



A Bibliometric Analysis of Grammar Instruction and Written Feedback in Second-Language (L2) Writing

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Abstract. Grammar instruction and written corrective feedback are widely recognized as central components of second-language writing development, yet research on how these two strands intersect with emerging technology-mediated writing tools remains fragmented, with no comprehensive account of how the field has evolved conceptually and methodologically over time. This gap limits understanding of dominant research patterns and influential contributions within grammar and second-language writing scholarship. This paper conducted a Bibliometric Analysis of research on grammar instruction and technology-enhanced writing pedagogy in second-language contexts published from 2015 to 2025. Specifically, it aimed to map the intellectual landscape and evolution of the field by analyzing annual publication trends and identifying the ten most-cited articles, while simultaneously mapping terminology co-occurrence links and temporal overlay visualizations to uncover thematic trajectories and emerging research trends across the study period. Bibliographic records were retrieved from Google Scholar and Scopus, then screened through an Identification, Screening, Eligibility, and Inclusion process, yielding a refined dataset of 152 journal articles. The dataset was analyzed using VOS viewer to generate keyword co-occurrence, overlay, and density visualizations. Results showed that grammatical accuracy and corrective feedback constituted the conceptual core of the field, with research progressively shifting from teacher-centered, direct feedback practices toward technology-mediated, adaptive, and artificial intelligence-assisted feedback models. Publication output followed a cyclical rather than linear growth pattern, culminating in a marked surge in the most recent years. The ten most-cited articles centered on feedback timing, feedback type, and individual learner differences. Despite the theoretical alignment between grammar instruction and writing development, findings indicate that explicit grammar teaching remains insufficiently integrated into sustained, technology-supported writing practice. These results map the field's established knowledge clusters and structural gaps, stressing the need for longitudinal research designs and principled instructional models that embed form-focused instruction within iterative, technology-mediated feedback cycles.

Keywords: Grammar Instruction; Written Corrective Feedback; Second-Language Writing; Adaptive Learning; Technology-Enhanced Writing; Bibliometric Analysis

Introduction

Mastery of grammar and writing is the bedrock of academic literacy, empowering learners to express their ideas with precision, clarity, and strong rhetorical control. Far from being a rigid list of rules, grammar acts as a cognitive tool that shapes human thought into meaningful communication. Within this process, teaching grammar in context helps students produce text that is both structurally accurate and rich in meaning (Ly, 2020). Building this foundational proficiency directly supports Sustainable Development Goal 4 (SDG 4), which champions inclusive, equitable quality education. Specifically, helping learners build strong writing skills advances SDG Target 4.1 (achieving effective learning outcomes) and Target 4.6 (promoting youth and adult literacy). Even so, writing fluency requires more than just mechanical grammatical knowledge; it must



develop through a continuous, recursive cycle of brainstorming, drafting, revising, and reflecting. By viewing grammar as an active resource for creating meaning instead of an isolated requirement, process-based writing instruction successfully creates a link between mechanical correctness and authentic, real-world communication in second language (*L2*) environments.

While the theoretical connection between grammar and writing is well-established, research shows that practical classroom implementation remains complex and uneven. Despite widespread support for communicative language teaching, ongoing gaps in student writing skills suggest unresolved tensions between form-focused instruction and authentic practice. Studies demonstrate that simply teaching grammatical rules in isolation is insufficient to ensure writing fluency (Belmekki, 2023). From an SDG 4 perspective, this disconnect is highly consequential: if grammar is not integrated into authentic writing tasks, efforts to provide inclusive, quality education for diverse language learners may fall short. Furthermore, this gap reflects considerable variation in how grammar instruction and written corrective feedback are implemented and evaluated, differences stemming from conflicting theoretical orientations and research designs (Nemati et al., 2017). As a result, the growing body of literature has become increasingly fragmented, complicating efforts to pinpoint dominant trends and shared conceptual ground.

In response to the growing complexity, recent studies have increasingly turned toward technology-enhanced writing instruction, further reshaping the research landscape (Williams & Beam, 2019). The rapid expansion of studies on automated feedback systems, corpus-informed instruction, and AI-assisted writing tools has diversified both the conceptual and methodological orientations of grammar-writing research (Barrot, 2021; Shi & Aryadoust, 2024). Traditional frameworks have systematically mapped oral and written corrective feedback as distinct yet theoretically parallel constructs within conventional classrooms (Li & Vuono, 2019). However, comparatively little attention has been devoted to systematically mapping how grammatical accuracy, written corrective feedback, and these newer technology-mediated writing instructions intersect across time. This points to a clear knowledge gap concerning the conceptual structure and evolution of the field, alongside a methodological gap in understanding publication trends and influential research contributions. Bibliometric analysis provides a rigorous means of addressing such gaps by offering a macro-level synthesis of research patterns, conceptual linkages, and citation networks within the field of grammar and *L2* writing research.

