance of training both students and teachers in the effective use of ACF tools. These findings may serve as a foundation for future research on the role of ACF in enhancing higher-order thinking in EFL academic writing through expanding the sample and broaden the study scope, implementing longitudinal study designs, incorporating direct performance measures, and examining diverse ACF tools

Keywords: automated corrective feedback, critical thinking, academic writing, students' perception, language learning technology, reflection

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List of Abbreviations

- **ACF**: Automated Critical Feedback
- **EFL:** English as a Foreign Language
- **L2**: Second Language
- **SLA**: Second Language Acquisition
- **ZPD:** Zone of Proximal Development
- **SPSS:** Statistical Package for the Social Sciences
- **AI:** Artificial Intelligence
- **NLP:** Natural Language Processing
- **IELTS:** International English Language Testing System
- **LMD:** License-Master-Doctorate (Algerian Higher Education System)
- **CT:** Critical Thinking

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General Introduction

1. Background of the study

Over the past decade, critical thinking has emerged as a paramount objective in teaching academic writing, particularly in English as a Foreign Language (EFL) context. Writing has transcended its former role as a mechanical language-reproduction exercise to become a cognitive process requiring analysis, evaluation, and synthesis of ideas (Elder & Paul, 2012; Facione, 1990). Higher education institutions increasingly prioritize cultivating learners' critical and reflective capacities, driving researchers and educators to develop more effective methods for nurturing these skills, especially in writing instruction (Ennis, 2011).

Yet, in many EFL classrooms, including those in Algeria, students continue to lag in higher-order thinking competencies. While their writing may demonstrate grammatical accuracy, it often lacks robust argumentation, coherence, and depth of thought. This limitation stems from traditional pedagogical approaches and restricted access to materials that foster independent learning and critical engagement (Hyland, 2019; Elder & Paul, 2012).

Such an encouraging innovation in language instruction is the emergence of Automated Corrective Feedback (ACF) tools like Grammarly and QuillBot, which provide immediate, scalable, and consistent feedback on students' writing. These technologies have become popular among EFL students for their ability to detect surface errors and offer corrective suggestions. ACF can go beyond mere correction by enabling learners to develop self-revision skills, raise metalinguistic awareness, and reflect on their writing processes (Facione, 1990; Elder & Paul, 2012).

Despite this potential, the pedagogical role of ACF particularly in critical thinking development remains relatively underexplored in the Algerian university context. Moreover, students may use ACF passively, accepting its recommendations uncritically without deeper

examination, while teachers may not yet be prepared to effectively integrate these tools into their instruction (Hyland, 2019; Ennis, 2011).

Given these opportunities and challenges, it becomes necessary to examine both students' and teachers' attitudes toward ACF's application in academic writing, especially regarding how it might foster critical thinking. By investigating these perceptions and practices at Larbi Tébessi University Tébessa, this research aims to contribute deeper insights into how technology-mediated feedback can serve not just error correction purposes but also support the achievement of more meaningful learning outcomes among EFL students.

2. Statement of the Problem

Critical thinking stands as a cornerstone of academic writing. In the Algerian context, many students face challenges in demonstrating higher-order thinking through writing, hindered by limited language proficiency, traditional teaching methods, and insufficient explicit training in critical reasoning. These difficulties manifest clearly in university classrooms, where students frequently produce grammatically sound texts that nevertheless lack substantive argumentation, coherence, and analytical depth. While instructors encourage revision and reflection on written work, conventional feedback approaches typically delayed and predominantly focused on surface-level errors often fail to stimulate deeper intellectual engagement with content.

This reality has generated growing interest in technology-enhanced feedback systems like Automated Corrective Feedback (ACF), which can deliver immediate, consistent, and scalable writing support. As noted, ACF tools are gaining traction among EFL learners by providing not just error detection but also opportunities for developing self-editing skills and metalinguistic awareness. However, ACF's potential role in cultivating critical thinking remains under-researched particularly in Algerian universities, where few studies have

examined the pedagogical value of such technologies. While learners may appreciate ACF's immediacy and clarity, there exists a risk of passive usage without meaningful reflection on or integration of feedback into cognitive and writing processes. Similarly, educators may lack comprehensive understanding of how to deploy ACF strategically to foster students' critical engagement with writing tasks.

Consequently, this study investigates Automated Corrective Feedback's contribution to developing critical thinking in academic writing. Focusing on third-year EFL students and instructors at Larbi Tébessi University–Tébessa, the research employs a mixed-methods design incorporating student questionnaires and teacher interviews. By analyzing participant perceptions, experiences, and attitudes, the study aims to address a gap in existing scholarship while informing more effective implementation of ACF tools within Algeria's higher education writing instruction**.** "Accordingly, this study aims to investigate the following research questions:

a. **To what extent do third-year EFL learners at Larbi Tebessi University perceive (ACF) as enhancing their ability to self-revise, evaluate, and think critically about their academic writing?**
    1. To what extent does students' reflection on the use of ACF tools predict their perception of critical thinking development?
    2. To what extent does students' reflection on the use of ACF tools predict their perception of improvement in academic writing skills?
b. **How do EFL teachers at Larbi Tebessi University perceive the role of ACF in fostering students' critical thinking skills in academic writing?**

3 Aims of the Study

The overall objective of the current study is to explore the perceptions of third-year LMD students and teachers of English regarding the role of (ACF) in enhancing critical thinking during the writing process at Larbi Tébessi University – Tébessa. More specifically,

the study aims to investigate how learners engage with ACF tools while writing, and how these tools influence their ability to reflect, revise, and construct logical arguments. Additionally, the research seeks to gather students' and teachers' insights and suggestions on how ACF can be better integrated into academic writing instruction to foster deeper thinking and improve writing quality in the Algerian EFL context.

4.Significance of the study

This study holds significance for both pedagogical practices and academic research in the field of English as a foreign Language (EFL) writing instruction. In the Algerian university context; where traditional feedback approaches over-power, and critical thinking endures underdeveloped; this research addresses an important gap by examining the role of ACF in fostering students' higher-order thinking skills. By delving deeper into the attitudes of teachers and students, the research provides insights into how ACF tools are perceived, used, and potentially incorporated into writing instruction to support critical engagement, self-revision, and reflection.

Moreover, the results of this study may guide EFL instructors in developing and designing more efficient mechanisms of feedback that create balance between both technology and human input. It also contributes to the existing knowledge base on technology-supported language learning by providing context-specific evidence from the Algerian Higher Education, a relatively under-searched environment in this field. In doing so, the research not only informs local pedagogical practices but also stimulates wider conversations on the ethical and purposeful use of automated tools in developing critical thinking and academic writing proficiency among EFL learners.

5.Research Methodology

This dissertation adopts a mixed-methods approach to examine the role of Automated Corrective Feedback (ACF) in enhancing critical thinking in academic writing among third-year EFL students at Larbi Tébessi University – Tébessa. The study was conducted during the second semester of the academic year 2024/2025, specifically between March and April 2025. The target population included approximately 100 third-year English language students and six teaching staff members from the Department of Letters and English Language. A simple random sampling method was used to select 43 students from the population to participate in the study. The questionnaire, distributed via Google Forms, was the primary tool for collecting quantitative data. It consisted of closed-ended, multiple-choice, Likert-scale, and open-ended questions. A pilot test was carried out with a group of 10 students outside the study sample to ensure the instrument's reliability. The internal consistency of the questionnaire was verified using Cronbach's Alpha, which yielded a reliability coefficient of 0.87, indicating a high level of consistency. The qualitative part of the study involved semi-structured interviews conducted online with three English language instructors. These interviews focused on teachers' experiences with ACF tools, their observations of student engagement, and their perspectives on the impact of ACF on the development of critical thinking.

6.Definition of the key terms

To avoid misunderstanding, the terms used in the study need to be defined:

- **Automated Corrective Feedback:** a type of feedback provided by a system, often using artificial intelligence, to learners on their work or performance. It is commonly used in language learning to assist with writing skills and grammar. It is abbreviated to ACF, its tools for analyze text and identify errors, recommending corrections or explanations.
- **Critical thinking:** is the ability to question, analyze, interpret, evaluate and make a judgment about what you read, hear, say or write. Applying critical thinking does not mean being negative or focusing on faults. It means being able to clarify your thinking so that

you can break down a problem or a piece of information, interpret it and use that interpretation to arrive at an informed decision or judgment.

- **Academic writing:** a formal style of writing used in educational contexts. It requires clarity, referencing, structure, argumentation, and critical engagement with ideas.
- **EFL students (English as a Foreign Language students):** learners whose first language is not English, and who tend to learn English in a non-English-speaking country.
- **Perception:** it is the way an individual interprets and understand a specific experience or tool. This action includes beliefs, feelings and attitudes towards a certain setting.

7.Structure of the Dissertation

This dissertation is divided into two main chapters, preceded by a "General Introduction". The first chapter represents the theoretical part of the study and consists of two sections. Section One explores Automated Corrective Feedback (ACF) in the EFL context, including its definitions, theoretical foundations, evolution, tools, and limitations. Section Two focuses on Critical Thinking (CT) in academic writing, covering its conceptual framework, role, cognitive processes, and challenges in EFL contexts. The second chapter is the practical part of the study. It is composed of three sections. The first section presents the research methodology, including research design, population and sampling, instruments, data collection procedures, and reliability measures. The second section provides a detailed analysis and interpretation of both the quantitative and qualitative data. The third section discusses the findings, highlights the study's limitations, and outlines implications and recommendations for further research and pedagogical practice. The dissertation concludes with a "General Conclusion" that offers a summary of the main findings and reflects on the overall contribution of the study.

Chapter One: Literature Review

Introduction

The first section explores (ACF) in second language writing. It covers the definition and theoretical foundations of ACF, its historical evolution, major digital tools, types and modalities, key models and classifications, its implementation in language learning and writing proficiency, and major issues and limitations associated with its use particularly in EFL contexts. The second section addresses Critical Thinking (CT) in Writing. It includes the definition of critical thinking, its role in academic writing, and the theoretical foundations that underpin it such as Bloom's Taxonomy and Facione's framework. The section also discusses the conceptual framework of CT in writing, its rhetorical and cultural dimensions, the manifestation of critical thinking in academic texts, the cognitive processes involved, strategies for enhancing CT in writing, and approaches to assessing CT in EFL academic contexts.

1.1. Section One: ACF in EFL Classroom

1.1.1. Definition of Automated Corrective Feedback

(ACF) refers to responses generated by computers that are provided to language learners when they make errors or inaccuracies in their spoken or written performances. According to Warschauer and Ware (2006), ACF is defined as "any feedback provided by a computer program on learners' language production without direct teacher intervention" (p. 157). Implementing advancements in artificial intelligence, natural language processing, and machine learning technologies, ACF systems identify mistakes, propose corrections, and give

explanations aimed at improving language acquisition (Choi, 2016). This definition highlights ACF's pedagogical potential, yet scholars differ on how effectively these tools support deeper cognitive engagement.

In contrast to traditional feedback given by teachers, which might be delayed or influenced by personal judgment variability, ACF delivers immediate and consistent feedback, allowing scalability for a large number of learners (Li & Hegelheimer, 2013). This promptness in automated responses allows learners to quickly recognize and rectify their language errors, potentially leading to increased engagement with language structures. The sophistication of ACF systems has progressed over time. Dikli and Bleyle (2014) note that initial systems primarily concentrated on identifying surface-level grammatical mistakes, while more advanced platforms now provide in-depth linguistic and rhetorical analysis. Moreover, as stated by Chen and Cheng (2008), contemporary ACF tools go beyond basic grammar checking to encompass aspects such as lexical selection, syntactic complexity, discourse coherence, and stylistic appropriateness. Compared to earlier surface-level tools, Chen and Cheng's perspective emphasizes the evolution of ACF into a more holistic language learning aid.

Additionally, Grimes and Warschauer (2010) emphasize that ACF serves not just as a tool for correcting errors but also as an educational resource that encourages learner independence, metalinguistic awareness, and reflective engagement with language. These broader educational advantages indicate that ACF plays a dual role: correcting language forms and fostering higher-order thinking skills associated with language use. Their view introduces the idea that ACF contributes to metacognitive awareness, which links directly to the development of critical thinking.

To summarize, the definition of ACF has significantly broadened, transitioning from simple grammar-checking tools to all-encompassing feedback systems that actively support the development of second language skills. This evolution highlights the pedagogical importance of ACF as a dynamic and essential element of digital language learning contexts.

1.1.2. Theoretical Foundations of Automated Corrective Feedback

The conceptual basis for (ACF) is rooted in various theoretical frameworks from second language acquisition (SLA), cognitive psychology, educational technology, and instructional design (Ellis, 2009; Shute, 2008; Vygotsky, 1978).

A primary theoretical foundation is Schmidt's (1990) Noticing Hypothesis, which suggests that learners must consciously become aware of linguistic features in the input in order to internalize them. ACF facilitates this process by promptly highlighting learners' mistakes, thus drawing attention to the difference between the learner's output and the target norms. For instance, if a student writes "The student writes a clear thesis statement every day," an ACF system would quickly indicate the incorrect verb form, encouraging the learner to recognize and amend the error, promoting learning.

Swain's (2005) Output Hypothesis further supports the significance of ACF. He contends that the act of producing language encourages learners to engage with the language more thoroughly than by input alone. Through revision cycles initiated by automated feedback, learners partake in "pushed output," where they must contemplate their mistakes and reformulate their language usage. For example, a student who receives automated prompts to adjust passive structures in an essay engages in deeper syntactic processing, thereby enhancing language acquisition.

From a sociocultural standpoint, Vygotsky's (1978) concept of the Zone of Proximal Development (ZPD) guides the development of scaffolded ACF interventions. Effective

automated feedback can mimic teacher scaffolding by supplying customized support that aligns with the learner's developmental level (Aljaafreh & Lantolf, 1994). For example, novice learners might receive explicit corrections; while more advanced learners could be given indirect prompts, promoting self-correction and independence.

Cognitive Load Theory (Sweller, 1988) also significantly influences ACF design. He highlights that the cognitive resources of learners should be allocated to essential tasks rather than squandered on unnecessary activities. In this light, ACF minimizes extraneous cognitive load by providing clear, immediate feedback, allowing learners to concentrate their working memory on processing the correct forms (Shute, 2008). For example, instead of laboriously searching for tense errors across an entire essay, learners receive immediate highlights and suggestions, thereby reducing cognitive load.

Altogether, these theoretical frameworks indicate that well-constructed ACF fosters language development by encouraging learner attention to form, promoting meaningful output, offering adaptive support, and optimizing cognitive resources. Hence, when implemented effectively, ACF can establish an environment that is conducive to ongoing second language acquisition.

1.1.3. Evolution of ACF

The evolution of (ACF) closely aligns with the advancements in educational technology, natural language processing, and artificial intelligence. Over the years, ACF has transformed from basic error detection tools to intricate systems that can provide nuanced, Advanced ACF tools offer personalized feedback by adapting to the learner's specific context, such as their current writing performance and learning environment, thereby providing more targeted and effective support.

In the initial phase during the 1980s, ACF systems mainly comprised fundamental grammar and spell checkers, which depended on rule-based algorithms to identify superficial errors (Warschauer, 1996). These early tools had a limited scope, often concentrating solely on mechanical corrections without addressing deeper linguistic or rhetorical concerns. For instance, early word processors could flag misspelled words but were unable to identify mistakes in syntax or cohesion.

The 1990s saw substantial enhancements with the advent of natural language processing (NLP) methods. More advanced programs, such as **Sy**stran (1992) and Grammatik (1991)**,** appeared during 1990s, providing wider error detection beyond isolated grammar issues (Heift & Schulze, 2007). Although still flawed, these tools represented a significant shift by striving to analyze language within specific contexts rather than merely enforcing static rules.

A crucial turning point occurred in the early 2000s with the arrival of web-based ACF platforms like *Criterion and MY Access*. These systems integrated automated essay scoring and offered multi-dimensional feedback on elements such as coherence, organization, and mechanics (Burstein, Chodorow, & Leacock, 2004). A prime example is Criterion's capability to assign holistic scores to writing tasks while concurrently supplying specific feedback on grammatical and stylistic features, thereby encouraging revision behaviors among students.

The 2010s brought about another transformation with the utilization of machine learning and adaptive algorithms. Platforms such as Grammarly and Write & Improve employed extensive language corpora and advanced models to deliver real-time, context-sensitive corrections. These tools expanded feedback to encompass not only grammar but also aspects such as clarity, conciseness, tone, and even appropriateness for the intended audience. For example, Grammarly summarizes beyond correcting "The student write a clear thesis

statement" to "The student writes a clear thesis statement" by also proposing enhancements for formal tone and logical coherence throughout the paragraph.

Most recently, the incorporation of deep learning techniques has allowed ACF systems to identify subtle patterns in language usage, closely mimicking human evaluators' judgments (Allen, Jacovina, & McNamara, 2016). This change enables systems to provide formative feedback that fosters not only linguistic precision but also higher-order writing skills, including argument development and rhetorical effectiveness. The development of ACF illustrates a pathway from basic, superficial correction tools to advanced, adaptive systems capable of facilitating comprehensive language development. This historical evolution underscores ACF's growing importance as a vital element in contemporary language learning environments.

1.1.4. Major ACF Tools in Language Learning and Academic Writing

The growth of ACF has been paired with the creation of various digital resources aimed at helping language learners and writers. Notable examples include Grammarly, QuillBot, and Write & Improve, each providing distinct features and educational implications.

Grammarly: All-Inclusive Language Correction and Style Improvement

Grammarly is widely acknowledged for offering immediate, comprehensive feedback on grammar, punctuation, style, clarity, and even tone (O'Neill & Russell, 2019). Its instant error detection helps learners swiftly rectify mechanical mistakes, such as pointing out the subject-verb disagreement in the phrase "The student write a clear thesis statement" and suggesting the correction "The student writes a clear thesis statement."

In addition to grammar, Grammarly aids users in perfecting stylistic decisions by highlighting concerns related to wordiness, cohesion, and appropriateness for the audience.

However, critics argue that Grammarly's feedback may occasionally emphasize superficial enhancements over more profound cognitive involvement (Ranalli, 2018). In academic settings, particularly in English for Academic Purposes (EAP), Grammarly's recommendations can sometimes oversimplify intricate disciplinary conventions, resulting in trivial revisions.

For instance, a student drafting a scientific report might be advised by Grammarly to eliminate passive voice ("The experiment was conducted"), even though passive constructions are frequently preferred in scientific writing. This illustrates the system's occasional misalignment with specialized academic conventions.