Research Objectives

This study aimed to conduct a Bibliometric Analysis of Research on Grammar Instruction and Technology-enhanced writing pedagogy in second-language contexts from 2015 to 2025. Specifically, this study sought to:

1. Map the co-occurrence networks of key terminologies;
2. Trace the temporal evolution of research terms via overlay visualization to trace thematic trajectories and emerging trends within the field;
3. Analyze the annual publication trends of articles spanning the 2015–2025 period; and
4. Identify the top ten most-cited research articles.

Literature Review

Grammar Instruction in Language Learning

Grammar instruction involves structured methods designed to help learners master second-language syntax, sentence structure, and accurate language use. Traditionally, approaches like the Grammar-Translation Method prioritized formal accuracy through explicit rule explanations and rote memorization; however, while this built strong declarative knowledge, it often left learners underprepared for spontaneous communication (Qasserras, 2023). Although the subsequent rise of Communicative Language Teaching (CLT) shifted the focus toward meaning, interaction, and learner autonomy, it drew criticism for de-emphasizing explicit grammar and leaving gaps in formal accuracy (Qasserras, 2023). Research in form-focused instruction (FFI) resolves this tension: Ahmadi et al. (2022) demonstrated that combining integrated and isolated FFI allows learners to outperform single-approach methods, while Pawlak (2021) argues that innovative, meaning-embedded grammar practice should complement rather than replace traditional exercises. Recent classroom evidence reinforces this synthesis, as Kord et al. (2025) found that teaching grammar in context improves grammatical performance while simultaneously fostering autonomy, critical thinking, and communicative fluency. Taken together, these insights demonstrate that contemporary pedagogy is converging on a balanced model, one that retains explicit grammar teaching as a vital resource for meaningful communication rather



than treating it as an isolated end in itself (Ahmadi et al., 2022; Kord et al., 2025; Pawlak, 2021; Qasserras, 2023).

Written Feedback Methods

Written feedback remains one of the most extensively debated components of second-language writing instruction, varying significantly in directness, focus, and source. Scholars commonly distinguish between direct written corrective feedback (WCF), where the instructor supplies the correct form, and indirect WCF, which prompts self-correction by merely signaling an error's presence; similarly, focused feedback targets narrow error types, whereas unfocused feedback addresses errors broadly. In a comprehensive meta-analysis of 21 empirical studies, Kang and Han (2015) demonstrated that WCF substantially improves grammatical accuracy, though its effectiveness is mediated by learner proficiency, instructional setting, and writing genre; notably, their analysis found no significant advantage of direct over indirect feedback, or of focused over unfocused feedback. Beyond feedback types, the source of evaluation plays a critical role. Cui et al. (2021) found that a semester of trained peer feedback produced improvements in EFL writing competence and self-efficacy comparable to traditional teacher feedback. Furthermore, Ajabshir and Ebadi (2023) compared teacher feedback with automated writing evaluation (AWE) across narrative and argumentative genres, revealing no significant difference in overall writing quality. However, each source offered distinct advantages: AWE drove stronger gains in lexical diversity and syntactic complexity, while teacher feedback more effectively boosted fluency. Taken together, this body of research suggests that no single feedback method is universally superior; rather, success depends on pedagogical implementation, such as learner training and proficiency-matching, rather than the format or source of the feedback itself (Ajabshir & Ebadi, 2023; Cui et al., 2021; Kang & Han, 2015).

Digital Tools for Writing

The proliferation of digital tools, online platforms, and computer-assisted software has reshaped modern writing instruction, moving classrooms past traditional pen-and-paper methods into interactive, technology-mediated spaces. Modern writing tools, including automated grammar checkers and AI-assisted platforms, offer instant feedback on mechanics, spelling, and grammar; research indicates that this real-time correction reinforces learner confidence in the surface-level accuracy of their drafts (Li et al., 2023). While some researchers caution that heavy dependence on AI can risk diminishing critical thinking and original idea development (Bui & Tong, 2025), empirical evidence demonstrates that these platforms significantly boost student engagement, motivation, and overall writing performance when purposefully integrated into instruction (Song & Song, 2023). When embedded into a well-designed curriculum, digital platforms serve as an effective scaffolding tool: by automatically handling surface-level errors, they free learners to redirect their cognitive attention toward deeper elements such as conceptual development, coherence, and argumentation (Li et al., 2023).

Student Engagement with Feedback

A growing body of research argues that feedback effectiveness is determined less by the feedback itself and more by how deeply and consistently students engage with it. In an early qualitative study using this framework, Han and Hyland (2015) examined four Chinese university students' engagement with teacher written corrective feedback, discovering individual variations across cognitive, behavioral, and affective dimensions driven by learner beliefs, goals, and interactional contexts. Crucially, they noted that revision success was sometimes inconsistent with the depth of cognitive processing, meaning students could correct an error on the page without genuinely understanding the underlying rule. Extending this framework to lower-proficiency learners, Zheng and Yu (2018) observed a different pattern: while students showed positive affective engagement, limited language proficiency restricted the depth of their cognitive and behavioral engagement, particularly their use of metacognitive strategies. Feedback source also influences this dynamic; in a case study comparing student responses to teacher versus automated writing evaluation (AWE), Zhang and Hyland (2018) found that engagement depth varied by feedback type, suggesting that active engagement, rather than the feedback source, is the decisive factor in writing improvement. This variation extends to fully automated tools as well, as Koltovskaia (2020) demonstrated that ESL students exhibited markedly different levels of multidimensional engagement when using Grammarly. Collectively, these studies underscore that maximizing the benefits of written feedback depends on cultivating a learner's active, multidimensional



engagement rather than relying on the feedback mechanism alone (Han & Hyland, 2015; Koltovskaia, 2020; Zhang & Hyland, 2018; Zheng & Yu, 2018).

Classroom Writing Practices

Classroom writing pedagogy has shifted decisively from product-oriented models that evaluate only a finished text toward process-oriented and genre-based approaches that scaffold students through planning, drafting, and revising. Demonstrating this shift, Dokchandra (2018) implemented a process writing approach in an overcrowded Thai university EFL class over ten weeks, finding a statistically significant improvement in essay performance alongside strongly positive student attitudes, proving that process pedagogy can succeed even in oversized classrooms. Building on this model, Wonglakorn and Deerajviset (2023) integrated structured collaboration among Thai secondary students, revealing that collaborative process writing significantly boosted post-test writing scores and fostered peer support during drafting. Other scholarship has merged genre awareness into this framework; for instance, Huang and Zhang (2022) found that a process-genre intervention significantly enhanced university students' audience awareness and metacognitive strategy use, leading to deeper planning of both global essay structure and local argument details. Finally, Peungcharoenkun and Waluyo (2023) combined the process-genre approach with structured feedback on an online platform, reporting substantial gains in task response and lexical resource, even though improvements in coherence and grammatical accuracy did not reach statistical significance. Together, these studies demonstrate that classroom writing instruction is most effective when combining process-based drafting with multifaceted structural support, such as collaboration, genre instruction, or technology, instead of relying on isolated practices.

AI Assistants in the Writing Process

The rise of generative AI tool, such as ChatGPT, Gemini, CoPilot, and AI-enhanced platforms like Grammarly, has introduced an interactive layer to the writing process, extending beyond mechanical correction into idea generation, content suggestion, and dialogic revision. In a qualitative case study, Werdiningsih et al. (2024) observed that EFL students valued ChatGPT for resolving linguistic uncertainties and offering content suggestions, which freed up cognitive space for creative and substantive drafting. This pattern is supported by larger experimental designs: Mekheimer (2025) found that postgraduate EFL students using Grammarly achieved significantly higher post-test writing proficiency scores than a control group, with increased tool usage positively correlating with more frequent revision and improved organizational cohesion. Comparing modalities, Yang et al. (2025) revealed that ChatGPT-supported university students achieved greater gains in revision productivity and self-efficacy than a teacher-supported group; students described the AI feedback as more actionable and dialogic, though human feedback remained valued for its inherent credibility. Rather than treating these sources as competing options, Tran (2025) demonstrated that strategically sequencing AI and teacher feedback yields pedagogical benefits beyond what either source offers in isolation. However, these benefits depend heavily on responsible implementation, as Cheng et al. (2025) caution against using generative AI to produce content verbatim, arguing that these tools must support rather than substitute for a writer's critical engagement. This concern is illustrated by Çiftci (2025), who found that despite favorable student attitudes toward AI-assisted writing, ethical awareness remained only moderate, with frequent users showing a higher tendency toward overreliance and nondisclosure. Empirically, Mahapatra (2024) confirmed that ChatGPT-based formative feedback significantly boosts academic writing skills, provided students receive structured guidance on navigating its outputs, while Teng (2024) reinforces this by characterizing ChatGPT as a "companion, not enemy," noting that learners who treat AI as an interactive collaborator report deeper revision engagement and stronger authorial ownership. Collectively, this literature indicates that AI writing assistants are most valuable not as engines of automated production, but as complementary, dialogic partners that offload lower-order concerns and stimulate revision, provided they are integrated ethically alongside human instruction.

Methodology

This study employed a Bibliometric Analysis to systematically examine scholarly literature on grammar instruction and writing pedagogy in second-language contexts published from 2015 to 2025. This approach was selected for its capacity to quantitatively map research trends, intellectual structures, and influential publications, thereby identifying broader thematic concentrations and research gaps rather than evaluating specific instructional interventions. Data were retrieved from Google Scholar and Scopus using

targeted search strings representing grammar-focused instruction, communicative writing practices, and feedback-based instruction. These terms were carefully selected to capture the wider instructional landscape rather than specific research on adaptive or technology-enhanced tools. Metadata extraction was facilitated via Harzing's Publish or Perish software to ensure efficient bibliographic management. Following the Identification, Screening, Eligibility, and Inclusion (ISEI) framework, duplicates, books, and irrelevant studies were removed, resulting in a refined corpus of 152 peer-reviewed journal articles. Finally, this high-quality dataset was imported into VOSviewer to generate a co-occurrence network map of high-frequency terms extracted from titles and abstracts, ensuring a rigorous foundation for bibliometric visualization.