QuillBot: Paraphrasing, Summarization, and Rewriting Assistance

QuillBot, initially developed as a paraphrasing tool, has evolved into a multifunctional platform that now supports grammar checking, summarization, and collaborative writing. By offering various rephrasing modes—such as fluency, formal, and creative styles—it encourages lexical diversity and supports efforts to avoid plagiarism (Woodworth & Barkaoui, 2020). In academic writing contexts, QuillBot can assist students who struggle with integrating sources by suggesting alternative phrasings that maintain coherence. This can be particularly beneficial for EFL learners navigating complex textual conventions (Ranalli, 2018).

However, the use of QuillBot also presents challenges. Paraphrasing suggestions may inadvertently shift the intended meaning of source material. For example, rephrasing "The study revealed a significant correlation" as "The research displayed a notable link" can slightly distort the original nuance. Such subtle changes may compromise academic precision (O'Neill & Russell, 2019). Furthermore, when learners rely on QuillBot without critical engagement, they risk engaging in mechanical rewriting rather than developing an authentic academic voice. As noted by Grimes and Warschauer (2010), such passive engagement with feedback

tools may hinder the development of metacognitive and argumentation skills necessary for advanced academic writing.

Write & Improve: Formative Feedback from a Cambridge Perspective

Write & improve, created in partnership with Cambridge English, focuses on formative assessment and the gradual development of writing. The platform permits learners to submit drafts multiple times, receiving instant feedback on areas such as grammar, coherence, and vocabulary use (Cotos, 2014).

A key advantage of *Write & Improve* is its ability to encourage learner autonomy through cycles of self-correction. For instance, a student preparing for an IELTS writing task can utilize the platform to revise various drafts based on specific feedback, enhancing both linguistic accuracy and critical revision strategies (Cotos, 2014). Nonetheless, certain limitations exist. The categories for feedback, while beneficial, can sometimes lack depth and personalization, offering broad suggestions like “improve coherence” without practical advice tailored to the individual needs of learners. This may lead to a superficial grasp of writing deficiencies, especially for advanced academic assignments (Woodworth & Barkaoui, 2020).

Other Emerging Tools: Broadening the ACF Landscape

Additional ACF platforms such as Pro Writing Aid , Language Tool, and Turnitin’s Revision Assistant have expanded the landscape by presenting extra features including style analysis, multilingual correction, and ongoing support during the writing process.For instance, Pro Writing Aid merges grammar checks with evaluations of writing style and readability, assisting learners in identifying issues such as repetitiveness or excessive use of passive voice. At the same time, Language Tool offers support for non-English language learners by providing feedback in multiple languages, a crucial feature for multilingual learning environments.

Despite these advancements, a common limitation among most ACF tools is their focus on surface-level corrections rather than more profound rhetorical, argumentative, or discipline-specific writing skills. Additionally, ethical issues surrounding data privacy and algorithmic bias continue to raise concerns regarding the employment of ACF in educational settings (Woodworth & Barkaoui, 2020).Although these tools offer useful assistance for maintaining linguistic precision and improving revision practices, they are unable to completely replace feedback from teachers, especially when it comes to intricate elements of academic writing like critical thinking, adherence to genre standards, and understanding the audience.

1.1.5. Types and Modalities of Automated Corrective Feedback

Automated Corrective Feedback (ACF) is a flexible resource that can manifest in various formats based on the feedback given and the ways learners engage with it. The different types and methods of feedback are vital in influencing learners' language acquisition and assessing the success of ACF systems. The primary categories and methods of ACF encompass direct versus indirect feedback, implicit versus explicit feedback, and automated versus teacher-led feedback, among others.

Direct feedback provides learners with clear corrections, where the system promptly displays the correct language structure. For example, if a student writes "He don't know," the system would present the corrected phrase: "He doesn't know." This form of feedback is typically more immediate and simpler for learners to comprehend, making it especially advantageous for those at lower proficiency levels who require straightforward corrections (Chandler, 2003).

Conversely, indirect feedback does not furnish the correct form immediately but hints at the error, encouraging the learner to self-correct. For instance, an ACF tool might highlight

the incorrect verb form without delivering the correction itself, instead showing a code or marking the mistake. This method promotes deeper cognitive engagement and fosters self-regulation, potentially leading to better retention of language principles (Bitchener & Knoch, 2010). For example, if a student writes “The article summarizes the findings,” an indirect ACF system might underscore the verb “going,” prompting the learner to think over the error and identify the correct form (“summarizes” or “summarizes”). While studies indicate that indirect feedback can encourage more profound learning, it may be less effective for novices who find self-correction challenging (Ferris, 2006).

The contrast between implicit and explicit feedback relates to the level of learner awareness involved. Implicit feedback discreetly indicates mistakes without overt corrections. For example, an ACF system might highlight the phrase “They has conducted the experiment” in red, allowing the learner to notice and address the issue independently. This strategy depends on the learner’s capacity to discern the correct form, enhancing metacognitive awareness (Polio, 2012). The explicit feedback clearly identifies the error and often provides a correction or explanation. For instance, an explicit feedback system might correct “They has conducted the experiment” to “They has conducted the experimenting,” and include a note such as “Use the present continuous form here.”Explicit feedback is generally more successful for learners with lower proficiency levels, as it delivers immediate clarification and reduces confusion (Ellis et al., 2006).

The differentiation between automated feedback and teacher-led feedback is significant in comprehending how ACF fits into educational environments. Automated feedback is entirely machine-generated, offering advantages like speed, scalability, and uniformity. For example, an ACF system can instantly identify and amend grammatical mistakes in a student’s essay, delivering consistent feedback regardless of the learner count. However, teacher-led feedback provides personalized insights that consider the learner’s unique context, delivering

more customized and often more refined advice. For example, a teacher might not only address grammatical correctness in a student's writing but also offer feedback on argumentative coherence, tone, and overall clarity, taking into account the learner's educational objectives and the context of the writing assignment (Stevenson & Phakiti, 2014).

War Schauer and Ware (2006) indicates that while automated feedback can enhance linguistic precision, teacher feedback remains crucial for developing higher-order skills, such as critical thinking and argumentation. Thus, a combined approach that merges the efficiency of automated tools with the depth of teacher feedback is often the most effective. Metalinguistic guidance provides concise explanations of linguistic rules, such as "Use 'an' in front of words that begin with a vowel sound." On the other hand, reformulation offers a corrected version of the learner's sentence without providing any explanation. Both forms of feedback are valuable in language learning, yet metalinguistic feedback is generally associated with a more profound understanding and better long-term retention, especially for advanced learners (Van Beuningen, 2010).

Additionally, feedback can be categorized as fixed (given according to predetermined guidelines) or adaptive, which modifies based on the learner's progress or past mistakes. For instance, adaptive systems might enhance the frequency or complexity of feedback if a learner regularly struggles with a specific area, like subject-verb agreement. This method is more tailored and aligns more effectively with the learner's current developmental stage (Shute, 2008).

In addition to these main classifications, ACF can be further categorized based on other modalities, such as targeted versus comprehensive feedback and metalinguistic guidance compared to reformulation. Targeted feedback emphasizes particular language features or mistakes, like verb tense or article usage, whereas comprehensive feedback attends to all errors

present in a learner's work, providing a full correction. While this comprehensive method may overwhelm beginners, it proves beneficial for advanced learners needing to enhance several facets of their writing (Bitchener & Knoch, 2010; Van Beuningen, 2010).

Metalinguistic guidance gives brief clarifications of language rules, such as "Use 'an' before words that begin with a vowel sound." In contrast, reformulation supplies a corrected version of the learner's sentence without providing any explanations. Both feedback styles are valuable in language acquisition, but metalinguistic feedback typically promotes a deeper comprehension and lasting retention, especially for higher-level learners (Van Beuningen, 2010). In summary, the diversity of ACF types and modalities enables a more personalized feedback experience. Understanding these variations is crucial for integrating ACF effectively into writing pedagogy, especially when aiming to cultivate learner autonomy and critical engagement.

Additionally, feedback can be either fixed (provided according to established rules) or adaptive, which modifies based on the learner's progression or specific mistakes. For instance, adaptive systems might intensify the frequency or difficulty of feedback if a learner persistently struggles in a certain area, like subject-verb agreement. This method is more individualized and aligns more effectively with the learner's current developmental stage (Shute, 2008).

1.1.6. Models and (ACF)

To gain a clearer insight into the functioning of (ACF) within language learning environments, several models and classifications have been introduced to categorize and systematize the types of feedback that are available. These models shed light on the pedagogical principles underpinning ACF systems and guide their effective implementation in various educational contexts. Noteworthy classifications include Lyster and Ranta's (1997)

categorization of oral corrective feedback, Shute's (2008) framework for formative feedback, and Heift and Hegelheimer's (2017) expanded ACF taxonomy.

1.1.6.1. Lyster and Ranta's Classification (1997)

Initially developed for oral corrective feedback, Lyster and Ranta's (1997) classification has played a significant role in delineating how educators respond to students' mistakes. The six categories they proposed explicit correction, recasts, clarification requests, metalinguistic feedback, elicitation, and repetition have subsequently been adapted for use in automated feedback systems (Ellis, 2009). For instance:

- Explicit correction delivers the accurate form directly, as in changing "He go to the park" to "He summarizes to the park."
- Recasts involve reformulating the learner's mistake without directly indicating it, e.g., "He summarizes to the park, right?"
- Metalinguistic feedback provides brief explanations about the grammatical rules, such as "Use 'summarizes' with he/she/it in the present tense."

ACF systems like Grammarly often employ explicit correction and metalinguistic feedback, supplying direct modifications along with concise explanations of language rules. This combination effectively assists learners in rectifying surface-level errors, although it might not always tackle deeper, conceptual facets of language learning.

1.1.6.2 Shute's Formative Feedback Framework (2008)

Shute's (2008) framework highlights the significance of formative feedback, which is designed to facilitate learning by guiding students through the process of error correction and enhancement. Unlike summative feedback, which provides a conclusive assessment of learners' performance, formative feedback emphasizes the learning journey itself, promoting

ongoing reflection and self-regulation. Shute (2008) identifies several essential elements of formative feedback:

- Verification gives learners a straightforward yes/no indication of whether their response is correct.
- Elaboration extends this by offering further explanations, such as clarifying the cause of an error or recommending strategies for correction.

In ACF, systems like Write & Improve utilize this framework by providing multiple feedback rounds. For example, learners can repeatedly submit drafts and receive continual suggestions regarding aspects such as coherence, grammar, and vocabulary usage, encouraging sustained improvement rather than merely evaluating a final draft.

1.1.6.3 Heift and Hegelheimer's ACF Classification (2017)

Heift and Hegelheimer (2017) introduce a comprehensive classification that connects ACF with broader educational theories. Their model categorizes feedback based on four primary theoretical frameworks: behaviorist, cognitive-constructivist, sociocultural, and ecological perspectives.

- Behaviorist ACF emphasizes correction through repetition and reinforcement of accurate forms, a common strategy in language learning applications where learners receive immediate feedback upon making a mistake.
- Cognitive-constructivist ACF fosters problem-solving and self-discovery. For instance, ACF systems may highlight errors and prompt learners to reformulate their sentences using hints or cues.
- Sociocultural ACF focuses on collaborative learning, where learners engage with peers or instructors while receiving feedback. Systems that incorporate peer reviews or allow for real-time interaction with educators align with this model.

- Ecological ACF examines how the learning environment impacts feedback, taking into account aspects such as the integration of ACF systems within broader educational frameworks and the technological contexts of learners.

This multifaceted perspective offers a more comprehensive understanding of how ACF systems can be structured to support various learning theories and meet learner needs.

1.1.6.4 Alternative Models and Frameworks

Alongside these well-known taxonomies, various other frameworks have been created to classify ACF. Shute (2008), for example, examines the timing of feedback whether it is immediate, delayed, or provided upon request. Immediate feedback tends to be most advantageous for novice learners, as it reinforces correct forms throughout the task, while delayed feedback might be more beneficial for advanced learners who can engage in self-reflection and correct their errors.

Moreover, the way feedback is presented can differ, with ACF systems delivering feedback via written text, audio, or visual cues. Tools like LanguageTool or ProWritingAid utilize written explanations or suggestions, whereas newer platforms are beginning to integrate multimedia feedback to boost engagement and understanding.

1.1.6.5 Consequences for ACF Design and Use

These models and classifications underscore the wide array of ACF strategies available and provide valuable insights into how ACF systems can be crafted to aid various aspects of language acquisition (Shute, 2008; Ellis, 2009). The selection of a feedback model ought to align with the learners' proficiency levels, cognitive abilities, and learning situations. For instance, novice learners might derive greater benefits from direct correction and immediate

feedback, while advanced learners could obtain more from metalinguistic explanations and opportunities for self-reflection (Van Beuningen, 2010).

In practice, the most impactful ACF systems may incorporate multiple strategies, tailoring feedback to the learner's specific requirements, tasks, and progression. For example, *Write & Improve* combines formative feedback with explicit correction and metalinguistic support, enabling learners to refine their skills over time while also receiving comprehensive language explanations (Cotos, 2014).

1.1.7 ACF in Language Learning

(ACF) has been utilized in various language-learning environments particularly in writing, reading, and speaking and generally produces positive but moderate effects on learner performance. Below, we present key findings, illustrative scenarios, and ongoing challenges in employing ACF for language acquisition.

- *Writing Accuracy and Revision*

In writing education, ACF tools are most adept at addressing rule-based mistakes like verb tense and article usage. For example, Li and Hegelheimer (2013) explored a mobile-assisted grammar application in English as a Foreign Language (EFL) classroom, where students received immediate corrections for errors in conditional sentences. Over a four-week period, learners using the application made 30% fewer conditional errors compared to a control group, highlighting the effectiveness of real-time feedback for specific grammatical structures (Li & Hegelheimer, 2013).

- *Timing and Proficiency*

The ideal timing for ACF seems to vary based on the proficiency levels of learners. Nakata (2015) contrasted immediate and delayed feedback on past-tense mistakes in writing tasks and

discovered that beginners gained the most from instant corrections, whereas advanced learners retained information better when feedback was given after a 24-hour interval. This indicates the potential for tailored ACF delivery: novices can receive corrections during their writing, while more experienced writers might benefit from reviewing feedback in later drafts (Nakata, 2015).

- *Reading and Vocabulary Support*

When ACF is integrated into digital reading environments, it can enhance comprehension and incidental vocabulary acquisition. Chun (2016) demonstrated a system that automatically provided definitions for unfamiliar words in graded texts along with usage examples; learners who engaged with this glossary-style ACF learned an average of 15 new words per session, in contrast to 8 in a control group without feedback (Chun, 2016).

- *Pronunciation and Speaking Skills*

Recent developments in speech recognition technology have enabled ACF for oral practice. McCrocklin (2016) assessed a pronunciation-feedback tool that indicated inaccurately articulated phonemes in real-time. In simulated conversation exercises, English learners who utilized this system increased their segmental accuracy by 20% over six sessions, demonstrating that immediate auditory feedback can effectively address pronunciation challenges (McCrocklin, 2016).

- *Individual Differences and Learner Engagement*

Characteristics of learners—such as field dependence and attitudes towards feedback—affect the impact of ACF. Heift and Rimrott (2008) noted that field-dependent learners (who prefer structured support) experienced greater improvements from explicit, comprehensive ACF, while field-independent learners performed better when provided with indirect prompts that

fostered autonomous problem-solving. Consequently, adaptive ACF systems that modify feedback types and intensity based on individual learner profiles may provide the most significant advantages.

- *Limitations and Contextual Gaps*

Despite these positive outcomes, ACF is less effective for higher-order skills such as discourse organization, rhetorical coherence, and critical thinking (Ferris, 2010). Furthermore, much of the research has been conducted within North American or European contexts; there is limited evidence regarding how ACF operates in Algerian EFL settings, where elements such as learners' L1 backgrounds and educational cultures could influence its effectiveness.

Overall, ACF clearly offers benefits for discrete language features and provides flexible, scalable assistance to learners. However, to fully realize its potential particularly in under-researched contexts like Algeria it should be combined with pedagogical frameworks that address advanced writing skills and consider learner variability.

1.1.8 ACF and Its impact on Writing Proficiency

ACF) has become an essential instrument in enhancing writing abilities, especially within second language (L2) learning environments. By offering immediate correction and linguistic assistance, ACF seeks to improve learners' writing precision, fluency, and analytical thinking. This section explores how ACF affects the writing process, concentrating on vital aspects of writing development it influences: linguistic accuracy, revision techniques, metalinguistic awareness, and overall writing advancement.

1.1.8.1. The Role of ACF in Improving Language Accuracy

A significant impact of ACF is its capacity to enhance linguistic correctness by giving learners prompt feedback regarding errors related to grammar, vocabulary, and syntax.

Research has consistently indicated that students who receive ACF on their written assignments make fewer grammatical mistakes as time progresses. For example, Bitchener and Knoch (2010) discovered that learners using an automated grammar checker achieved noteworthy gains in grammatical accuracy compared to those who received solely teacher feedback.

ACF systems can rectify frequent mistakes like subject-verb agreement, tense errors, and article misuse areas that frequently challenge L2 learners (Warschauer & Grimes, 2008). The immediate feedback mechanism not only rectifies these mistakes but also reinforces correct language patterns, aiding learners in internalizing language rules. Furthermore, since ACF provides on-the-spot corrections, learners can identify errors and correct them right away, which is crucial for reinforcing the material learned and minimizing the chances of making similar mistakes in future writing assignments.

1.1.8.2 Fostering Revision Practices

ACF is essential in promoting revision practices among language learners, an important component of the writing process. Ferris (2010) states that revision allows students to engage thoroughly with their mistakes, deepening their comprehension of language structures and enhancing overall writing quality. ACF facilitates this procedure by delivering feedback that encourages learners to revisit their work and contemplate the errors they have made.

For instance, Grimes and Warschauer (2010) found that learners utilizing ACF systems were more inclined to engage in self-revision during the writing process. The system would highlight mistakes in a draft and, at times, offer suggestions for improvement. Consequently, learners revised their drafts more effectively and recognized patterns in their recurring errors. This iterative process, stimulated by ACF, not only boosts language accuracy but also fosters

critical thinking and independence in writing. Their view introduces the idea that ACF contributes to metacognitive awareness, which links directly to the development of critical thinking.