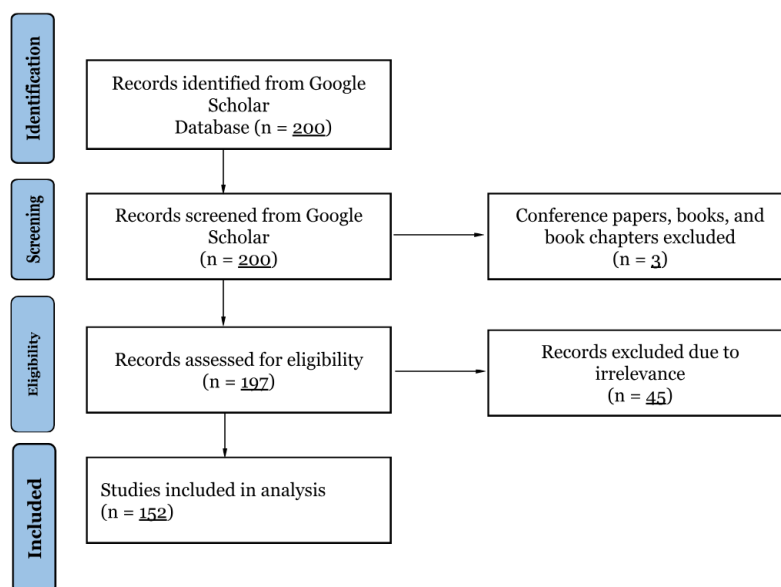


Figure 1. PRISMA Flowchart

Results and Discussions

Research Objective 1: Map the co-occurrence networks of key terminologies?

Keyword Co-occurrence Network

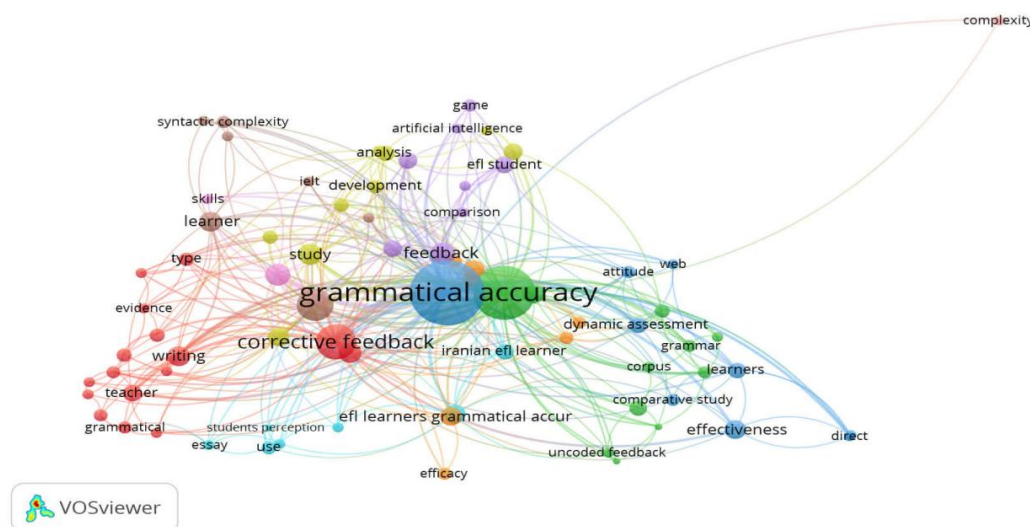


Figure 2. Keyword Co-occurrence Network on Grammar Instruction and Feedback

The VOSviewer mapping shows the main concepts and historical trends in research on grammatical accuracy and corrective feedback in second-language (L2) writing. Within this map, grammatical accuracy stands out as the most central and deeply connected concept, sharing a strong link with corrective feedback. This visual prominence highlights it as the foundation of the entire field. This layout mirrors real-world evidence showing that feedback improves writing accuracy (Kang & Han, 2015), and matches broader research trends that identify these topics as major focal points in the field (Miao et al., 2023). As the core feature of the map, grammatical accuracy shapes how neighboring themes are understood and measured across different teaching and development areas. First, the red cluster groups classroom-focused terms, such as *writing*, *teacher*, *evidence*, and *type*, showing a foundational body of work that views feedback as a standard school practice built into formal classrooms and measured through students' written essays. In contrast, the brown cluster in the upper-left corner connects *syntactic complexity*, *learner*, and *proficiency-related ideas*, reflecting research that looks at accuracy as a long-term part of language growth rather than just correcting isolated errors. Meanwhile, the yellow cluster expands the scope to include *development* and *analysis*, showing a clear shift toward experimental and tech-based tools that test how feedback works in new learning settings. Closely tied to this shift, the purple cluster treats *feedback* as a flexible variable, linking *EFL learners* with modern treatments like *comparison*, *artificial intelligence*, and *game*. This allows researchers to study how different types of feedback perform in digital spaces, underscoring a growing academic interest in how automated and gamified systems change traditional teacher-student dynamics. On the right side of the network, the blue cluster focuses on results, grouping terms like *effectiveness*, *direct*, *attitude*, *dynamic assessment*, *comparative study*, and *web*. This group represents studies that prioritize measurable progress, student reactions, and online delivery methods. This focus connects directly with the green methodological cluster, which includes *grammar*, *corpus*, and *uncoded feedback*, showing that researchers are increasingly relying on data-rich, corpus-driven, and adaptive approaches to track the long-term effects of feedback. Positioned at the bottom-center, a distinct teal cluster branches out to capture the student-centered and process-oriented side of the research by grouping *essay*, *usage*, *efl learners*, and *students' perception*. Instead of looking at feedback only through large-scale school metrics or automated systems, this group shifts the focus toward the personal experiences and daily writing habits of the learners themselves. This cluster shows how students actually use and build feedback into their essays depends heavily on individual differences, proving that student's perception is the vital link needed to turn teacher feedback into real writing improvement for efl learners. Together, these clusters show a modern research trend that balances clear, measurable results with advanced technology to track how written feedback truly helps students improve over time.

Research Objective 2: Trace the temporal evolution of research terms via overlay visualization to trace thematic trajectories and emerging trends within the field?

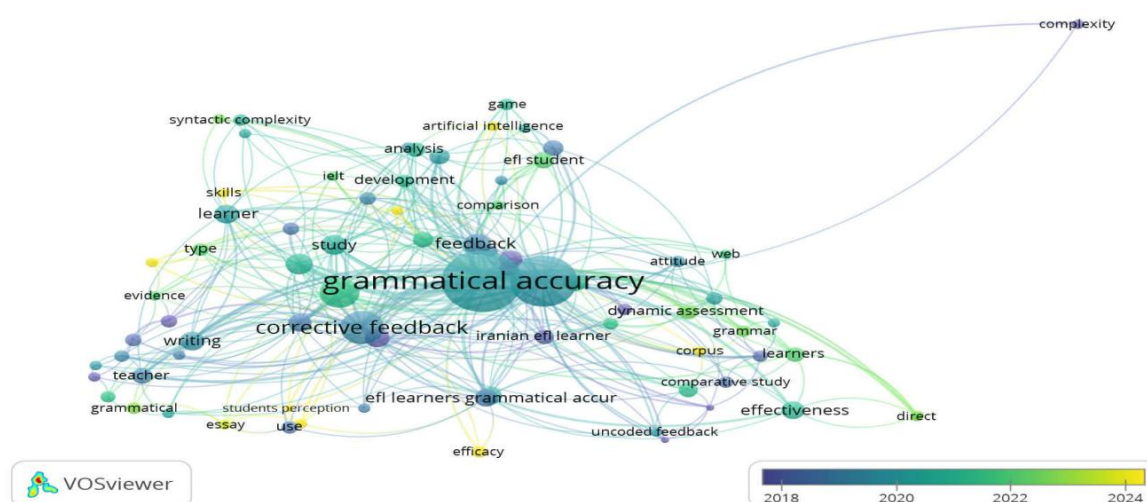


Figure 3. Overlay Visualization of Terms on Grammar Instruction and Feedback

The VOSviewer overlay visualization shows the historical timeline of research on grammatical accuracy and written feedback in second-language writing. The map identifies grammatical accuracy as the

most central and deeply connected topic, showing strong links with corrective feedback, EFL learners, and writing, confirming that it is the core focus of the field. This visual layout matches the findings of Nguyen and Chu (2024), who reviewed recent studies to argue that because there is no single best way to give feedback, grammar accuracy must always be looked at alongside the specific needs of the students and their classroom settings. Nodes on the map from earlier years, particularly around 2018–2019, mostly group together around words like *use*, *EFL learners*, *feedback*, *grammatical accuracy*, *comparative study*, *dynamic assessment*, *attitude*, *writing*, *teacher*, and *corrective feedback*. Collectively, empirical work during this foundational era focused extensively on evaluating whether written corrective feedback directly facilitates structural grammatical development, while establishing early frameworks to compare the efficacy of different feedback types within traditional, teacher-led classroom settings (Al-Hazzani & Altalhab, 2018; Boggs, 2019; Bonilla López et al., 2018; Lim & Renandya, 2020).