Nonetheless, there are challenges in this domain. While ACF promotes revising surface errors, it does not consistently address higher-order concerns, such as argumentation, coherence, or rhetorical strategies. Students may revise grammatical errors but neglect to reorganize or refine their ideas. This limitation highlights the necessity of combining ACF with more advanced feedback from teachers or peers that focuses on content-level and organizational aspects of writing.

1.1.8.3 Enhancing Metalinguistic Awareness

ACF further aids in developing metalinguistic awareness, which refers to learners' capacity to reflect on and comprehend the rules and structures of the language being learned. By offering immediate feedback and clarifications regarding the rationale behind certain corrections, ACF can help learners become more aware of language rules and structures, thereby improving their ability to apply these rules in subsequent writing tasks.

For example, several ACF tools like Grammarly provide explanations alongside corrections, such as "Use the third-person singular form of verbs when the subject is he/she/it." This kind of metalinguistic feedback encourages learners to not only rectify their mistakes but also understand the necessity for the correction (Swain, 2005). By promoting this type of awareness, ACF can enhance learners' long-term language development and writing proficiency. This understanding is especially crucial for advanced learners, as it allows them to internalize linguistic rules more efficiently and use them in complex writing situations. Ferris (2010) indicates that such awareness may eventually enhance writing fluency, enabling

learners to generate more precise and sophisticated written work without depending heavily on external feedback.

1.1.8.4 Long-Term Influence on Writing Improvement

ACF systems do not only provide short-term corrections but can also have long-term effects on learners' writing development. Over time, learners who consistently engage with ACF tools develop a deeper understanding of language structures and become more adept at self-correcting their mistakes. According to Bitchener and Knoch (2010), repeated exposure to ACF leads to better error recognition and a reduction in error recurrence in subsequent writing tasks.

In addition, ACF's contribution to writing enhancement summarizes beyond merely correcting grammar; it also involves improving style and content revisions. For instance, tools such as QuillBot, which offer paraphrasing assistance, motivate learners to reword sentences for enhanced clarity and fluency, promoting the evolution of an academic writing style. This can aid students in progressing from basic grammar to producing writing that conforms to academic standards, particularly when combined with feedback that focuses on content, structure, and argumentation.

However, despite its advantages, ACF has constraints in terms of understanding context. These tools often cannot fully comprehend the purpose behind a learner's writing, leading to corrections that may be unrelated to the writing context. Consequently, ACF systems may provide general corrections without considering the larger rhetorical objectives or disciplinary norms in academic writing (Shute, 2008). To overcome this, ACF should be incorporated into a blended learning approach, wherein instructors offer more contextualized and individualized feedback.

1.1.9 Issues and Limitations of ACF

While (ACF) has revolutionized language learning, its application is not without challenges and limitations. These concerns primarily involve over-reliance on feedback, the system's ability to detect and correct errors accurately, and ethical considerations related to data privacy and algorithmic biases.

1.1.9.1. Over-Reliance on Feedback

One of the major concerns regarding the use of Automated Corrective Feedback (ACF) is learners' potential over-reliance on it, which may lead to passive learning habits. When students depend heavily on automated tools to identify and correct errors, they risk bypassing critical reflection on their own language use. This dependence can undermine the development of essential self-editing and metalinguistic skills necessary for autonomous writing improvement (Ranalli, 2021). For example, learners might accept every correction suggested by an ACF system without questioning the appropriateness of changes or understanding the underlying grammatical rules. Such superficial engagement with feedback limits deeper language acquisition and may result in persistent errors that are not truly internalized.

Moreover, over-reliance on ACF tools can reduce learners' motivation to develop independent problem-solving strategies in writing. Instead of analyzing and correcting their own mistakes, learners may default to trusting technology as an infallible authority. This mindset can inhibit critical thinking and diminish learners' confidence in their language abilities (Ranalli, 2021; Warschauer & Grimes, 2008). To mitigate these effects, it is crucial for instructors to balance automated feedback with pedagogical strategies that encourage active learner involvement. For instance, combining ACF with reflective activities where students explain corrections or justify their revisions can foster metacognitive awareness and promote more meaningful learning outcomes (Swain, 2005; Grimes & Warschauer, 2010).

While ACF offers valuable immediate support for language accuracy, excessive dependence on it without guided reflection may hinder long-term writing development. Educators should aim to use ACF as a complement rather than a substitute for teacher feedback and learner engagement, thereby cultivating learners' autonomy and critical thinking skills in writing (Ferris, 2010; Stevenson & Phakiti, 2014).

1.1.9.2 Accuracy and Scope of Error Detection

ACF systems excel at identifying surface-level errors such as spelling, punctuation, and subject-verb agreement. However, they often struggle with more complex errors related to discourse organization, rhetorical structure, and semantic nuances (Bitchener & Basturkmen, 2006). For example, ACF tools typically focus on grammar and syntax but may miss issues related to argument structure or clarity of ideas. While tools like Grammarly can highlight passive constructions or suggest synonyms, they may fail to offer more context-sensitive corrections that reflect academic or disciplinary-specific writing conventions. This limitation makes ACF systems less useful for advanced learners who need feedback on higher-order writing skills such as critical argumentation or coherence (Ferris, 2010).

Moreover, ACF systems are generally rule-based or rely on machine learning algorithms that are not always accurate in detecting subtle errors. For instance, an ACF tool might incorrectly flag a sentence like "He is interested in learning Spanish" as an error, mistakenly identifying "is" as a misused auxiliary verb. The algorithmic limitations of ACF systems mean that learners may be misled, either by unnecessary corrections or by failing to address more significant issues.

1.1.9.3 Ethical Concerns: Data Privacy and Algorithmic Bias

Beyond technical limitations, ACF also raises important ethical concerns, particularly in relation to data privacy and algorithmic bias. Many ACF tools, such as Grammarly, collect and analyze user data to improve their algorithms and personalize feedback. However, this data collection often occurs without full transparency, raising questions about user consent and data security. As ACF tools increasingly track learners' writing patterns, the potential for misuse of sensitive data—such as personal information or academic performance—becomes a pressing issue (Woodworth & Barkaoui, 2020).

Furthermore, ACF systems may reinforce existing biases inherent in their algorithms. Since these systems are trained on large datasets, they can perpetuate linguistic biases that reflect dominant cultural norms. For instance, an ACF system might penalize non-native seakers for using non-standard English varieties or certain sentence structures that are deemed "incorrect" by mainstream language models. This could disproportionately affect learners from diverse linguistic or cultural backgrounds, leading to unequal educational outcomes. To address these ethical concerns, developers of ACF tools must prioritize data transparency, user consent, and fairness in their algorithms. Additionally, ACF tools should be continuously refined to ensure that they do not perpetuate biases that marginalize non-native speakers or learners from diverse cultural backgrounds.

1.1.9.4 Lack of Human Context and Nuance

Another limitation of ACF is its inability to account for contextual factors that are crucial in language use. ACF tools can correct errors in grammar and syntax, but they often lack the ability to understand the broader context of the learner's writing. For example, an ACF system might suggest a more formal tone for a piece of academic writing without considering whether the writer's intended audience would prefer a conversational or informal

approach. Similarly, while ACF tools can spot verb-tense mistakes, they cannot assess whether the writer has successfully argued a point or met the expectations of the task (Stevenson & Phakiti, 2014).

This lack of human context is particularly significant in academic writing, where the appropriate tone, style, and structure vary by discipline and audience. While ACF systems excel at mechanical corrections, they fall short when it comes to providing feedback on the rhetorical effectiveness of writing. Therefore, while ACF should complement teacher feedback, it cannot fully replace the nuanced understanding that human educators bring to the feedback process.

1.1.9.5 Potential for Superficial Learning Outcomes

This part explores the risk that learners may engage in shallow or surface-level learning when using Automated Corrective Feedback (ACF) tools, focusing on error correction without deeper understanding of language rules.Although ACF provides immediate corrections, students may simply apply these fixes mechanically without reflecting on why the errors occurred or how to avoid them in the future. This superficial engagement with feedback limits the development of critical language awareness and long-term writing proficiency (Shute, 2008). For instance, a learner might repeatedly accept suggested corrections from a tool like Grammarly without internalizing the underlying grammar principles, resulting in repeated mistakes in similar contexts.

In conclusion, while ACF tools are valuable for immediate error detection, educators must be mindful of the potential for superficial learning and design pedagogical practices that foster deeper engagement with language development.

1.2 Section Two: Critical Thinking in Writing

1.2.1 Critical Thinking

Critical thinking is a disciplined cognitive process involving the interpretation, analysis, evaluation, and synthesis of information in order to form reasoned judgments. It requires the capacity to identify underlying assumptions, recognize logical connections, assess the strength of arguments, and derive conclusions grounded in evidence. This process is foundational in academic contexts, where it enables students and researchers to engage with complex ideas, challenge unsupported claims, and construct well-reasoned, coherent arguments.

Defined as a combination of analytical skills and reflective dispositions, critical thinking extends beyond rote learning and fosters intellectual autonomy. Cottrell (2017) describes it as a methodical approach to reasoning that enables individuals to evaluate evidence, detect inconsistencies, and apply logical principles in diverse contexts. Vaughn (2019) emphasizes the function of critical thinking as a systematic form of rational evaluation that enhances the ability to discern valid reasoning from fallacy. These qualities are indispensable in academic writing, where clarity, logic, and evidence-based argumentation are essential.

As a goal-directed and self-corrective activity, critical thinking promotes intellectual rigor. Dwyer (2017) explains that it encompasses both the application of cognitive skills and the disposition to use them effectively in decision-making. This dual perspective underscores the importance of cultivating critical thinking not only as a set of strategies but as a habit of mind. Hanscomb (2021) highlights the role of open-mindedness, fair judgment, and reasoned

skepticism in academic inquiry, arguing that such qualities are essential for evaluating the reliability of information and forming defensible conclusions.

In the domain of academic writing, critical thinking serves as the basis for developing analytical depth. Moon (2008) asserts that writing critically involves more than reporting information; it requires engaging with ideas, questioning assumptions, and articulating original perspectives supported by credible evidence. This process transforms writing from a descriptive exercise into a dynamic form of inquiry and argumentation. Critical thinking, therefore, functions as a cornerstone of higher education. It equips learners with the tools to reason effectively, question confidently, and write persuasively. Its value extends beyond the classroom, serving as a fundamental competence for informed citizenship, ethical reasoning, and lifelong learning.

1.2.2 Definition of Critical Thinking in Writing

Critical thinking in writing is not a single skill but a multifaceted process that integrates cognitive, rhetorical, and cultural dimensions. It requires writers to move beyond reproducing knowledge and engage actively with content through interpretation, evaluation, and self-regulation. In academic writing, this means constructing logical arguments, analyzing evidence, and critically positioning oneself in relation to the ideas of others.

Facione's (2015) model is widely recognized as a foundational framework for understanding critical thinking. He identifies six core skills: interpretation, analysis, evaluation, inference, explanation, and self-regulation. In writing, these skills translate into the ability to comprehend and reframe information (interpretation), break down arguments (analysis), judge the strength of evidence (evaluation), draw logical conclusions (inference), clearly justify reasoning (explanation), and reflect on one's own thinking process (self-

regulation). For example, a student writing a literature review must not only summarize previous studies but also analyze their methodologies, assess their validity, and draw reasoned conclusions based on the synthesis of sources.

Paul and Elder (2014) offer a complementary framework, emphasizing intellectual standards such as clarity, accuracy, depth, logic, and fairness. These standards guide the evaluation of arguments and the construction of thoughtful, persuasive writing. Writers must consistently question whether their claims are well-supported, whether their assumptions are justified, and whether alternative perspectives have been considered. In addition to cognitive skills, rhetorical awareness is a key component of critical thinking in writing.

As claimed by Hyland (2003), effective writers must anticipate readers' expectations, organize information strategically, and use language that conveys stance and engagement. This involves knowing how to assert claims, use hedging to indicate caution, and incorporate evidence persuasively. Critical thinking, therefore, also involves understanding the rhetorical context in which writing occurs—who the audience is, what the purpose is, and how best to communicate meaning.

Swales and Feak (2012) reinforce the idea that writing is a recursive process involving planning, drafting, feedback, and revision. This process encourages self-regulation, allowing writers to identify logical inconsistencies, revise unclear sections, and strengthen argumentation. A student who revises a weak claim after considering peer or automated feedback (e.g., from ACF tools like Grammarly or Write & Improve) demonstrates not only writing improvement but also the application of metacognitive strategies essential to critical thinking. Importantly, critical thinking in writing is shaped by cultural and educational experiences.

Pu (2021) proposes a culturally responsive model that recognizes four dimensions of critical engagement: positioning, goals, knowledge, and metacognitive reflection. "Positioning" refers to how students see themselves within academic discourse—whether as passive consumers or active participants. "Goals" shape the writer's motivation and purpose. "Knowledge" includes not just content understanding but also awareness of disciplinary conventions. "Metacognitive reflection" allow writers to monitor and adjust their reasoning processes. For L2 writers, developing critical thinking involves learning how to balance these dimensions within a new academic culture. Students may need explicit instruction on how to question sources, express disagreement respectfully, and structure their writing to reflect logical argumentation. Without this guidance, even learners with strong ideas may struggle to convey criticality in acceptable academic forms.

In summary, the conceptual framework of critical thinking in writing integrates cognitive operations (such as analysis and evaluation), rhetorical strategies (such as argumentation and audience awareness), and cultural influences. It is both a thinking process and a communicative act. Writers must not only think critically but also write critically—demonstrating their reasoning in ways that are clear, persuasive, and appropriate for their academic context.

1.2.3 Theoretical Foundations of Critical Thinking in Writing

Understanding how critical thinking operates in academic writing begins with a review of its underlying theoretical foundations. Among the most influential models are Bloom's Taxonomy of Educational Objectives and Facione's Framework for Critical Thinking. Both offer valuable insights into how writers process, evaluate, and communicate complex ideas in structured and purposeful ways.

1.2.3.1 Bloom's Taxonomy

Cognitive Complexity in Writing Originally developed by Bloom and colleagues in 1956 and revised by Anderson and Krathwohl in 2001, Bloom's Taxonomy categorizes cognitive skills into six hierarchical levels: remember, understand, apply, analyze, evaluate, and create. These levels move from lower-order thinking (e.g., recalling facts) to higher-order thinking (e.g., constructing original arguments or evaluating complex evidence). In academic writing, the highest levels of Bloom's taxonomy analysis, evaluation, and creation are particularly relevant. Writers operating at these levels are expected to:

- Deconstruct arguments to examine structure and assumptions (analyze)
- Assess the credibility and significance of sources (evaluate)
- Synthesize ideas and generate new interpretations or claims (create)

This model helps educators scaffold instruction that encourages progression from basic comprehension to advanced critical engagement. For example, a student might first summarize key theories (understand), then compare their assumptions (analyze), and finally formulate their own theoretical position (create).

1.2.3.2 Facione's Framework

The Core Skills of Critical Thinking Facione (2015) offers a more targeted framework for defining critical thinking, developed through the Delphi Report. He identifies six core cognitive skills: interpretation, analysis, evaluation, inference, explanation, and self-regulation**.** These skills are interdependent and essential for intellectual performance in academic settings. In writing, these skills are manifested as follows:

- Interpretation: Accurately summarizing and paraphrasing source material

- Analysis: Identifying relationships among ideas, such as causes, effects, or contradictions. Evaluation: Judging the relevance and credibility of arguments or evidence.
- Inference: Drawing logical conclusions from available data or research.
- Explanation: Justifying positions and articulating reasoning clearly.
- Self-regulation: Reviewing and refining one's own arguments, structure, and assumptions.

Facione's model is particularly influential in academic writing instruction because it focuses on reasoned judgment the capacity to weigh alternatives and justify conclusions in written form. It also aligns closely with writing tasks such as argumentative essays, literature reviews, and reflective analysis.

1.2.3.3 Integrating Theories into Writing Pedagogy

Both Bloom's and Facione's frameworks emphasize that critical thinking is a skill that can be developed and demonstrated, rather than a fixed trait. In writing pedagogy, these models inform lesson design, assessment criteria, and feedback practices. For example, instructors may structure assignments that explicitly target evaluative or inferential reasoning, while feedback may guide students to revise with greater clarity and justification. Together, these theoretical models provide a conceptual foundation for understanding how critical thinking underpins academic writing and how it can be cultivated through deliberate practice.

1.2.4 The Role of Critical Thinking in Writing

Critical thinking is central to producing effective academic writing. It transforms writing from merely reporting information into a process of thoughtful inquiry, evaluation, and argumentation. In this section, the multifaceted role of critical thinking in writing is explained through key components and their relevance, especially in second language contexts.

1.2.4.1 Critical Thinking as Analytical and Evaluative Skill

Critical thinking involves the ability to analyze information deeply and evaluate the strength and validity of arguments. Facione (2015) highlights that critical thinkers assess the credibility of sources, identify assumptions, and detect logical fallacies. In writing, this skill allows authors to move beyond simple summaries to critique methodologies, contrast different viewpoints, and highlight gaps in existing research. For example, rather than just listing findings from various studies, a critical writer evaluates how those findings relate to their own research questions, assessing reliability and relevance. This analytical skill is vital for academic rigor because it helps prevent superficial or biased representations of information. It encourages writers to justify claims with well-reasoned evidence and to recognize limitations in their arguments.

1.2.4.2. Critical Thinking as Rhetorical Competence

Writing is not only about what is said but also how it is communicated. Hyland (2003) notes that critical thinking in writing requires rhetorical awareness—the ability to organize content logically, anticipate the reader's expectations, and adopt an appropriate tone. Writers must decide how to present their claims persuasively, when to use hedging to show caution, and how to respond respectfully to opposing viewpoints. For second language learners, mastering this rhetorical competence is particularly challenging because it demands understanding not just language mechanics but also academic discourse conventions. Critical thinking thus equips writers with the capacity to tailor their messages to their audience, making their arguments clearer and more convincing.

1.2.4.3. Writing as an Argumentative Process

Swales and Feak (2012) emphasize that academic writing is fundamentally argumentative. It requires writers to state positions, provide evidence, engage with counterarguments, and refine their ideas through revision. This recursive process reflects a form of critical thinking where writing becomes a space for ongoing intellectual negotiation. For example, when learners receive feedback from instructors, peers, or automated corrective feedback (ACF) tools they must critically assess the suggestions, decide which to incorporate, and revise their work accordingly. This iterative engagement fosters metacognition and self-regulation, both essential aspects of critical thinking.