In contrast, nodes from more recent years (2020–2024), which show up in lighter colors, increasingly focus on tech-based and student-centered ideas. This modern group includes terms like *uncoded feedback*, *grammar*, *effectiveness*, *direct*, *corpus*, *web*, *artificial intelligence*, *game*, *development*, *IELTS*, *comparison*, *essay*, *students perception*, *efficacy*, and *type*. This shift shows that the field is moving away from simple "yes or no" debates about whether feedback works. Instead, researchers are looking at how feedback can be built into digital writing tools and smart testing methods to track how things like student attitudes affect real-world essay writing (Barrot, 2021; Ko, 2024; Kurzer, 2018; Willis et al., 2021). Interestingly, across the entire timeline, terms related to explicit grammar drills, application, and transfer stay on the outer edges of the map. This trend implies that traditional grammar exercises are still not being connected enough to actual, everyday writing practice. This is a major gap, since practical studies show that pairing focused grammar lessons with written feedback significantly improves writing accuracy over time (Masrul et al., 2024). This pattern supports ongoing calls to move away from isolated grammar worksheets and instead use focused feedback that helps students apply grammar rules directly to their own essays (Lee, 2019; Lim & Renandya, 2020; Nguyen & Chu, 2024). The long-term timeline mapped out by this visual data highlights a major shift in how we think about second-language writing. Research has successfully moved from traditional, teacher-led setups focused strictly on comparing test scores toward highly interactive, digital, and student-centered spaces. By linking automated tools and data tracking with how students actually feel and perceive feedback, modern studies aim to boost student engagement and personalize teaching in digital classrooms. Fundamentally, this journey shows that long-term writing improvement does not come from isolated grammar correction, but from a unified approach where digital feedback is built directly into the student's natural writing process.

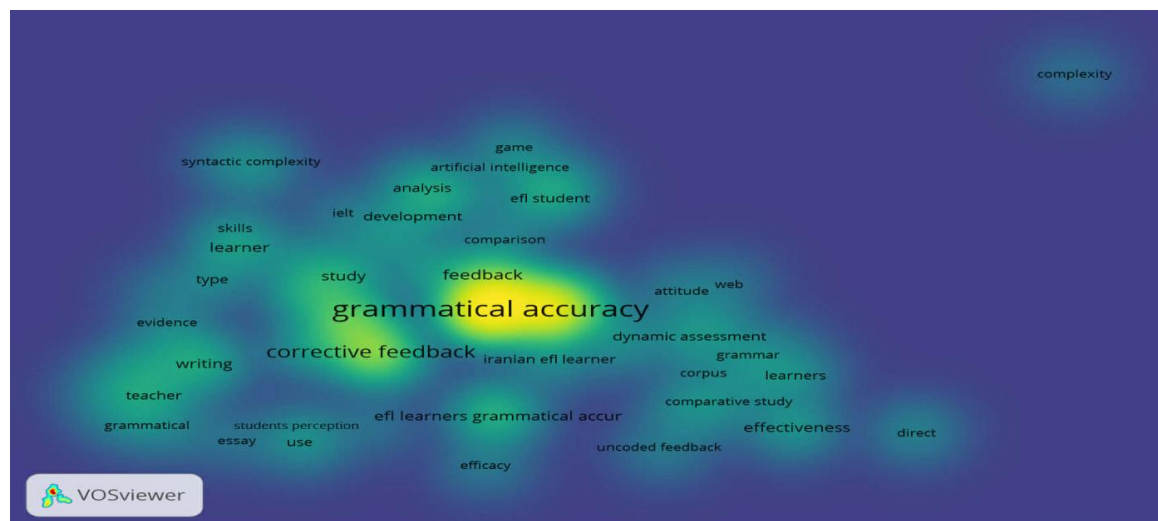


Figure 4. Density Visualization of Terms on the Grammar Instruction and Feedback

The purpose of this density map is to depict the frequency and strength of co-occurring keywords in grammatical accuracy research, with warmer color concentrations indicating higher density, stronger links, and greater prominence within the literature. As illustrated in the figure, *grammatical accuracy* occupies the region of highest density, confirming its centrality in the field. Closely associated high-density terms, such as *corrective feedback*, *feedback*, and *study*, indicate that scholarly attention is primarily focused on instructional and assessment-related mechanisms that influence learners' performance. This alignment is clearly reflected in recent benchmark literature; for instance, Brown et al. (2026) addressed these exact high-density themes by conducting a Bayesian meta-analysis of 52 primary studies, providing robust evidence for the long-term

effectiveness and durability of written corrective feedback across various research contexts. The frequent occurrence of diverse text types alongside grammar and corpus nodes further suggests that grammatical accuracy is predominantly examined through actual written production, such as student essays, analyzed via data-driven analytical approaches (Mekasha & Amogne, 2025; Sarré et al., 2024). From this distribution, it can be inferred that grammatical accuracy is largely conceptualized as an outcome of pedagogical intervention rather than as an inherent linguistic trait, consistent with meta-analytic findings and classroom studies demonstrating that written corrective feedback and corpus-based grammar instruction can enhance L2 grammatical accuracy in writing (Kang & Han, 2015; Zhang & Cheng, 2021). This interpretation aligns with empirical and meta-analytic evidence demonstrating the efficacy of corrective feedback in improving grammatical accuracy, while also showing that the effects depend on the type of feedback, the grammatical target, and the instructional context (Brown et al., 2023; Kang & Han, 2015). At the same time, the lower-density appearance of terms such as artificial intelligence, game, and web indicates that technology-mediated feedback remains an emerging yet underexplored strand within the literature, despite promising results for digital game-based instruction, automated feedback, and learner-corpus-based noticing tasks in supporting grammatical development (Barrot, 2021; Reynolds & Kao, 2021; Sarré et al., 2024). Overall, the density visualization underscores the established focus on corrective feedback and grammatical accuracy while accentuating emerging avenues for integrating technology-enhanced and adaptive approaches in future research.

Research Objective 3: Analyze the annual publication trends of articles spanning the 2015–2025 period?

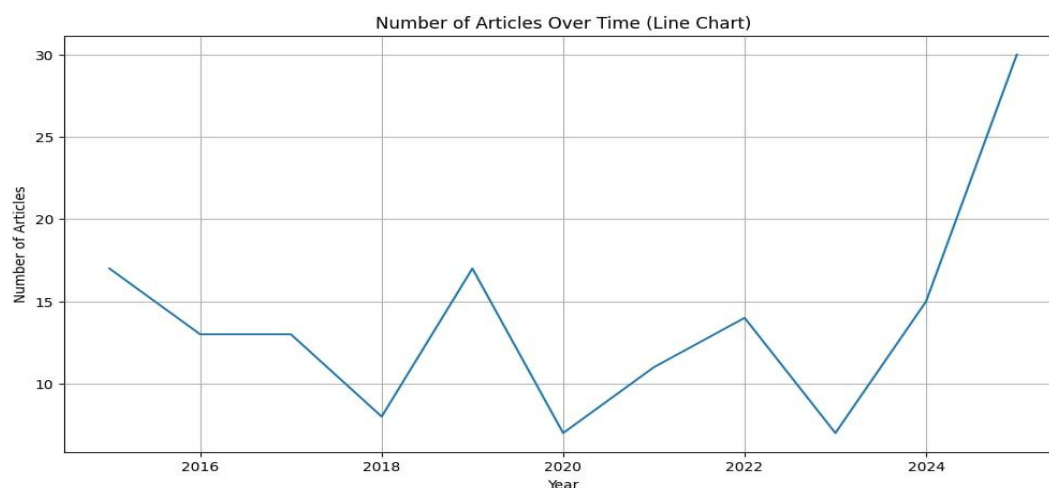


Figure 5. Year of Publication of Research Competence Articles

Figure 5 presents the yearly distribution of research articles on grammar instruction, written corrective feedback, and writing pedagogy from 2015 to 2025. The figure aims to illustrate publication trends over time and situate the present study within the broader evolution of the literature. As shown, research output fluctuated between 2015 and 2018, then increased sharply in 2019 and declined in 2020. From 2021 onward, publication activity generally rebounded, with increases observed in 2021 and 2022, a temporary decline in 2023, and a renewed rise in 2024, culminating in a marked peak in 2025. Rather than indicating a linear or sustained growth pattern, the distribution reflects cyclical variation alongside an overall expansion of scholarly interest in grammar-focused writing instruction and feedback-related research over the decade. This pattern aligns with bibliometric evidence indicating that written corrective feedback and technology-mediated feedback are experiencing a period of rapid growth and diversification, particularly in writing contexts. It also aligns with reviews indicating that research on technology-mediated feedback expanded substantially from 2015 onward, especially in higher education and blended or online learning environments (Loncar et al., 2023; Sun & Lan, 2023). From this trend, the publication record exhibits a non-linear yet upward pattern across the examined years. Output remains moderate in the mid years, followed by a decline around 2018 and a more pronounced drop in 2020, suggesting periods of reduced research activity rather than steady growth. This downturn is followed by a gradual recovery beginning in 2021, with publication counts rising again in 2022 before a brief dip in 2023. The most notable feature of the trend appears in most recent years, when the number of publications increases sharply and reaches its highest point in the dataset. This late surge reveals a marked intensification of research production rather than incremental expansion. The temporal distribution suggests

that the field had entered an accelerated phase of scholarly output, signaling growing research engagement rather than sporadic interest. Overall, the increasing volume of publications in recent years, therefore, affirms the relevance and timeliness of developing an adaptive grammar writing portal consistent with current research directions emphasizing process-based writing, individualized feedback, and technology-enhanced learning.

Research Objective 4: Identify the ten most-cited research articles?