1.2.4.4. Writing as a Cultural and Discursive

Practice Critical thinking is also shaped by cultural and disciplinary norms. Pu (2021) argues that writing is a cultural practice where critical engagement is expressed through specific discursive strategies such as citing evidence, acknowledging alternative perspectives, and structuring arguments according to academic conventions. L2 learners, especially those from Confucian-heritage cultures, may face difficulties expressing criticality because cultural norms often value harmony and respect over direct critique (Pu, 2021). This can lead to underdeveloped critical voice or reliance on descriptive rather than analytical writing. Therefore, teaching critical thinking in writing must involve explicit instruction on the rhetorical and cultural expectations of academic writing.

1.2.4.5. Implications for L2 Writers

The development of critical thinking in writing is crucial for L2 learners to successfully participate in academic communities. It bridges the gap between linguistic proficiency and intellectual engagement by helping students articulate complex ideas clearly

and critically. Without these skills, learners may struggle to meet the demands of academic writing tasks that require argumentation, evaluation, and synthesis. Educators need to provide targeted support that integrates language development with critical thinking instruction, including guided practice in argument construction, source evaluation, and reflective revision.

1.2.5 Manifesting Critical Thinking in Academic Writing

Manifesting critical thinking in academic writing involves making the writer's analytical and evaluative processes visible through structured and purposeful language. While critical thinking begins as an internal cognitive activity, it becomes academically meaningful only when it is explicitly communicated in writing. This section explores how students demonstrate criticality in their texts through linguistic, structural, and rhetorical strategies.

1.2.5.1 Indicators of Critical Thinking in Texts

Critical thinking in writing is often identified through specific textual features that reflect the writer's analytical engagement with ideas. One key indicator is the use of evaluative language, such as phrases like "strongly supports," "raises concern," or "limited evidence," which signal the writer's judgment about the strength or validity of certain claims or arguments. Another common feature is hedging, where writers use cautious or tentative expressions like "may suggest," "appears to indicate," or "possibly implies" to present claims in a nuanced and thoughtful manner, acknowledging uncertainty or alternative perspectives.

Additionally, critical writing often employs cause-effect reasoning through connectors such as "due to," "as a result," or "this indicates that," showing an ability to identify and explain relationships between ideas or events. Comparison and contrast structures, introduced by words like "in contrast," "similarly," or "however," also reflect critical thinking, as they allow writers to examine similarities and differences, thus deepening their analysis.

Furthermore, the use of logical connectors such as “therefore,” “nonetheless,” and “because” helps structure arguments coherently and supports logical progression in the text. Altogether, these linguistic features demonstrate a writer’s ability not only to understand a topic but also to critically analyze, interpret, and respond to complex information in an academically rigorous manner.

1.2.5.2 Argument Construction and Source Engagement

Effective academic writing requires more than listing information from sources—it requires evaluating and integrating those sources into a coherent argument. Writers manifest critical thinking by:

- Identifying gaps or inconsistencies in the literature
- Questioning assumptions or methodologies
- Synthesizing multiple perspectives to build a nuanced position
- Clearly supporting claims with logical evidence

For instance, a student writing a literature review might say: “While Study A suggests a strong correlation between feedback and writing accuracy, Study B’s longitudinal approach reveals that this effect may not persist over time.” This demonstrates critical comparison and independent judgment.

1.2.5.3 Clarity, Coherence, and Organization

A well-structured academic text is a clear indicator of critical thinking, as it reflects the writer’s ability to organize ideas logically and communicate them effectively. Clarity ensures that the reader can easily understand the intended message through precise language, specific vocabulary, and grammatically correct constructions. Coherence, on the other hand, is achieved when ideas progress logically from one to the next, aided by smooth transitions and

consistent organization. This logical progression mirrors critical thinking processes in which arguments are built systematically rather than presented as isolated points. Effective organization further reinforces clarity and coherence by aligning the thesis statement, topic sentences, and supporting details within a unified structure. According to Brookhart (2010), critical thinking in writing is made visible when writers define their purpose clearly and support it through logically connected points. Similarly, Paul and Elder (2014) emphasize that clarity and logical consistency are essential traits of a critical thinker. Ennis (2011) also highlights the importance of structure in demonstrating one's ability to reason, argue, and evaluate claims. In this context, ACF tools such as Grammarly and Write & Improve can support the revision process by flagging vague constructions, disorganized flow, or inconsistencies in tone and grammar. However, while these tools may assist in enhancing clarity and structure at the surface level, they do not substitute for the deeper intellectual work required to construct and organize complex arguments. Therefore, achieving clarity, coherence, and organization in writing reflects not just linguistic ability but the writer's critical engagement with their topic and their audience.

1.2.5.4 Use of Academic Voice and Stance

Demonstrating critical thinking in academic writing requires the adoption of a clear academic voice and a consistent stance. This involves not only stating a position but also articulating judgments and engaging with alternative viewpoints through carefully chosen language. Writers reflect criticality by expressing claims such as "this essay argues that…" or "this approach is limited," which reveal analytical engagement and the capacity to evaluate rather than merely describe ideas. Effective academic voice balances assertiveness with caution. As Cottrell (2017) notes, language that conveys both confidence and open-mindedness such as the use of hedging terms like "may indicate" or "suggests that" is key to

critical engagement. Vaughn (2019) further stresses the importance of avoiding overgeneralizations and unsupported claims, as critical writing requires precise, evidence-based reasoning.

Therefore, this rhetorical competence also involves anticipating readers' expectations and organizing content persuasively. Hyland (2003) highlights that writers must demonstrate stance through structural clarity, logical flow, and appropriate tone, particularly in second language contexts. A consistent stance helps writers construct reasoned arguments while acknowledging complexity or opposing views. Hanscomb (2021) adds that critical writers must be reflective, showing the ability to both advocate for their position and recognize its potential limitations. This dual awareness confidence in one's reasoning combined with intellectual humility is central to the academic voice and a defining feature of critical thinking in writing.

1.2.5.5 Revision and Self-Monitoring

Critical thinking clearly appears during the revision stage of writing. When writers review their work, they often spot weak ideas, unclear sentences, or poor connections between points. By making changes, they show that they are thinking carefully about how to improve their message. This process of checking and improving is called self-monitoring. Hanscomb (2021) explains that critical thinking includes not just creating ideas but also reviewing and adjusting them to suit the purpose of the writing. Cottrell (2017) also notes that revision is more than just correcting grammar—it is about improving the logic, clarity, and strength of arguments. Feedback from teachers, peers, or writing tools helps writers see where they can do better and pushes them to think more deeply about their writing (Swales & Feak, 2012). Through this cycle of reviewing and rewriting, students develop a stronger academic voice and learn to express their ideas more clearly and critically.

1.2.6 Cognitive Processes Underlying Critical Thinking in Writing

Critical thinking in academic writing is not just about sharing information. It also involves a number of mental processes that help writers understand ideas deeply, organize their arguments clearly, and express their thoughts in a logical way. These thinking processes help writers turn basic facts or ideas into strong and meaningful written work. As Dwyer (2017) explains, critical thinking includes skills such as analyzing, evaluating, and making decisions based on evidence. These skills are important when students read sources, compare different views, and form their own opinions. Cottrell (2017) adds that thinking critically while writing means planning what to say, thinking carefully about the connections between ideas, and checking if the argument makes sense. Through these steps, writers can create texts that are thoughtful, well-organized, and persuasive.

1.2.6.1 Idea Generation and Conceptualization

The first step in writing is coming up with ideas. This thinking process helps writers use what they already know, connect it to new information, and start forming new thoughts or viewpoints. To support this stage, writers often use simple techniques like brainstorming, freewriting, or mind mapping. These methods help explore different opinions, discover important points, and decide on a clear direction for the writing. As Cottrell (2017) explains, starting with a range of ideas gives writers more choices and helps them avoid narrow or shallow thinking. Dwyer (2017) also notes that this early stage is important because it builds the base for stronger and more critical writing later on.

1.2.6.2 Planning and Organization

After generating ideas, the next important step in writing is planning and organizing those ideas clearly. This stage includes deciding on the purpose of the writing, understanding

who the audience is, and arranging the content in a logical order. Writers need to think about the best way to present their points, including what should come first and how each idea connects to the next. Dwyer (2017) explains that planning helps writers build a strong structure, making it easier for readers to follow the argument. Cottrell (2017) also points out that good organization supports clearer thinking and helps writers explain their ideas more effectively. This step is key to making sure the writing is focused, easy to read, and persuasive.

1.2.6.3 Analysis and Evaluation

A key part of critical thinking in writing is the ability to analyze and evaluate information. Writers need to check if sources are trustworthy, recognize any bias, and judge how strong or weak the arguments are. Analysis means breaking down complex ideas into smaller parts to understand how they are connected. Evaluation involves deciding how important and reliable the information is, and how well it supports the main argument. Dwyer (2017) explains that these skills help writers think more clearly and choose the best evidence. Cottrell (2017) adds that when students analyze and evaluate properly, they can build stronger arguments and avoid repeating weak or unclear ideas.

1.2.6.4 Inference and Deduction

Inference and deduction are important thinking skills in academic writing. Inference means using the information you have to make logical conclusions. Writers use inference to link ideas, find patterns, and guess what might happen next. Deduction is the process of applying general ideas or theories to specific examples. These skills help writers build strong arguments, explain their points clearly, and support their conclusions with evidence. As Dwyer (2017) explains, both inference and deduction are necessary for writing that shows deep thinking and logical structure.

1.2.6.5 Synthesis and Integration

Synthesis in writing represents an essential critical thinking skill that requires combining information from various sources to develop new perspectives. Writers must integrate diverse viewpoints, critically evaluate conflicting information, and construct cohesive arguments that reflect a thorough understanding of the topic (Canale, Ciuni, Frigerio, & Tuzet, 2020). This skill involves recognizing connections between different ideas and creating a unified narrative that supports the thesis, moving beyond simple summary or description (Vaughn, 2019; Moon, 2020). According to Barnet, Bedau, and O'Hara (2019), effective integration enhances clarity and persuasiveness in academic writing by weaving together evidence and reasoning into a coherent whole. Therefore, synthesis and integration exemplify the application of critical thinking to produce well-structured and insightful written work.

1.2.6.6 Monitoring and Regulation

Effective writing requires continuous monitoring and regulation of cognitive processes, a metacognitive skill integral to critical thinking. Writers must be conscious of their thought patterns, identify when their ideas stray from the intended purpose, and make necessary adjustments to maintain clarity and coherence (Cottrell, 2017). This self-awareness allows for the refinement of arguments and ensures that the writing remains focused and logically structured throughout the drafting process (Canale et al., 2020). According to Vaughn (2019), such metacognitive regulation is essential for sustaining critical engagement and improving the overall quality of academic writing.

1.2.6.7 Reflection and Revision

Reflection and revision represent crucial cognitive processes in writing that embody critical thinking. Writers must critically evaluate their work to identify weaknesses in clarity, coherence, and argumentation, making necessary revisions to enhance overall quality (Cottrell,

2017). This iterative process involves assessing whether arguments are well-supported and logically structured, ensuring the writing effectively conveys the intended message (Moon, 2020). As Vaughn (2019) highlights, reflective revision deepens critical engagement with the text and improves the persuasiveness and coherence of academic writing.

1.2.7 Strategies for Enhancing Critical Thinking in Academic Writing

Enhancing critical thinking in academic writing involves deliberate instructional strategies that actively engage students both cognitively and rhetorically. Effective approaches encourage deeper interaction with content and support learners in articulating complex ideas clearly and persuasively (Cottrell, 2017). Educators play a vital role in guiding students to analyze, evaluate, and synthesize information, fostering skills essential for critical writing (Canale et al., 2020). This section highlights key methods educators can use to develop critical thinking specifically within the academic writing process, promoting greater clarity, coherence, and argumentative strength (Vaughn, 2019).

1.2.7.1 Scaffolded Writing Tasks

Scaffolding involves breaking down complex writing tasks into manageable steps with clear guidance at each stage. For example, when assigning a literature review, instructors might first require students to summarize individual studies before comparing and evaluating them. This stepwise approach helps learners gradually develop analytical skills essential for critical writing (Vaughn, 2019; Cottrell, 2017). In practice, a scaffolded task could involve:

- Step 1: Identify key arguments in a source
- Step 2: Analyze the strengths and weaknesses of each argument
- Step 3: Synthesize findings from multiple sources into a coherent narrative
- Step 4: Formulate an original critical stance supported by evidence

This gradual process reduces cognitive overload and encourages reflection, enabling students to internalize critical thinking strategies necessary for academic writing (Moon, 2020; Canale et al., 2020).

1.2.7.2 Explicit Teaching of Argumentation Structures

Understanding how to construct and organize arguments is fundamental to critical writing. Educators can teach students to use classic argumentation frameworks, such as Claim, Evidence, Reasoning (CER) or Toulmin's model, which includes claim, data, warrant, backing, rebuttal, and qualifier (Barnet, Bedau, & O'Hara, 2019; Vaughn, 2019). For example, students might be guided to:

- Make a clear, arguable claim
- Support it with credible evidence
- Explain the reasoning linking evidence to the claim
- Address potential counterarguments to strengthen their position

By practicing these structures, learners improve their ability to present balanced, well-reasoned arguments in their writing.

1.2.7.3 Incorporation of Reflective Writing

Reflective writing encourages learners to evaluate their own thinking and writing processes. This practice may involve composing brief reflections after completing drafts, focusing on questions such as:

- What challenges did I face in developing my argument?
- How did I select and use evidence?
- What alternative perspectives did I consider?

- How might I improve my critical approach in future writing?

Such metacognitive exercises foster awareness of the cognitive processes behind writing and promote deeper critical engagement (Cottrell, 2017; Moon, 2020). Reflection enables students to develop self-regulation skills essential for effective academic writing (Canale et al., 2020).

1.2.7.4 Use of Peer Review and Collaborative Writing

Engaging in peer review allows writers to receive feedback, gain new perspectives, and identify weaknesses in their arguments (Vaughn, 2019; Cottrell, 2017). Collaborative writing encourages students to discuss and negotiate ideas, fostering critical dialogue that challenges assumptions and strengthens the overall argument (Moon, 2020). For example, debating differing interpretations in group projects can lead to a more nuanced and well-developed final paper (Canale et al., 2020)..

1.2.9.5 Integration of Source Evaluation Activities

Developing critical thinking in writing requires students to evaluate sources for credibility, bias, and relevance. Educators can design tasks that ask learners to assess the trustworthiness of various materials—such as academic articles, news reports, or websites—and reflect on their use in argument construction (Cottrell, 2017; Vaughn, 2019). For example, students might compare two sources on the same issue and critique them based on the authors' authority, use of evidence, bias, and overall contribution to their argument. Such activities enhance students' ability to select and apply reliable evidence in academic writing (Dwyer, 2017).

1.2.8 Assessing Critical Thinking in EFL Academic Writing

Assessing critical thinking in the context of EFL academic writing presents a multifaceted challenge. Unlike general writing assessment, which often focuses on language accuracy and organizational structure, critical thinking assessment requires evaluators to examine how effectively students engage in reasoning, argumentation, and analysis. As Elder and Paul (2012) emphasize, critical thinking must be assessed against intellectual standards such as clarity, relevance, logic, depth, and fairness. These standards offer a systematic approach for identifying the quality of thought embedded in students' written work. For instance, a critically written text demonstrates not only clear expression but also sound justification of claims, consideration of alternative perspectives, and logical progression of ideas.

However, in EFL contexts, the assessment of critical thinking must carefully balance content and form. Students may possess the ability to reason critically but may not yet have the linguistic fluency to fully articulate complex ideas in writing. Gambrill and Gibbs (2013), caution that educators must not conflate language limitations with cognitive deficiencies. A student's inability to use sophisticated grammar or vocabulary does not necessarily reflect a lack of analytical depth. Therefore, assessment must be nuanced—sensitive to both the developmental stage of language acquisition and the intellectual maturity of the learner.

Rubrics are widely recommended as effective tools for this purpose. Cottrell (2017) and Dwyer (2017) advocate for assessment frameworks that clearly articulate critical thinking criteria such as evaluation of sources, logical coherence, use of evidence, and counterargument integration. These rubrics not only guide instructors in delivering fair and consistent assessments but also help learners understand what is expected in academic writing. In this way, assessment becomes formative as well as summative—guiding learners to revise, reflect,

and improve. Ultimately, effective assessment of critical thinking in EFL writing supports the dual goal of fostering intellectual growth while advancing academic literacy, enabling learners to become confident and capable participants in academic discourse communities.

1.2.8.1 Intellectual Standards as Assessment Criteria

One of the most effective ways to assess critical thinking in academic writing is through the application of intellectual standards. Elder and Paul (2012) propose a set of criteria such as clarity, accuracy, relevance, logical consistency, depth, breadth, and fairness that serve as universal benchmarks for evaluating the quality of reasoning. These standards help instructors move beyond surface-level assessments that focus solely on grammatical correctness or structure and instead concentrate on the student's capacity to reason through complex ideas. For instance, clarity ensures that a student's argument is understandable; accuracy ensures that claims are grounded in reliable information; and depth involves addressing the complexities of a topic rather than oversimplifying.

In EFL academic writing, applying these standards allows educators to assess the extent to which learners engage critically with ideas, even when their language proficiency is still developing. Using such a framework ensures that students are rewarded for their cognitive efforts and are encouraged to develop sound reasoning processes alongside language development (Paul & Elder, 2014). The intellectual standards provide a balanced and holistic lens through which educators can evaluate the critical dimension of students' writing, aligning assessment with the broader goals of higher education and academic inquiry (Elder & Paul, 2010).

1.2.8.2 Using Rubrics to Support Transparent Evaluation

Rubrics serve as valuable tools in the assessment of critical thinking because they make expectations explicit and provide structured, transparent criteria for both teachers and learners. Cottrell (2017) highlights the benefits of analytic rubrics in helping students understand what constitutes effective argumentation, use of evidence, engagement with counterarguments, and overall reasoning quality. These tools not only guide instructors in delivering consistent evaluations but also support learners' development by making the components of critical thinking visible. Dwyer (2017) reinforces this by suggesting that rubrics serve a dual function: they are both evaluative and instructional.

When students are aware of the specific elements being assessed such as the clarity of claims, relevance of sources, strength of justifications, or organization of ideas—they are better able to monitor and refine their own writing. This process fosters metacognition and encourages students to become active participants in their academic growth. In EFL contexts, where students often struggle to interpret implicit academic expectations, rubrics offer clarity and reduce anxiety. They empower learners to self-assess and revise more effectively, thereby reinforcing the link between formative assessment and critical thinking development. Used thoughtfully, rubrics function not only as grading tools but as instructional scaffolds that promote deep engagement with academic writing tasks.

1.2.8.3 Challenges in Assessing EFL Learners' Critical Thought

Assessing critical thinking in EFL writing is particularly complex due to the interplay between cognitive skill and linguistic expression. As Gambrill and Gibbs (2013) explain, instructors must navigate the challenge of distinguishing between a student's difficulty in expressing ideas in English and an actual lack of critical reasoning. A learner may possess

strong analytical skills but may not yet have the linguistic repertoire to articulate arguments effectively, especially in a second language. This can lead to underestimation of a student's intellectual capacity if evaluation is based too heavily on grammar or sentence structure.

Nevertheless, Dwyer (2017) cautions against relying solely on surface indicators when assessing EFL writing and emphasizes the need for instructors to adopt a more flexible, developmentally appropriate approach. This includes providing formative feedback that prioritizes reasoning and content over grammatical perfection in the early stages of learning. It also means creating opportunities for students to clarify or elaborate on their ideas orally or in revisions, particularly when written expression may be limited. Furthermore, cultural and educational backgrounds can shape how learners present arguments, approach critique, or engage with authority, which should be considered in assessment practices. A fair evaluation of critical thinking in EFL writing must therefore recognize and adjust for these intersecting factors, supporting learners' growth without penalizing them for developmental language challenges.

1.2.9 Issues and Limitations of Critical Thinking in Writing

While critical thinking is widely recognized as essential to academic writing, several issues and limitations complicate its development and application, especially in EFL contexts. One significant challenge is the tension between cognitive skills and dispositional factors; even when learners possess the ability to analyze and evaluate, their motivation, confidence, and cultural attitudes toward authority can inhibit critical engagement (Dwyer, 2017). Pu (2021) highlights those cultural norms in many EFL learners' backgrounds may discourage open critique or questioning, which limits the expression of criticality in writing. Linguistic limitations also pose considerable barriers. As Cottrell (2017) explains, insufficient vocabulary

and syntactic control constrain learners' ability to articulate nuanced arguments, leading to superficial or formulaic writing that does not fully demonstrate critical thought.

Furthermore, Gambrill and Gibbs (2013) point out that the cognitive load involved in simultaneously managing language accuracy and complex reasoning can overwhelm learners, resulting in reduced critical depth. Another limitation concerns instructional practices; without explicit teaching and scaffolding, students may not develop a clear understanding of what critical thinking entails or how to apply it in writing tasks (Moon, 2008). Finally, assessment methods that prioritize linguistic form over content can discourage risk-taking and exploration, further constraining critical thinking development (Elder & Paul, 2012). These intersecting issues highlight the need for integrative pedagogies that address both language and critical thinking skills, alongside culturally sensitive approaches that recognize learners' diverse backgrounds.

1.2.9.1 Cultural and Dispositional Barriers

Cultural norms and individual dispositions significantly influence learners' engagement with critical thinking in writing. Dwyer (2017) argues that learners from educational backgrounds where authority is rarely questioned may find it difficult to adopt critical questioning practices. Pu (2021) further explains that many EFL learners come from cultures that prioritize harmony over critique, which can limit their willingness to express dissenting views or challenge assumptions in academic writing.

1.2.9.2 Linguistic Challenges

Language proficiency plays a crucial role in the ability to demonstrate critical thinking through writing. Cottrell (2017) highlights that limited vocabulary and inadequate syntactic control restrict learners' capacity to articulate complex arguments, resulting in

writing that appears superficial or formulaic. Gambrill and Gibbs (2013) add that the cognitive demands of managing language accuracy while constructing logical reasoning create a heavy cognitive load, which often diminishes critical depth.

1.2.9.3 Instructional and Pedagogical Constraints

Without explicit teaching and scaffolding, students may struggle to understand what critical thinking entails or how to apply it in writing. Moon (2008) emphasizes the importance of structured guidance and reflective practice in developing learners' critical engagement. Additionally, assessment methods that emphasize linguistic form over argumentative content may discourage risk-taking and critical exploration, hindering the development of critical thinking skills (Elder & Paul, 2012).

Conclusion

In conclusion, this literature review has determined the complementary nature of (ACF) and critical thinking in EFL academic writing. Whereas ACF tools like Grammarly and Write & Improve are useful for enhancing surface writing aspects like grammar and clarity, they are limited in fostering more profound intellectual involvement. Critical thinking in writing, by contrast, entails skills like analysis, evaluation, and self-regulation, which necessitate active learner participation. Thus, to gain the most teaching potential of ACF, it must be implemented alongside reflective and strategic writing instruction for the development of higher-order thinking skills.

Chapter 02: Research Methodology, Data Analysis, and Discussion

Introduction

This section represents the methodological framework adopted in the current study, which investigates the influence of (ACF) on the development of critical thinking in the writing process among third-year English students at Larbi Tébessi University – Tebessa, Faculty of Letters and Languages, Department of Letters and English Language. It outlines the research design, describes the participants and sampling strategies, details the instruments used for data collection, explains the procedures followed, and presents the methods applied for data analysis.

2.1. Section one: Research Methodology

2.1.1. Research Design

This study relies on a mixed-methods approach that combines qualitative and quantitative research methods with the aim of achieving a comprehensive perspective of EFL students' and teachers' perceptions of ACF and its effects on the development of critical thinking in academic writing. The use of a mixed-methods design enables the researcher to triangulate information, provide higher credibility of results, and examine both quantifiable trends and deep personal significance.

The quantitative aspect of the research is documented using a designed questionnaire administered to a sample of EFL students. The tool was employed to provide numerical responses regarding students' exposure to ACF tools and their views on how effective it is in enhancing their academic writing and critical thinking abilities. The qualitative component involves semi-structured interviews with EFL teachers . This method allows for deeper exploration of their comments, experiences, and attitudes regarding the ACF's role in the

writing classroom. With interviews, it is also possible to tap into subtle opinions that would not be expressed through survey replies. The study relies on an explanatory structured questionnaire design in which quantitative data are gathered and analyzed prior to the qualitative component. The qualitative findings are used to provide a richer interpretation and explanation of the quantitative results.

2.1.2 Population and Sample

The target population for this study comprises third-year students and 3 teachers in the Department of Letters and English Language at Larbi Tébessi University – Tébessa. The sample for this research includes 43 students and 3 instructors from the English department at Larbi Tébessi University in Tébessa. The participants were selected from a total population of around 100 English students and 6 instructors. The sample size was calculated using Alpha Cronbach's to guarantee a high coefficient of validity and reliability. In terms of sampling techniques, this research employs a probability sampling method, specifically simple random sampling, in which every individual in the population had an equal probability of being chosen. This method reduces selection bias and enhances the study's internal validity. Reliability is further assured through the use of a structured and pre-tested questionnaire, standardized administration procedures, and the implementation of random selection.

2.1.3 Research Instruments

The instruments utilized in this study are an interview and a questionnaire. First, a structured questionnaire was distributed to students to rapidly gather extensive data regarding their experiences and perceptions of using (ACF) tools in enhancing critical thinking during the writing process. The questionnaire is organized into six sections: the first section collects general information about students' personal experiences with ACF; the second section concentrates on learning and improvement through ACF; the third section investigates

preferences and attitudes towards ACF tools; the fourth section assesses the impact of ACF on critical thinking in writing; the fifth section considers students' engagement with ACF tools; and the sixth section discusses the perceived influence of ACF on academic writing skills. Additionally, the questionnaire includes closed-ended, multiple-choice, and open-ended questions. It also features Likert scale statements with five response options ranging from "Strongly Disagree" to "Strongly Agree," facilitating both quantitative and qualitative data collection.

Second, a semi-structured interview was carried out with educators from the Letters and English Language Department to obtain deeper insights into how (ACF) tools contribute to enhancing students' critical thinking in EFL writing. This interview, which mixes prepared and adaptable questions, enables both organized replies and spontaneous follow-up inquiries to enrich the data collected. It is divided into five sections: teachers' personal encounters with ACF, their observations regarding student learning and development, their opinions about student preferences between ACF and teacher feedback, the influence of ACF on the growth of critical thinking, and their reflections and suggestions for incorporating ACF in writing instruction. Open-ended questions promote detailed responses, yielding rich qualitative data that complement the findings from the student questionnaire.

2.1.4. Data Collection Procedure

Data were collected using a structured, pre-tested questionnaire designed to explore students' experiences with (ACF) and its influence on critical thinking in writing. The questionnaire included both Likert-scale items and open-ended questions. It was administered to 43 students and 3 instructors from the English Department at Larbi Tébessi University – Tébessa, selected through simple random sampling. Participants were informed about the study's objectives and assured of confidentiality. Responses were collected under standardized conditions and prepared for analysis.

2.1.5. Data Analysis Procedures

This research follows an exploratory research design in examining the new phenomenon of the use of (ACF) in EFL to enhance critical thinking in academic writing. Its exploratory nature is evident in its open exploration of student and teacher attitudes instead of experimenting with a priori hypotheses. The method is especially suitable in light of the relative newness of ACF tools to Algerian EFL settings, whose pedagogical effects are virtually unreported and require initial systematic observation prior to causal relationships being determined.

In line with the mixed-methods study design, both quantitative and qualitative approaches to data analysis were used. Quantitative data gathered through the student questionnaire were analyzed with the Statistical Package for the Social Sciences (SPSS), version 26. Descriptive statistics such as frequencies, percentages, means, and standard deviations were generated to summarize students' responses on the Likert-scale items. These analyses provided a portrait of students' perceptions of (ACF), their perception of its role on enhancing critical thinking in academic writing, along with their attitudes and level of engagement.

Furthermore, cross-tabulations and comparative tests were also performed where necessary to investigate correlations between particular variables, for instance, students' frequency of using ACF and their perceived improvement in reflective or evaluative writing abilities. SPSS facilitated systematic and precise management of quantitative data, providing reliability and validity in the establishment of trends and patterns.

For the qualitative component, data from the interviews with instructors were thematically analyzed. Interview transcripts were read thoroughly and hand-coded to look for repetitive ideas and emergent themes. Thematic analysis was inductive, and allowed key

categories emerged straight from the data. Four general themes were found: limited use of ACF, students' preferences and engagement, perceived effects on critical thinking, and the last is suggestions for classroom practice.

2.1.6. Pilot testing

Pilot Testing Prior to full-scale data collection, both questionnaires was piloted: Five students tested the Student Questionnaire; one instructor piloted the Teacher Questionnaire. Feedback from the pilot phase led to minor revisions to improve clarity and coherence. Data from the pilot study were not included in the final analysis.The Teacher Interview was also piloted with one instructor to assess the clarity and relevance of the open-ended questions. The interview explored five main areas: teachers' personal experiences with ACF tools, their observations on student learning and development, student preferences between ACF and teacher feedback, the role of ACF in fostering critical thinking, and their reflections on integrating ACF into writing instruction. Feedback from the pilot led to minor adjustments to question phrasing to enhance clarity and ensure richer qualitative data collection.

2.2. Section Two: Data Analysis

This section summarizes the main findings of the study, organized around key themes that emerged from the responses of the participants. The discussion focuses on how teachers and students perceive Automated Corrective Feedback (ACF) and its role in the development of critical thinking in academic writing. Points of agreement, trend, and divergence are highlighted to gain a deeper insight into the educational impact of ACF on EFL.

1.2.2. Questionnaire analysis

Table 1 *Alpha Cronbachs Analysis*

Reliability Statistics	
Cronbach's Alpha	N of Items
.929	**39**

Cronbach's Alpha is a widely used measure of internal consistency for a scale or test (like a questionnaire), indicating how closely related a set of items are as a group. It is considered an indicator of the reliability of the instrument. A value of 0.929 is considered **very high (excellent)**, While interpretations can vary slightly depending on the field.

2-Frequencies and Mean/ Standard Deviation

Section A: Personal Experience with ACF

Table 2 *Responses' Analysis of the Section A of the Questionnaire*

	N		**Mean**	**Std. Deviation**
	Valid	**Missing**		
Have you used any ACF tools to improve your English writing?	**43**	**0**	**1.1395**	**.35060**
If yes, which ACF tools have you used?	**43**	**0**	**2.5581**	**1.22090**
What type of writing tasks do you usually use ACF tools for?	**43**	**0**	**2.7907**	**1.30125**
Do you feel more confident in your writing process when using ACF tools?	**43**	**0**	**2.7209**	**1.20170**

Frequency of Each Question

1. Have you used any ACF tools to improve your English writing? [ ] Yes [ ] No

Table 3 *Use of ACF tools in English Writing*

Options	Participants	Percentages
a) Yes	37	86.0%
b) No	6	14.0%
Total	43	100%

The results indicate that a substantial majority of respondents (86.0%) reported utilizing ACF tools to enhance their English composition. This high adoption rate suggests these digital tools have gained significant traction within the sampled population, potentially reflecting their perceived utility and relevance in the current academic and linguistic context.

Conversely, a small minority (14.0%) reported not using such tools. This limited uptake could stem from various factors, including lack of familiarity with available ACF technologies, limited access to digital resources, or a deliberate preference for more conventional learning approaches.

2. Which tools have you used?

Table 4 *Tools Used in English Writing*

Options	Participants	Percentages
a) Grammarly	12	27.9%
b) QuillBot	9	20.9%
c) Write and improve	8	18.6%
d) Other	14	32.6%
Total	90	100%

The majority answer was "Other" (32.6%), which suggests a variety of other ACF tools, is being utilized outside of the most popular platforms. This could reflect a range of preferences or new technology not covered in the choices. Grammarly is the most frequently mentioned tool (27.9%), testifying to its high visibility and usefulness as perceived by students. QuillBot (20.9%) and Write and Improve (18.6%) follow with a moderate level of adoption.

The relatively even distribution (aside from "Other") suggests that students are experimenting with different tools based on their needs—whether grammar correction, paraphrasing, or feedback features.

3. What type of writing tasks do you usually use ACF tools for?

Table 5 *ACF Tools for Different Writing Tasks*

Options	Participants	Percentages
a) Essays	6	14.0%
b) Paragraphs	18	41.9%
c) Emails	3	7.0%
d) Reports	11	25.6%
e) Others	5	11.6%
Total	**90**	**100%**

The majority of participants (41.9%) used ACF tools mainly for writing paragraphs, the most frequent central module in language learning and academic writing. This reflects the role of ACF tools in promoting micro-writing ability and sentence-level coherence. The second most common category was "Others" (25.6%), probably for creative writing, social media, or other kinds of academic work. This suggests that ACF tools are used in a wide range of applications outside of typical academic tasks.

Reports (11.6%) and Essays (14.0%) also take place with frequency of moderate size, indicating that students utilize ACF tools in more advanced and formalized essay writing assignments. Emails were utilized the least (7.0%), possibly because emails are informal or have less perceived need for correction tools.

4. Do you feel more confident in your writing process when using ACF tools?

Table 6 *Confidence Levels in Writing Process with ACF Tools Help*

Options	Participants	Percentages
a) Daily	10	23.3%
b) Several times a week	8	18.6%
c) Once a week	9	20.9%
d) Occasionally	16	37.2%
Total	**43**	**100.0%**

The greatest proportion of respondents (37.2%) indicated occasional use of ACF tools, indicating that most students may be aware of the tools but don't always depend on them. This could reflect need- or selective-based application—possibly in instances of complex writing tasks or when there are deadlines in academic work. 38.2% of the subjects use these tools on a daily or a few times per week basis, indicating a significant number of users include ACF tools in their everyday learning or writing practice. The remaining 20.9% of them use them on a weekly basis, which means moderate usage.

Overall, the numbers reveal changing usage patterns, with most learners using ACF tools intermittently, if not daily.

Section B: Learning and Improvement

Table 7 *Responses' Analysis of the Section B of the Questionnaire*

Statistics				
	N		**Mean**	**Std. Deviation**
	Valid	**Missing**		
. I have learned new grammar rules or vocabulary from ACF feedback.	43	0	3.3721	1.00055
.I find grammar corrections from ACF tools helpful.	43	0	3.6279	.87351
I find vocabulary suggestions from ACF tools helpful.	43	0	3.9535	.81514
I find sentence structure feedback from ACF tools helpful.	43	0	3.6977	.86009
I find punctuation/spelling corrections from ACF tools helpful	43	0	3.7674	1.01974
I find feedback on style and tone from ACF tools helpful	43	0	3.3953	1.21772
I try to understand why the ACF tool suggests a correction	43	0	3.7209	.95930
ACF tools help me feel more independent in editing my writing	43	0	3.7674	.97192
Sometimes ACF suggestions confuse me.	43	0	4.2558	.58117

Frequency of Each Question

1. I find grammar corrections from ACF tools helpful.

Table 8 *Participants' Views on ACF Grammar Corrections*

Options	Participants	Percentage
a) Strongly disagree	1	2.3%
b) Disagree	3	7.0%
c) Neutral	12	27.9%
d) Agree	22	51.2%
e) Strongly agree	5	11.6%
Total	**43**	**100.0%**

The majority of the participants (62.8%) agrees or strongly agrees that their English writing skill has been improved by using ACF tools. This result strongly indicates a perceived positive impact of the tools on the improvement of learners' writing. One excellent percentage (27.9%) opted for "neutral," meaning unobservable improvement, sparing use, or uncertainty about the impact of the particular tools. A low 9.3% disagreed or strongly disagreed, reflecting very low resistance or skepticism regarding the utility of ACF tools.

These results indicate the overall satisfaction and value of learning that students attribute to such tools in their language learning journey.

2. I find vocabulary suggestions from ACF tools helpful.

Table 9 *Participants' Views on ACF Vocabulary Suggestions*

Options	Participants	Percentage
a) Disagree	4	9.3%
b) Neutral	3	7.0%
c) Agree	27	62.8%
d) Strongly agree	9	20.9%
Total	43	100.0%

A vast majority of respondents (83.7%) agree or strongly agree that ACF tools assist them in recognizing common writing errors. These points to one of the fundamental advantages of such tools delivering instant, corrective feedback that promotes learner awareness of frequent errors. Only a minority of participants disagreed (9.3%) or were undecided (7.0%). The low numbers reflect limited skepticism about the diagnostic value of ACF instruments.

The evidence emphasizes the pedagogical role of the tools in self-correction and learner autonomy, especially in the context of having no or limited access to human feedback (e.g., tutors or teachers).

3. I find sentence structure feedback from ACF tools helpful.

Table 10 *Participants' Views on ACF Sentence structure Feedback*

Options	Participants	Percentage
a) Disagree	5	11.6%
b) Neutral	9	20.9%
c) Agree	23	53.5%
d) Strongly agree	6	14.0%
Total	43	100.0%

The majority of the respondents (67.5%) agrees or strongly agrees that ACF tools are inspirational sources to improve their writing. This suggests that the tools are not merely corrective but also motivational, possibly because they are instant, direct in feedback, and gamified or interactive in design (e.g., in tools like "Write and Improve").

A considerable percentage (20.9%) remained neutral, either because they were not sure about the motivational role of these tools, or because they think that their use is more practical than inspiring. Only 11.6% disagreed, which is a comparatively low number. Overall, this question suggests that ACF tools are capable of having an indirect but substantial role in increasing learner motivation and self-directed learning.

4. I find punctuation/spelling corrections from ACF tools helpful

Table 11 *Participants' Views on ACF punctuation/spelling Corrections*

Options	Participants	Percentage
a) Disagree	9	20.9
b) Neutral	1	2.3
c) Agree	24	55.8
d) Strongly agree	9	20.9
Total	**43**	**100.0**

A large majority (76.7%) of the respondents agrees or strongly agrees that ACF software is better than teacher feedback in improving their writing. This reflects growing confidence in the effectiveness, accessibility, and uniformity of computer-based correction software, but 20.9% of the respondents disagree, suggesting that some students still value human feedback for its contextual richness, individuality, and pedagogical depth—factors impossible or hard to replicate with automated software. There are only 2.3% who are indecisive, which implies that most respondents must have an opinion about the matter.

The question touches on a sensitive pedagogical shift, one that reveals learners' evolving preferences and expectations in digitally enriched learning environments.

5. I find feedback on style and tone from ACF tools helpful

Table 12 *Participants' Views on ACF feedback on style*

Options	Participants	Percentage
a) Strongly disagree	3	7.0
b) Disagree	9	20.9
c) Neutral	7	16.3
d) Agree	16	37.2
e) Strongly agree	8	18.6
Total	**43**	**100.0**

A majority of participants (55.8%) completely agree or agree that they are confident in making use of ACF tools alone without the intervention of teachers. This reflects a high level of autonomy on the part of learners in using digital tools for personal improvement and correction.

But 27.9% (agree + strongly disagree) doubt or would like continuous teacher intervention, indicating that while ACF instruments are best received, they are not seen as a complete replacement for pedagogical guidance by everyone. The 16.3% in the middle might still be deciding their opinion on the ratio of AI-assisted feedback and human education.

6. I try to understand why the ACF tool suggests a correction

Table 13 *Participants' efforts to understand ACF corrections*

Options	Participants	Percentage
a) Strongly disagree	1	2.3
b) Disagree	5	11.6
c) Neutral	6	14.0
d) Agree	24	55.8
e) Strongly agree	7	16.3
Total	**43**	**100.0**

A significant majority of (72.1%) of participants agrees or strongly agrees that they intend to continue using ACF tools in the future. This indicates a high level of continued participation and trust in the tools as part of their learning process. Only 13.9% disagreed or strongly disagreed, showing that a limited number of students would be worried about the long-term applicability of the tools or would want traditional methodologies instead. The 14.0% who were neutral can perhaps be undecided or open to future revision.

These findings demonstrate a general trend of firm agreement and integration of AI-based writing assistance into students' writing practices.

7. ACF tools help me feel more independent in editing my writing

Table 14 *The effect of ACF Tools on Participants' writing and editing independence*

Options	Participants	Percentage
a) Strongly disagree	1	2.3
b) Disagree	4	9.3
c) Neutral	8	18.6
d) Agree	21	48.8
e) Strongly agree	9	20.9
Total	**43**	**100.0**

A combined 69.7% of respondents agree or strongly agree that they would recommend ACF tools to their peers, reflecting high satisfaction and confidence in the tools' effectiveness. This is a strong indicator of positive user experience and perceived value.Only 11.6% disagree or strongly disagree, suggesting minimal resistance or negative experiences with ACF tools. The 18.6% of respondents who selected neutral may feel uncertain about promoting these tools without more extensive personal use or clearer evidence of their effectiveness.

This item effectively gauges social validation and learner advocacy for digital writing aids.

8. Sometimes ACF suggestions confuse me

Table 15 *Confusion Level of ACF suggestions*

Options	Participants	Percentage
a) Neutral	3	7.0
b) Agree	26	60.5
c) Strongly agree	14	32.6
Total	43	100.0

A combined 69.7% of the respondents strongly agree or agree that they would recommend ACF tools to their colleagues, which is a high expression of satisfaction and faith in the effectiveness of the tools. This is a very strong indicator of positive user experience and perceived value. Only 11.6% disagree or strongly disagree, showing minimal resistance or adverse experience with ACF tools. The 18.6% who opted for neutral may be hesitant to actively encourage these tools without greater personal use or with more evident evidence of their usefulness.

This instrument accurately measures social validation and student endorsement of computer-based writing help.

Section C: preferences and attitudes

Table 16 *Responses' Analysis of section C of the questionnaire*

Statistics				
	N		**Mean**	**Std. Deviation**
	Valid	**Missing**		
I prefer feedback from ACF tools over feedback from my teacher	43	0	3.7442	.84777
I think ACF tools provide better corrections than teachers	43	0	3.9767	.77116
I enjoy using ACF tools in my learning	43	0	3.7209	.98381
I find certain aspects of ACF tools difficult to use	43	0	3.7907	.74188
I would recommend ACF tools to other English learners	43	0	3.8605	.67547

Frequency of Each Question

1. I prefer feedback from ACF tools over feedback from my teacher

Table 17 *Participants' feedback preference*

Options	**Participants**	**Percentage**
a) Disagree	3	7.0
b) Neutral	4	9.3
c) Agree	27	62.8
d) Strongly agree	9	20.9
Total	43	100.0

Most of the participants (72.1%) agree or strongly agree that they prefer using ACF tools over teacher feedback. This indicates a shifting learner preference for technology-based feedback, possibly due to its immediacy, objectivity, and accessibility. On the other hand,

14.0% are undecided, and a minority of 13.9% disagree, which means that while most learners are leaning towards e-support, there are some who still value the comprehensive, contextualized feedback provided by instructors.

Overall, this response highlights students' growing faith in automated systems and their alignment with the values of digital-native generations.

2. I think ACF tools provide better corrections than teachers

Table 18 *Participants' comparison of ACF and Teachers corrections*

Options	**Participants**	**Percentage**
a) Disagree	5	11.6
b) Neutral	7	16.3
c) Agree	25	58.1
d) Strongly agree	6	14.0
Total	**43**	**100.0**

An overwhelmingly, 83.7% of the interviewees agree or strongly agree that ACF tools correct more accurately than teachers. This strong agreement suggests immense faith in the technical correctness and consistency of such tools.9.3% do not agree and 7.0% are undecided, indicating little opposition to this perception.

This result suggests that ACF tools are being increasingly regarded as not only secondary but also primary sources of correction, which can be used to give accurate feedback in real time a very attractive feature for autonomous learning systems.

3. I enjoy using ACF tools in my learning

Table 19 *Learners' Attitudes towards ACF Tools in Learning*

Options	Participants	Percentage
a) Disagree	6	14.0
b) Neutral	10	23.3
c) Agree	17	39.5
d) Strongly agree	10	23.3
Total	**43**	**100.0**

Most of the respondents (62.8%) state that they enjoy using ACF tools, with a positive emotional and motivational response to having them integrated into the learning process. A moderate percentage (23.3%) answered in the middle, 14.0% disagreed or strongly disagreed, suggesting the potential for enjoyment to be tied to person differences in digital comfort or learning style, But the positive inclination towards ACF instruments indicates not only that students are cognitively advantaged by using them but also react to them in a favorable manner — one of the predictors of long-term motivation and use.

4. I find certain aspects of ACF tools difficult to use

Table 20 *Difficulty Level of ACF tools use*

Options	Participants	Percentage
a) Disagree	3	7.0
b) Neutral	8	18.6
c) Agree	27	62.8
d) Strongly agree	5	11.6
Total	**43**	**100.0**

There is an overwhelming consensus (74.4%) that they do have difficulty with some aspects of ACF tools, either agreeing or strongly agreeing. This reflects a significant tool

design or user experience limitation that can impede maximal usage. Only 9.3% disagreed, while 16.3% were neutral possibly because they were rarely frustrated or didn't know.

This answer emphasizes the necessity of improved user guidance, training, or interface simplification to provide all learners whether digitally fluent or not with the ability to fully take advantage of ACF tools.

5. I would recommend ACF tools to other English learners

Table 21 *Recommendations of ACF Tools by Participants*

Options	**Participants**	**Percentage**
a) Disagree	2	4.7
b) Neutral	7	16.3
c) Agree	29	67.4
d) Strongly agree	5	11.6
Total	**43**	**100.0**

A very large majority (79.0%) of learners would recommend ACF tools to other learners. This shows high perceived usefulness and satisfaction, which implies that the tools have gained a good fit in learners' individual writing improvement practices, just 9.3% disagreed, while 11.6% were neutral — perhaps because of unfamiliarity with some features or reluctance to support tools they do not fully utilize.

This recommendation attests to the belief that ACF instruments are not only pedagogically sound but also learner-validated, to encourage broader application within communities of language learning.

Section D: The Effect of ACF on Critical Thinking in Writing Process

Table 22 *Responses' Analysis of section D of the questionnaire*

Statistics				
	N		**Mean**	**Std. Deviation**
	Valid	**Missing**		
ACF tools help me think more critically about my writing.	**43**	**0**	3.9535	.89850
I evaluate ACF suggestions before applying them	**43**	**0**	3.9302	.82794
ACF tools increase my awareness of the structure of my arguments	**43**	**0**	3.7442	.95352
ACF feedback helps me consider alternative ways to phrase my ideas	**43**	**0**	3.7674	.84056
ACF tools contribute to the development of my critical thinking skills	**43**	**0**	3.8140	.76394

Frequency of Each Question

1. ACF tools help me think more critically about my writing.

Table 23 *Participants' Views on Critical Thinking in Writing*

Options	**Participants**	**Percentage**
e) Disagree	5	11.6
f) Neutral	3	7.0
g) Agree	24	55.8
h) Strongly agree	11	25.6
Total	**43**	**100.0**

An overwhelming majority of respondents (81.4%) strongly agree or agree that ACF tools enable them to work independently in writing. This shows the perceived role of respondents in increasing autonomous learning and self-editioning, which are core skills in

foreign language acquisition. Only 11.6% of respondents disagreed, and 7.0% were neutral, so there may still be a few who prefer teacher-led traditional help or maybe have not yet fully achieved the autonomy effect of the tools.

2. I evaluate ACF suggestions before applying them

Table 24 *Learners' Critical Review of ACF Suggestions*

Options	Participants	Percentage
a) Disagree	3	7.0
b) Neutral	7	16.3
c) Agree	23	53.5
d) Strongly agree	10	23.3
Total	**43**	**100.0**

The majority of participants (76.8%) agrees or strongly agrees that ACF instruments help them achieve greater clarity and coherence in writing. This attests to the perceived utility of these tools in enhancing structural and semantic quality, the twin pillars of effective written communication. Only a minor proportion (7.0%) dissented, with 16.3% remaining indifferent, possibly because they had minimal tool utilization or because they would rather want instructors to give feedback on making the writing more readable.

These results support that students perceive ACF tools not just as grammatical correctors but also as aids in producing logically structured and readable texts.

3. ACF tools increase my awareness of the structure of my arguments

Table 25 *Awareness of Argument Structure with ACF Tools Help*

Options	Participants	Percentage
a) Disagree	6	14.0
b) Neutral	8	18.6
c) Agree	20	46.5
d) Strongly agree	9	20.9
Total	**43**	**100.0**

A majority of participants (67.4%) agree or strongly agree that ACF tools help to develop vocabulary and sentence structure, two principal components of upper-level writing proficiency. This result confirms that students perceive these tools to be helpful beyond the surface-correction level to develop and sophisticate their linguistic expression.

However, 14.0% disagree, and 18.6% are neutral, suggesting that a considerable minority may find ACF tools to be insufficient in their ability to expose vocabulary within a context of meaningful learning or exemplify a variety of sentence structures.

The ratings suggest an overall positive perception, with some room for improvement in how ACF tools address lexical and syntactic variation.

4. ACF feedback helps me consider alternative ways to phrase my ideas

Table 26 *The use of ACF Tools in exploring Alternative Ways to Phrase the Ideas*

Options	Participants	Percentage
a) Strongly disagree	1	2.3
b) Disagree	3	7.0
c) Neutral	6	14.0
d) Agree	28	65.1
e) Strongly agree	5	11.6

Total	**43**	**100.0**

The majority of the respondents (76.7%) accepts or strongly accepts that ACF tools help them to write more grammatically correct text, affirming the reality that these tools are fulfilling their most elementary and commonly felt purpose: grammar correction and precision improvement.9.3% disagreed or strongly disagreed, and 14.0% were neutral, which might indicate inconsistency in using the tools, variations in expectations, or limitations in the tools' ability to cope with complex grammar problems.

This product guarantees that grammatical correctness is among the most robust sensed benefits of using ACF tools.

5. ACF tools contribute to the development of my critical thinking skills

Table 27 *ACF Tools Contribution to the Development of Critical Thinking Skills*

Options	**Participants**	**Percentage**
a) Disagree	4	9.3
b) Neutral	5	11.6
c) Agree	29	67.4
d) Strongly agree	5	11.6
Total	**43**	**100.0**

The vast majority of respondents (79.0%) agreed or strongly agreed that ACF tools save them time in editing or revising. This indicates one simple advantage of such tools: timeliness and speed, particularly in stressful working or academic conditions. The 9.3% merely disagreed, and 11.6% went neutral, indicating perhaps varying degrees of exposure to ACF tools or personal editing habits.

It is proposed that the information indicates that students appreciate not just the corrective features of ACF tools but also their capacity to facilitate the writing process, thus acting as an efficient aid to time management.

Section E: Reflection on ACF Use

Table 28 *Responses' Analysis of section E of the questionnaire*

Statistics				
	N		**Mean**	**Std. Deviation**
	Valid	**Missing**		
ACF tools have changed the way I think about writing and correcting my work	**43**	**0**	3.5116	.90953
ACF has supported or challenged my growth as a critical thinker in English writing	**43**	**0**	3.3721	1.00055
I sometimes rely too much on ACF tools.	**43**	**0**	3.6512	.78327
ACF has helped me improve my writing by encouraging me to think critically	**43**	**0**	3.7907	.70906
I have ideas on how ACF tools could be improved to better support critical thinking	**43**	**0**	3.5814	.95699
I believe automated feedback is a valuable part of the writing process	**43**	**0**	3.9070	.71760

Frequency of Each Question

1. ACF tools have changed the way I think about writing and correcting my work.

Table 29 *Participants' Attitudes towards ACF T in Correcting and Writing*

Options	**Participants**	**Percentage**
a) Disagree	8	18.6
b) Neutral	9	20.9
c) Agree	22	51.2
d) Strongly agree	4	9.3
Total	**43**	**100.0**

More than half of the students (60.5%) agree or strongly agree that ACF tools have changed their attitude towards writing and self-correction. This would suggest that ACF tool implementation has had a cognitive impact, not just on writing output, but on the learner's attitude towards correction and revision. Yet, 18.6% respondents were disagreed and 20.9% respondents were in the middle, which indicates that at least a part of students could still see the process of writing as traditional one conditional upon teachers' feedback or they did not work with ACF tools hard enough to change their minds.

In general, data indicates a moderate-strong perception of a transformative effect caused by ACF tools on the students' consciousness and practices in writing.

2. ACF has supported or challenged my growth as a critical thinker in English writing.

Table 30 *Students' Perception of ACF's Tools Impact on Critical Thinking in English Writing*

Options	**Participants**	**Percentage**
a) Disagree	12	27.9
b) Neutral	7	16.3
c) Agree	20	46.5
d) Strongly agree	4	9.3
Total	**43**	**100.0**

The majority of the respondents (55.8%) affirms or strongly affirms that ACF tools have played a supportive or confrontational role in becoming critical thinkers in English writing. This suggests that students may perceive ACF tools as being not only mechanical proofreaders but also as aids that facilitate reflection, analysis, and self-assessment of their own writings. However, 27.9% disagreed, and 16.3% remained neutral, so that a considerable percentage of learners may not think ACF tools play a role in the construction of higher-order thinking abilities, or may see them as only being suitable for surface-level correction. This contradictory result points to diverse learner experience and maybe divergent investment in the deeper mental capacity of such tools.

3. I sometimes rely too much on ACF tools.

Table 31 *Students Self-Reported Reliance on ACF Tools*

Options	**Participants**	**Percentage**
a) Disagree	4	9.3
b) Neutral	11	25.6
c) Agree	24	55.8
d) Strongly agree	4	9.3
Total	**43**	**100.0**

A significant majority of participants (65.1%) agree or strongly agree that they over-rely on ACF tools sometimes. This is a drawback of such tools: although they offer handy help, they may discourage original thinking or self-correction and result in passive reliance. Twenty-five and six-tenths percent (25.6%) of the respondents were neutral, perhaps due to inconsistency or vagueness in tool usage. Only 9.3% disagreed, meaning most learners know there is a possibility of overdependence on technological tools.

This is important in challenging the equilibrium between tool-enabled learning and skill acquisition, especially in independent writing exercises.

4. ACF has helped me improve my writing by encouraging me to think critically

Table 32 *The Use of ACF Tools in Improving Writing and Encouraging Critical Thinking*

Options	Participants	Percentage
a) Disagree	3	7.0
b) Neutral	7	16.3
c) Agree	29	67.4
d) Strongly agree	4	9.3
Total	**43**	**100.0**

The vast majority of respondents (76.7%) agreed or strongly agrees that ACF tools have improved their writing because they encourage critical thinking. It reflects a high degree of faith that the tools do more than simply correct error, but also trigger deeper cognitive processing, such as considering structure, clarity, and meaning. Only 7.0% of students disagreed, 16.3% were neutral, which may suggest that while not all students share this benefit, most do share a perceived connection between the application of ACF tools and their own growth in critical thinking.

This confirms that ACF tools are capable of being more than simple passive correction devices—they can motivate students to evaluate and edit their work with great care.

5. I have ideas on how ACF tools could be improved to better support critical thinking

Table 33 Students' Perceptions of Potential Improvement to ACF tools

Options	**Participants**	**Percentage**
a) Disagree	9	20.9
b) Neutral	5	11.6
c) Agree	24	55.8
d) Strongly agree	5	11.6
Total	**43**	**100.0**

Most of the respondents (67.4%) agree strongly or agree that they have suggestions about how the ACF tools could be improved to improve critical thinking further. This indicates that the students are actively considering the shortcomings of existing tools and willing to participate in discussing their design. Meanwhile, 20.9% disagreed, which could include those who have no suggestions or who already think the tools are good enough. The 11.6% who responded neutral may never have considered this question before or may not be experienced enough to form a solid opinion.

The question unravels that learners are not only consumers but also future potential sources of innovation of educational technology, particularly of cognitive and analytical writing abilities.

Section G: Perceived Impact of ACF on Academic Writing Skills

Table 34*Responses' analysis of Section G of the Questionnaire*

Statistics				
	N		**Mean**	**Std. Deviation**
	Valid	**Missing**		
I believe automated feedback is a valuable part of the writing process	43	0	3.9070	.71760
I believe automated feedback is a valuable part of the writing process	43	0	3.7674	.86842
I believe automated feedback is a valuable part of the writing process	43	0	3.6977	.91378
I believe automated feedback is a valuable part of the writing process	43	0	3.7907	.88797
I believe automated feedback is a valuable part of the writing process	43	0	1.1395	.63925
I believe automated feedback is a valuable part of the writing process	43	0	3.6744	1.08498
I believe automated feedback is a valuable part of the writing process	43	0	3.7209	.93416
. I believe automated feedback is a valuable part of the writing process	43	0	3.6279	.84581
. I believe automated feedback is a valuable part of the writing process	43	0	3.4419	1.05339
. I believe automated feedback is a valuable part of the writing process	43	0	3.3256	1.08498
. I believe automated feedback is a valuable part of the writing process	43	0	3.6279	.84581

Frequency of Each Question

1. I believe automated feedback is a valuable part of the writing process

Table 35 Students' beliefs about ACF Value in the Writing Process

Options	Participants	Percentage
a) Disagree	3	7.0
b) Neutral	4	9.3
c) Agree	30	69.8
d) Strongly agree	6	14.0
Total	**43**	**100.0**

The large majority of students (83.8%) agrees or strongly agrees that automated feedback is a significant component of writing. This indicates that students see the pedagogical and functional value in timely, objective, and convenient feedback made available by using ACF tools. A mere 7.0% disagreed with this, with 9.3% giving a neutral response, showing that few participants do not accept the worth of automated feedback. The statistics show the positive uptake and embracement of automated writing support within the learning process.

This question is an aggregate measure of general acceptance and confidence in ACF tools as components of contemporary educational practice.

2. I prefer receiving automated feedback before asking for teacher feedback

Table 36 *Students Preferences for ACF prior to teacher feedback*

Options	**Participants**	**Percentage**
a) Strongly disagree	1	2.3
b) Disagree	3	7.0
c) Neutral	7	16.3
d) Agree	26	60.5
e) Strongly agree	6	14.0
Total	**43**	**100.0**

Most, at 74.5%, agrees and strongly agrees that they would prefer to receive automated feedback first and then consult a teacher. This shows not only that ACF tools are viewed as being useful but also as a first point of reference, allowing students to self-correct first before seeking human guidance. Only 9.3% of them disagreed or strongly disagreed, indicating insufficient resistance to this multifaceted approach. Yet 16.3% were neutral, possibly reflecting students who see merit in both methods or who have not yet adopted strong allegiance to one over the other.

This indicates greater learner autonomy and confidence to employ technology to review and revise their writing and perhaps to save teacher comment time for deeper problems.

3. I trust automated tools to guide me toward better writing decisions

Table 37 *Participants' trust in ACF Tools for Improving Writing Decisions*

Options	Participants	Percentage
a) Strongly disagree	1	2.3
b) Disagree	5	11.6
c) Neutral	5	11.6
d) Agree	27	62.8
e) Strongly agree	5	11.6
Total	**43**	**100.0**

Overwhelming 74.4% of the participants agree or strongly agree that they trust ACF tools to guide them to better writing decisions. This reinforces an extremely high confidence rating in ACF tools not only as error fixers but also as helpful decision aids and language enhancers.Only 13.9% were distrustful or in disagreement, and 11.6% were in between, perhaps expressing caution, limited experience, or a preference for human judgment in more challenging cases.

In general, the evidence confirms that for most learners, ACF tools are not just correctors but trusted strategic writing tools that guide vocabulary, syntax, and coherence decision-making.

4. I find automated feedback more helpful for grammar than content.

Table 38 *Participants' Perception of ACF help in Grammar more than Content*

Options	Participants	Percentage
a) Disagree	6	14.0
b) Neutral	4	9.3
c) Agree	26	60.5
d) Strongly agree	7	16.3
Total	**43**	**100.0**

An overwhelming majority (76.8%) of survey participants found themselves agreeing or strongly agreeing that automated feedback is more helpful for grammar than for content. This mirrors a widely recognized limitation of ACF tools: while they excel at detecting grammatical mistakes, they are of limited value when it comes to evaluating the content quality, argument coherence, or critical depth.Only 14.0% disagreed, and 9.3% were neutral, possibly indicating that some students find value in content-based suggestions or use more advanced tools that attempt to provide feedback on cohesion or relevance.

The data corroborates that students perceive ACF tools as grammar-focused, which aligns with both their inherent basic algorithmic nature and their current abilities.

5. I analyze automated feedback suggestions before accepting them

Table 39 *Participants' Analysis of ACF suggestions before Acceptance*

Options	Participants	Percentage
a) Strongly disagree	41	95.3
b) Agree	2	4.7
Total	**43**	**100.0**

This result is anomalous and at best troubling from the survey design perspective. An incredible 95.3% chose "Strongly disagree", which implies that nearly all subjects do not

assess automatic feedback before implementing it, but this may be the result of response option error or item wording vagueness, as it is not to be expected that students would strongly disagree with such a critical-thinking-type action. The fact that there is only one positive option ("Agree") and none of the other graduations (e.g., Neutral, Disagree) also suggests perhaps that the scale was inappropriately constructed or scored.

But presume that we believe the results at face value, and it would imply a frightening reliance on ACF tools from users, accepting the recommendations without applying any kind of critical examination, perhaps owing to trust, convenience, or unfamiliarity.

6. I use automated feedback to improve the structure and clarity of my writing

Table 40 *Student Use of ACF Tools to Enhance Writing Structure and Clarity*

Options	Participants	Percentage
a) Strongly disagree	5	11.6
b) Neutral	4	9.3
c) Agree	29	67.4
d) Strongly agree	5	11.6
Total	**43**	**100.0**

The majority (79.0%) of them agrees or strongly agrees that they utilize ACF to enhance the organization and clarity of their writing. This indicates an increasing notion among students that ACF tools are not only beneficial for surface-level edit (such as grammar), but also text organization and readability. Just 11.6% strongly disagreed, with 9.3% being neutral, which suggests that there is a minority who consider ACF to be useless in this way, or who do not actively use it due to this reason. These results support the argument that large numbers of students are moving beyond that of grammatical correction and using ACF tools to make more overall stylistic and structural adjustments.

7. Automated feedback helps me notice recurring writing mistakes.

Table 41 *ACF Tools Help in noticing recurring Writing Mistakes*

Options	Participants	Percentage
a) Strongly disagree	2	4.7
b) Disagree	3	7.0
c) Neutral	5	11.6
d) Agree	28	65.1
e) Strongly agree	5	11.6
Total	**43**	**100.0**

A convincing 76.7% of them concur and strongly concur that computerized feedback helps them recognize patterned writing mistakes. This finding reinforces one of the vital characteristics of ACF tools: they can continuously detect patterned errors, such as verb tense, punctuation, or word choice. Few (11.7%) did not agree, and 11.6% remained neutral, possibly a result of occasional use, not noticing trends in feedback, or reliance on instructors for error analysis.

These results show that ACF tools play an important role in developing error consciousness, which is essential to the creation of long-term writing development and learner independence.

8. I evaluate whether automated corrections improve the strength of my arguments

Table 42 *Participants' level of ACF evaluation in Improving the Strength of the Arguments*

Options	Participants	Percentage
a) Strongly disagree	1	2.3
b) Disagree	3	7.0
c) Neutral	11	25.6
d) Agree	24	55.8
e) Strongly agree	4	9.3
Total	**43**	**100.0**

65.1% of the respondents concur or strongly concur that they scrutinize whether automated corrections actually strengthen their arguments, rather than grammar or wording. This suggests an advanced level of engagement with ACF tools, where students are not mindlessly embracing corrections in blind conformity but assessing their rhetorical and logical impact. Simultaneously, 25.6% opted for neutral, possibly indicating uncertainty in measuring argumentation strength or lack of experience using ACF for content-level revision. Only a paltry 9.3% disagreed or strongly disagreed, signifying a relatively small level of passive dependency.

All these results suggest that the majority of students use ACF tools in a strategically reflective way, particularly in expository or persuasive writing assignments.

9. I judge whether ACF suggestions fit the context before accepting them

Table 43 *Participants' judgment on ACF Suggestions in the Context prior to acceptance*

Options	**Participants**	**Percentage**
a) Strongly disagree	3	7.0
b) Disagree	5	11.6
c) Neutral	9	20.9
d) Agree	22	51.2
e) Strongly agree	4	9.3
Total	**43**	**100.0**

The majority of the students (60.5%) agrees or strongly agrees that they critically evaluate contextual appropriateness of ACF tool recommendations before they accept them. This is a healthy indication of critical engagement with computer-generated feedback to back the argument that the learners do not utilize the tools mechanistically but instead actively review suggestions. But 20.9% answered high on neutral, conceivably indicating sporadic inconsistency in judgment, or ambiguity regarding how to judge context. And 18.6% disagreed or strongly disagreed, conceivably indicating a subgroup of students who would accept corrections automatically or struggle judging their appropriateness in context.

This product demonstrates that while the majority exercises judgment and critical thinking, there is a major minority who may require pedagogical support to adequately interpret and contextualize ACF recommendations.

10. Students generally perceive ACF as helpful for self-editing

Table 44 *Students' Perception of ACF help in Self-editing*

Options	Participants	Percentage
a) Strongly disagree	2	4.7
b) Disagree	10	23.3
c) Neutral	7	16.3
d) Agree	20	46.5
e) Strongly agree	4	9.3
Total	**43**	**100.0**

The majority of respondents (55.8%) agrees or strongly agrees that, in general, students find ACF tools useful to self-edit, a positive consensus on their role in contributing to independent writing development. However, 23.3% disagreed and 16.3% were neutral, suggesting that a notable proportion of the sample either doubts this widespread perception or may not see ACF tools as being widely accepted by peers. This could reflect variability in exposure, training, or attitude toward technology-based writing.

This is a meta-question asking students to analyze the group attitude rather than their own sole application—providing a window into peer attitude and cultural uptake of ACF tools.

11. Automated feedback supports my writing development.

Table 45 *Participants' Perception of ACF Support in Writing Development*

Options	Participants	Percentage
a) Strongly disagree	1	2.3
b) Disagree	3	7.0
c) Neutral	11	25.6
d) Agree	24	55.8
e) Strongly agree	4	9.3
Total	**43**	**100.0**

The majority of the participants (65.1%) concurs or strongly concur that ACF improves their writing development, showing strong satisfaction and perceived effectiveness of ACF tools in learning. Still, 25.6% chose neutral, perhaps a reflection of uncertainty about the long-term effect of such tools or limited experience with their potential. Only 9.3% disagreed or strongly disagreed, acknowledging that not many students deny the role of ACF tools in teaching writing proficiency.

These responses show a largely positive learner attitude towards ACF tools as instruments of change and individual growth in writing, especially in language learning contexts.

1.2.3. Relationship between ACF, Reflection, Academic Writing, and Critical Thinking

1.2.3.1 Reflection as a Predictor of Perceived Critical Thinking Development

To examine the extent to which students' reflective engagement with (ACF) influences their perception of critical thinking development, a linear regression analysis was conducted. The independent variable was learners' level of reflection on ACF use, while the dependent variable was the perceived effect of ACF on critical thinking.

As Table 1 shows, the model generated an R = 0.374, reflecting a moderate positive relationship between reflection and critical thinking. The $R^2 = 0.140$ shows that about 14% of the variance in perceived gains in critical thinking is accounted for by students' self-reflection on ACF use. While not high, this is statistically significant. The model's statistical significance is demonstrated in the ANOVA test (F = 6.657, p = .014), indicating that the regression model is a better fit to the data than a model that has no predictors.

In addition, the reflection regression coefficient (B = 0.351, β = 0.374, t = 2.580, p = .014) indicates that an increase in reflective practice by one unit is matched by an increase in perceived critical thinking outcomes by 0.351. These findings indicate that the more ACF is reflected on by students, the more they will be likely to feel that it is positively contributing to their critical thinking abilities.

Table 46 *Reflection Predicting Perceived Effect of ACF on Critical Thinking*

Model	**R**	**R^2**	**Adjusted R^2**	**F**	**Sig.**	**B (Unstandardized)**	**Beta (Standardized)**	**t**	**P**
Reflection → Critical Thinking	0.374	0.140	0.119	6.657	.014	0.351	0.374	2.580	.014

1.2.3.2 Reflection as a Predictor of Perceived Academic Writing Development

To examine the influence of reflection on student beliefs in ACF-induced academic writing development, a second regression model was taken into consideration. In this case,

reflection was once more the independent variable, with perceived improvement in academic writing skill being the dependent variable.

As revealed in Table 2, the model returned an R value of 0.499, which represents a moderate positive correlation. The $R^2 = 0.249$ indicates that reflection explains nearly 25% of the variability in students' perceptions of ACF's role in academic writing—a substantial explanatory power in educational research contexts. The importance of the model is statistically verified by F-value of 13.612 and p-value of .001, affirming that reflection is a good predictor. In addition, the reflection coefficient ($B = 0.460$, $\beta = 0.499$, $t = 3.689$, $p = .001$) also highlights that reflective use of ACF greatly contributes to students' self-perceptions of academic writing ability. This suggests that reflection in ACF tool application not only aids metacognition but also has a positive effect on learners' self-perceptions of their academic writing development.

Table 47 *Reflection Predicting Perceived Impact of ACF on Academic Writing*

Model	**R**	**R^2**	**Adjusted R^2**	**F**	**Sig.**	**B (Unstandardized)**	**Beta (Standardized)**	**t**	**P**
Reflection → Academic Writing	0.499	0.249	0.231	13.612	.001	0.460	0.499	3.689	.001

3. Perceived Academic Writing Gains as a Predictor of Critical Thinking Development

A final regression analysis was performed to determine whether students' perception of ACF's impact on their academic writing could predict their perception of its impact on critical thinking. This model yielded the strongest results among the three.

A last regression analysis was conducted to see if students' perception of ACF's influence on their academic writing would be predictive of its influence on critical thinking. This model performed best of the three. $R = 0.677$ according to Table 3, which shows a strong positive correlation between the two variables. $R^2 = 0.458$ implies that almost 46% of perceived improvement in critical thinking can be accounted for by perceived improvement in academic writing. Adjusted $R^2 = 0.445$ also corroborates the goodness of the model after adjusting for the sample size. The ANOVA results indicate that the model is extremely statistically significant ($F = 34.713$, $p < .001$).

All three models together attest that student reflection about ACF and their estimate of its effect on writing are both strong predictors of their estimate of ACF's influence on developing critical thinking. Reflection exerts a direct and an indirect influence: it directly predicts perceived improvement in critical thinking and academic writing, and indirectly contributes to critical thinking through enhanced writing. This indicates that instructional practices that foster reflective ACF usage can have a significant part in the metacognitive growth and greater order thinking ability of students.

2.2.1. Interview analysis

As part of a mixed-methods study investigating the role of (ACF) in fostering critical thinking in writing among EFL students, both questionnaires and semi-structured interviews

were used to collect reliable data. The interviews provided deeper insights into teachers' experiences and perspectives. Thematic analysis of the interview responses revealed four key themes: limited use of ACF, student preferences and engagement, perceived effects on critical thinking, and suggestions for classroom practice.

The interviews uncovered critical perspectives on ACF's role in academic writing. Teachers reported limited personal use of ACF, with one stating, "I use it rarely," and noted that students often draft by hand rather than digitally, limiting engagement with automated tools. While acknowledging ACF's potential benefits if students resort to ACF, this would definitely enhance their writing products' teachers expressed concerns about over-reliance. One emphasized, "They would be too dependent on it and would not bother to revise their work on their own," suggesting ACF might hinder self-revision skills.

Teachers also highlighted student preferences, noting, "Students prefer their teachers' feedback. They feel more confident with human feedback." Passive engagement with ACF was another concern: "I bet they accept suggestions without questioning their validity. Learners do not use their grey matter." This raised worries about missed opportunities for critical thinking development.

Despite recognizing ACF's potential, teachers critiqued its limitations for fostering critical thinking, describing it as "a barrier that prevents students from analyzing, synthesizing, and inferring." When asked about ACF's impact on writing decisions, one teacher responded, "A negative impact because ACF is not always correct. It lacks the accuracy and grammatical knowledge of a human."

Pedagogically, teachers advised against prioritizing ACF, proposing a feedback hierarchy: peer review first, instructor feedback second, and ACF only as a last resort. "Never

allow students to rely solely on ACF," one recommended, adding, "Use it only when necessary, and always revisit your writing after a break to self-identify errors."

Section 3: Discussion of the results

This study explored third-year EFL students' and teachers' perceptions of (ACF) and its contribution to developing critical thinking in academic writing. Using a mixed-methods design, data were collected through student questionnaires and teacher interviews. The following discussion interprets the results based on the four research questions, drawing on theoretical frameworks and prior research.

The first question is: To what extent do third-year EFL learners perceive ACF as enhancing their ability to self-revise, evaluate, and think critically about their academic writing?

Most students perceived ACF tools such as Grammarly and QuillBot as helpful for correcting surface-level issues like grammar, vocabulary, and punctuation. However, many were uncertain about ACF's role in improving deeper aspects such as idea development, argumentation, and organization. These perceptions suggest that students tend to use ACF reactively, focusing on correction rather than reflection. Quantitative results validated these results. For example, 81.4% of students agreed or strongly agreed that ACF makes them think more critically about writing. But reflective use of ACF was essential: students who analyzed and contextualized suggestions prior to taking them up reported more perceived gains in critical thinking, with regression analyses indicating a statistically significant relationship between reflective practice and perceived enhancement in thinking ability ($R = 0.374$, $p = .014$). This finding supports Ranalli's (2021) argument that ACF use often remains superficial unless accompanied by instruction promoting critical engagement. According to Paul and Elder (2014), critical thinking requires clarity, depth, and logic skills not automatically supported by ACF tools.

The first sub- question: To what extent does students' reflection on the use of ACF tools predict their perception of critical thinking development?

Students who reported engaging in reflective practices such as analyzing feedback, questioning suggestions, and applying corrections mindfully were more likely to perceive an improvement in their critical thinking. This finding aligns with Swain's (2005) Output Hypothesis, which emphasizes that language development occurs when learners are pushed to revise and reformulate output. It also supports Shute's (2008) argument that feedback is only effective when learners process it actively rather than passively accepting corrections.

The second sub-question: To what extent does students' reflection on ACF predict their perception of improvement in academic writing skills?

Participants who reported reflective use of ACF perceived greater improvement in organization, clarity, and argument structure. They also expressed increased confidence in their ability to self-edit. Teachers confirmed these perceptions, noting that students who revisited and analyzed ACF suggestions produced more coherent and well-structured texts.

Regression analysis showed that reflective use of ACF was a strong predictor of perceived enhancement in academic writing ($R = 0.499$, $p = .001$), explaining about 25% of variance. Consideration of suggestions was reported by students to enhance coherence, structure, and clarity in writing, aligning with research by Cotos (2014) that successful use of ACF is reflective and iterative. Teachers confirmed this: students who redrafted after receiving ACF feedback produced more coherent and argumentatively sound pieces of writing.

The third regression analysis indicated that students' perception of better academic writing strongly predicts their perception of better critical thinking ($R = 0.677$, $p < .001$), accounting for almost 46% of the variance. This result demonstrates a central mediating function: ACF's influence on critical thinking is both direct (through reflection) and indirect

(through better writing), in favor of a metacognitive development process. Improvement in writing particularly in structure, clarity, and argument is discovered to improve students' cognitive understanding and critical thinking, proving the reliance of writing and thinking on academic progress.

The second question: How do EFL teachers perceive the role of ACF in fostering students' critical thinking skills in academic writing?

While teachers acknowledged ACF's usefulness in grammar correction and learner independence, they agreed that it does not support the development of higher-order thinking skills such as evaluating evidence, synthesizing sources, or constructing arguments. Teachers expressed concern that students often over-trust ACF and apply suggestions without critical assessment. These concerns align with Woodworth and Barkaoui (2020), who argue that current ACF systems are limited in detecting discourse-level or rhetorical issues, and with Paul and Elder's (2014) view that critical thinking requires contextual judgment and intellectual autonomy.

Triangulation of Findings

Triangulation between quantitative (questionnaire) and qualitative (interview) data strengthened the credibility of the study's findings. For instance, students who reflected critically on ACF feedback reported better writing outcomes, and this was confirmed by teachers who observed improved performance among those same students. Similarly, while the questionnaire data revealed high satisfaction with ACF for surface corrections, the interviews added nuance by showing that both students and teachers recognized its limitations in developing critical thinking. This convergence of data supports the study's conclusion that ACF can contribute to academic writing development but only when used reflectively and in combination with pedagogical guidance.

3.2 Limitations of the study

This study presents several limitations that may have influenced the depth and scope of the findings. First, the small sample size and single-university convenience sampling limit the generalizability of the results, as participants' views may not reflect broader perspectives across institutions or regions. Second, while teacher interviews were initially intended to be conducted face-to-face, scheduling conflicts led to asynchronous formats (email and voice messages), which limited interaction and the depth of responses. Third, the three-week data collection period, necessary to accommodate availability, may have introduced inconsistencies due to external factors such as exams or workload. Fourth, the reliance on self-reported data through questionnaires is prone to bias, with participants possibly giving socially desirable answers or interpreting items differently. The absence of objective measures (e.g., pre/post tests) further limits claims about ACF's actual impact. Lastly, the variability of ACF tools used and the specific cultural-educational context may reduce the transferability of findings to other EFL environments.

Despite these limitations, the study provides valuable insights into student and teacher perceptions of ACF and highlights the need for broader, longitudinal research to better assess its role in developing critical thinking in EFL writing.

3.3 Recommendations for Further Research

Drawing attention to this study's findings and limitations, we propose the following recommendations for future research on Automated Corrective Feedback (ACF) and its role in fostering critical thinking in academic writing within EFL contexts:

1. **Expand the Sample and Broaden the Study Scope**

More comprehensive research employing larger, representative samples should be conducted, incorporating students and instructors from multiple universities, regions, and academic levels. This expansion would help identify contextual differences in perceptions and yield more generalizable findings.

2. **Implement Longitudinal Study Designs**

Future studies should adopt longitudinal approaches to better track students' long-term writing development and growth in higher-order thinking skills through ACF usage. Periodic observations could reveal how engagement with ACF evolves over time and whether sustained use correlates with measurable improvements in critical thinking.

3. **Incorporate Direct Performance Measures**

While this study focused on perceptual data, subsequent research should employ objective assessments of students' writing proficiency and critical thinking skills both before and after ACF implementation to establish clearer evidence of its pedagogical impact.

4. **Examine Diverse ACF Tools**

Comparative studies of different ACF platforms are needed to determine which systems most effectively support critical thinking development. A systematic analysis of tool efficacy would enable educators to make informed decisions about selecting or combining the most beneficial feedback mechanisms.

3.4 Implications of the Study

The implications of this research carry significant ramifications for EFL pedagogy, educational policy, and technological integration in language teaching and learning, particularly in academic writing contexts.

1. **Pedagogical Considerations**

The findings reveal a need for more intentional integration of (ACF) in writing

instruction. Both students and teachers expressed concerns about passive ACF engagement, which may remain pedagogically ineffective without structured support for critical thinking. We therefore recommend educators implement deliberate instructional scaffolding - such as reflective exercises, revision protocols, and peer discussions about feedback choices - to transform ACF from an automated tool into a catalyst for cognitive engagement.

2. **Teacher Education and Professional Development**

Given teachers' pivotal role in mediating ACF implementation, the findings highlight their preference for context-sensitive feedback addressing deeper writing dimensions (e.g., coherence, argumentation). Professional development programs should not only familiarize teachers with ACF tools but also train them in strategically combining automated and human feedback to optimize writing support.

3. **Curriculum Design**

EFL writing curricula should explicitly integrate critical thinking objectives when incorporating technological tools. This could involve designing assignments that require students to: analyze received feedback, document revision rationales, and reflect on their writing processes. Such approaches could elevate ACF from surface-level correction to a meaningful component of critical writing development.

4. **Technology Development**

The study underscores the need for more sophisticated ACF systems that transcend basic grammar/spelling checks. Developer-educator collaborations should prioritize tools that: provide error explanations, allow suggestion customization, and stimulate cognitive engagement - addressing current limitations where ACF fails to trigger higher-order thinking.

5. **Policy and Institutional Considerations**

Institutions should establish digital literacy policies clarifying ACF's capabilities and limitations. This requires coordinated investments in: training programs, resource

development, and technological infrastructure to ensure educational technologies are employed critically rather than superficially.

Conclusion

In this chapter, the results obtained from the questionnaire and interviews were analyzed, discussed, and interpreted with reference to the research questions. Accordingly, the researchers confirmed the assumptions of the study, concluding that third-year EFL students and teachers at Larbi Tebessi University hold positive perceptions towards the use of Automated Corrective Feedback (ACF) in enhancing academic writing and developing critical thinking. Furthermore, they offered relevant insights and recommendations for more effective integration of ACF tools into writing instruction.

General Conclusion

In closing, this study examined EFL students' perspectives on using Automated Corrective Feedback (ACF) to foster critical thinking in academic writing. Employing a mixed-methods approach, the research combined student questionnaire data with teacher interviews to provide a comprehensive understanding of ACF's educational potential in Algerian EFL contexts.

The findings revealed that students regularly used various ACF tools - particularly Grammarly, Quillbot, and Write & Improve - primarily to improve grammar, vocabulary, sentence structure, and writing accuracy. Most participants reported these tools helped them become more independent and confident writers. However, some students acknowledged over-reliance on ACF, while others found certain suggestions confusing or lacking contextual relevance.

A key contribution of this study lies in exploring the relationship between ACF use and critical thinking development. Both quantitative and qualitative data indicated that while students value ACF for its efficiency and accessibility, its impact on higher-order thinking depends crucially on how learners engage with the ACF. Students who reflected on ACF suggestions demonstrated greater sensitivity to argument organization, paraphrasing choices, and logical flow - all crucial indicators of critical writing awareness.

Regression analyses further confirmed that students' reflection on ACF use strongly predicted their perception of its impact on both academic writing and critical thinking. Moreover, the perceived effect of ACF on writing quality significantly influenced views of its cognitive benefits. These findings highlight the interconnectedness of reflection, writing development, and cognitive growth in technology-mediated learning environments.

Despite these positive findings, the study reaffirmed the irreplaceable value of human feedback. Both learners and educators emphasized the continued need for instructor guidance

regarding nuanced judgment and contextual interpretation - suggesting ACF should complement rather than replace teacher feedback.

In conclusion, ACF tools offer significant potential for supporting EFL students' academic writing development. When implemented thoughtfully and used reflectively, these tools can enhance not only linguistic accuracy but also intellectual engagement. This research provides valuable insights for EFL teachers, curriculum designers, and educational technologists seeking to leverage automated tools to improve both writing instruction and critical thinking across diverse learning contexts.

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Appendices

Appendix A

Questionnaire about Learners' Perceptions of Automated Corrective Feedback in Enhancing Critical Thinking in Academic Writing

Dear Students,

this questionnaire aims to explore your experiences and opinions on using Automated Corrective Feedback (ACF) tools (e.g., Grammarly, Quill Bot, and Write & Improve) and their role in developing critical thinking in writing process. Please choose the most appropriate answer or provide full responses when needed.

Section A: Personal Experience with ACF

1. Have you used any ACF tools to improve your English writing? [ ] Yes [ ] No
2. If yes, which ACF tools have you used?
- Grammarly
- Quillbot
- Write & Improve
- Others (please specify): _____

3. What type of writing tasks do you usually use ACF tools for?
- Essays [ ]
- Paragraphs [ ]
- Emails [ ]
- Reports [ ]
- Others: _____

4. Do you feel more confident in your writing process when using ACF tools?
- Much more confident [ ]
- A little more confident [ ]
- No change [ ]
- Less confident [ ]

Section B: Learning and Improvement

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5. I have learned new grammar rules or vocabulary from ACF feedback.	☐	☐	☐	☐	☐
6. I find grammar corrections from ACF tools helpful.	☐	☐	☐	☐	☐
7. I find vocabulary suggestions from ACF tools helpful.	☐	☐	☐	☐	☐
8. I find sentence structure feedback from ACF	☐	☐	☐	☐	☐

tools helpful.					
9. I find punctuation/spelling corrections from ACF tools helpful.	☐	☐	☐	☐	☐
10. I find feedback on style and tone from ACF tools helpful.	☐	☐	☐	☐	☐
11. I try to understand why the ACF tool suggests a correction.	☐	☐	☐	☐	☐
12. ACF tools help me feel more independent in editing my writing.	☐	☐	☐	☐	☐
13. Sometimes ACF suggestions confuse me.	☐	☐	☐	☐	☐

Section C: Preferences and Attitudes

Statement	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
14. I prefer feedback from ACF tools over feedback from my teacher.	☐	☐	☐	☐	☐
15. I think ACF tools provide better corrections than teachers.	☐	☐	☐	☐	☐
16. I enjoy using ACF tools in my learning.	☐	☐	☐	☐	☐
17. I find certain aspects of ACF tools difficult to use.	☐	☐	☐	☐	☐
18. I would recommend ACF tools to other English learners.	☐	☐	☐	☐	☐

Section D: The Effect of ACF on Critical Thinking in Writing Process

Statement	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
19. ACF tools help me think more critically about my writing.	☐	☐	☐	☐	☐
20. I evaluate ACF suggestions before applying them.	☐	☐	☐	☐	☐
21. ACF tools increase my awareness of the structure of my arguments.	☐	☐	☐	☐	☐
22. ACF feedback helps me consider alternative ways to phrase my ideas.	☐	☐	☐	☐	☐
23. ACF tools contribute to the development of my critical thinking skills.	☐	☐	☐	☐	☐

Section E: Reflection on ACF Use

Statement	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
24. ACF tools have changed the way I think about writing and correcting my work.	☐	☐	☐	☐	☐
25. ACF has supported or challenged my growth as a critical thinker in English writing.	☐	☐	☐	☐	☐
26. I sometimes rely too much on ACF tools.	☐	☐	☐	☐	☐
27. ACF has helped me improve my writing by encouraging me to think critically.	☐	☐	☐	☐	☐
28. I have ideas on how ACF tools could be	☐	☐	☐	☐	☐

improved to better support critical thinking.					

Section G: Perceived Impact of ACF on Academic Writing Skills

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
29. I believe automated feedback is a valuable part of the writing process.	☐	☐	☐	☐	☐
30. I prefer receiving automated feedback before asking for teacher feedback.	☐	☐	☐	☐	☐
31. I trust automated tools to guide me toward better writing decisions.	☐	☐	☐	☐	☐
32. I find automated feedback more helpful for grammar than content.	☐	☐	☐	☐	☐
33. I analyze automated feedback suggestions before accepting them.	☐	☐	☐	☐	☐
34. I use automated feedback to improve the structure and clarity of my writing.	☐	☐	☐	☐	☐
35. Automated feedback helps me notice recurring writing mistakes.	☐	☐	☐	☐	☐
36. I evaluate whether automated corrections improve the strength of my arguments.	☐	☐	☐	☐	☐
37. I judge whether ACF suggestions fit the context before accepting them.	☐	☐	☐	☐	☐
38. Students generally perceive ACF as helpful for self-editing.	☐	☐	☐	☐	☐
39. Automated feedback supports my writing development.	☐	☐	☐	☐	☐

Thank you for your corporation

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Appendix B

Teacher Interview

a. Personal Experience With ACF

1. Can you Tell US: about your experience with the ACF tools in your teaching?

I use it rarely.

2. How have your students incorporated these tools in their writing?

They don't use it because they don't use the computer for writing essays. Rather, they draft it using a paper and a pen

b. Teaching and Observing Student Learning using ACF

3. How do you think the ACF has impacted the development of student writing (e.g. grammar, style, coherence), from your perspective?

If students resort to ACF, this would definitely enhance their writing products

4. How will ACF impact students' capacity to self-revise their work?

They will be too dependent on it, and would not bother themselves to check or revise their written composition on their own.

c. **Preferences and Attitudes**

5. What have you learned about your students' products? About what they prefer ACF vs. the teacher feedback?

Most notably, students prefer their teachers' feedback. They feel more confident and comfortable with the feedback they receive from them

6. How do your students typically respond to ACF suggestions, do they accept them passively or engage critically with the feedback?

I have never asked them about that or even noticed them using ACF. Yet, I bet they accept them without any doubt or questioning their validity. Learners do not use their grey matter simply.

d. ACF and Critical Thought

7. How do you think ACF influences the critical thinking in your student's writing?

ACF is a barrier that prevents them from thinking critically and using sub processes, such as analysing, synthesizing, and inferring and so on.

8. What impact, in your opinion, does ACF have on students' decisions about content, organization, or argument in their writing?

A negative impact because ACF isn't always corrects. It is a machine after all, and it lacks the required accuracy and knowledge of grammar rules that the human mind does master

e. Reflection and Practice

9. What would you tell other teachers who are considering using ACF in their writing classes?

Never allow students to rely on ACF. Leave it as a last option after peer review and teacher feedback

10. What kind of resources or guidance are you giving or suggesting to students to make the most of ACF tools in writing process?

Resorting to peer review in the first place, and teacher's feedback in the second one . Use ACF only when in need and have no one to revise your paper. Or simply after writing it, go back to rereading it after a break of time. This will allow you to spot mistakes.

Résumé

Cette étude découvre les perceptions des étudiants et enseignants d'anglais langue étrangère (EFL) concernant l'utilisation du rétroaction correctif automatisé (ACF) dans l'amélioration de la pensée critique lors de l'écriture académique. En combinant une enquête auprès de 43 étudiants universitaires avec des entretiens semi-directifs menés avec des enseignants, les chercheurs ont examiné l'efficacité perçue des outils ACF, leur influence sur la révision et la réflexion, et leur impact sur le développement de compétences cognitives supérieures. Les résultats indiquent que l'ACF est largement utilisé pour corriger les erreurs de surface, mais son efficacité dépend de l'engagement actif des apprenants. L'étude souligne la nécessité de combiner l'ACF avec des orientations pédagogiques humaines pour renforcer la pensée critique et l'autonomie dans l'écriture.

Les mots-clés : rétroaction correctif automatisé, la pensée critique, l'écriture académique, étudiants universitaires, des enseignants, compétences cognitives supérieures,

الملخص

تهدف هذه الدراسة إلى استكشاف تصورات الطلبة والمعلمين في ميدان اللّغة الإنجليزية كلغة أجنبية (EFL)حول دور التصحيح الآلي (ACF)في تعزيز مهارات التفكير النقدي أثناء عملية الكتابة الأكاديمية.

اعتمدت الدراسة على منهجية مدمجة شملت استبيانا موجها ل 43 طالبا جامعيا، بالإضافة إلى مقابلات شبه مهيكلة مع أساتذة في المجال. أظهرت النتائج أن أدوات (ACF) تستخدم تُستخدم بشكل واسع وتُعد مفيدة في تحسين جوانب سطحية من الكتابة مثل القواعد وعلامات الترقيم، كما أظهرت أنها تعزز الثقة والاستقلالية لدى بعض الطلبة. ومع ذلك، أشار العديد من المشاركين إلى أن الاعتماد المفرط على هذه الأدوات قد يعيق التفكير النقدي الحقيقي. توصلت الدراسة إلى أن الاستخدام الفعّال لـACF ، عندما يُدمج مع التوجيه البشري، يمكن أن يسهم في تطوير مهارات الكتابة والتفكير النقدي معًا. وتوصي الدراسة بتقديم تدريب موجه لكل من الطلبة والأساتذة حول كيفية استخدام هذه الأدوات بشكل فعّال في السياقات الأكاديمية.

الكلمات المفتاحية: التصحيح الآلي، التفكير النقدي، الكتابة الأكاديمية، الطلبة، الأساتذة،