Table 1. Ten Most-cited Articles on Research Competence

Rank	Articles	Citations
1	Shintani, N., & Aubrey, S. (2016). The effectiveness of synchronous and asynchronous written corrective feedback on grammatical accuracy in a computer-mediated environment. <i>The Modern Language Journal</i> , 100(1), 296-319.	233
2	Shintani, N., & Ellis, R. (2015). Does language analytical ability mediate the effect of written feedback on grammatical accuracy in second language writing? <i>System</i> , 49, 110-119.	157
3	Reynolds, B. L., & Kao, C. W. (2021). The effects of digital game-based instruction, teacher instruction, and direct focused written corrective feedback on the grammatical accuracy of English articles. <i>Computer assisted language learning</i> , 34(4), 462-482.	119
4	Boggs, J. A. (2019). Effects of teacher-scaffolded and self-scaffolded corrective feedback compared to direct corrective feedback on grammatical accuracy in English L2 writing. <i>Journal of Second language writing</i> , 46, 100671.	99
5	Li, Z., Feng, H. H., & Saricaoglu, A. (2017). The short-term and long-term effects of AWE feedback on ESL students' development of grammatical accuracy. <i>Calico Journal</i> , 34(3), 355-375.	69
6	Hashemifardnia, A., Namaziandost, E., & Sepehri, M. (2019). The effectiveness of giving grade, corrective feedback, and corrective feedback-plus-giving grade on grammatical accuracy. <i>International Journal of Research Studies in Language Learning</i> , 8(1), 15-27.	63
7	Khanlarzadeh, M., & Nemati, M. (2016). The effect of written corrective feedback on grammatical accuracy of EFL students: An improvement over previous unfocused designs. <i>Iranian Journal of Language Teaching Research</i> , 4(2), 55-68.	51
8	Lahuerta, A. C. (2018). Study of accuracy and grammatical complexity in EFL writing. <i>International Journal of English Studies</i> , 18(1), 71-89.	50
9	Tan, K. E., & Manochphinyo, A. (2017). Improving grammatical accuracy in Thai learners' writing: Comparing direct and indirect written corrective feedback. <i>Journal of Asia TEFL</i> , 14(3), 430.	42
10	Gorman, M., & Ellis, R. (2019). The relative effects of metalinguistic explanation and direct written corrective feedback on children's grammatical accuracy in new writing. <i>Language Teaching for Young Learners</i> , 1(1), 57-81.	40

Table 1 presents the ten most-cited articles on grammatical accuracy and written corrective feedback, highlighting the studies that have been most strongly shaped by multiple research studies on grammar-writing integration and feedback-based instruction. The prominence of Shintani and Aubrey (2016) and Shintani and Ellis (2015) underscores the central role of timing and individual differences in how written corrective feedback supports grammatical accuracy. Such studies demonstrate that focused direct feedback can significantly improve learners' control of complex grammatical structures, while factors such as synchronous versus asynchronous delivery and learners' analytical abilities mediate the durability of these gains (Shintani & Aubrey, 2016; Shintani & Ellis, 2015). Li et al. 2017 further highlight scholarly interest in automated writing evaluation (AWE), showing short-term reductions in errors but limited long-term transfer of grammatical accuracy through automated feedback. Collectively, these highly cited works suggest that feedback serves as a crucial mechanism for guiding learners' attention, practice, and metalinguistic engagement with grammar in writing. The citation landscape also reveals broader conceptual and methodological patterns in the field. Reynolds and Kao (2021) extend the field toward digital game-based instruction, demonstrating that focused grammatical teaching combined with direct written feedback can improve accuracy outcomes. In contrast, Boggs (2019) emphasizes the effectiveness of teacher-scaffolded, self-scaffolded, and unscaffolded feedback under realistic classroom conditions. Studies compare feedback types and further explore the optimization of direct, indirect, and metalinguistic feedback for diverse learner groups, including children, with mixed evidence regarding the added value of explicit explanation (Gorman & Ellis, 2019; Tan & Manochphinyo, 2017). Overall, the analysis of the most-cited studies demonstrates that written corrective feedback is a central focus in L2 grammatical accuracy research, with recurring themes around feedback timing, type, delivery, learner characteristics, and technology-mediated approaches, reflecting both established evidence and emerging trends in literature.

Ethical Considerations

As this study utilized a bibliometric research design, it relied exclusively on secondary, publicly available data extracted from established academic databases (Scopus and Google Scholar). Accordingly, this study involved no direct participation or intervention with human subjects, nor did it involve any animal

experimentation. As a result, formal oversight or approval from an Institutional Review Board (IRB) or animal care and use committee was not required. Despite the absence of human or animal participants, the study strictly adhered to the highest regulatory standards of research integrity, academic honesty, and ethical data management. The collection, processing, and visualization of the 152 articles were conducted with complete transparency. Every effort was made to prevent data manipulation, misattribution, or selective reporting. All source materials, original authors, and institutional affiliations mapped within the dataset were objectively documented and appropriately cited, ensuring compliance with international publishing ethics and intellectual property guidelines.

Conclusion

This paper examined the literature on adaptive grammar writing tools and feedback-based instruction through a rigorous bibliometric analysis, mapping keyword co-occurrence patterns, longitudinal publication trends, and highly cited foundational studies published between 2015 and 2025. The findings establish grammatical accuracy and written corrective feedback as the conceptual core of the field, with research progressively shifting from teacher-centered, direct feedback practices toward process-based, learner-responsive, and technology-mediated models of writing instruction; temporal analysis further reveals a cyclical rather than linear pattern of scholarly growth, culminating in a pronounced surge in the most recent years, while the ten most-cited studies converge on feedback timing, feedback type, and individual learner differences as the field's most influential concerns. Critically, however, the overlay and density visualizations expose a persistent structural gap: despite the theoretical inseparability of grammar instruction and writing development, explicit grammar teaching remains peripheral to sustained, technology-supported writing practice, with terms tied to artificial intelligence, automated writing evaluation (AWE), and digital game-based instruction occupying low-density, outlying positions on the map. Fundamentally, this bibliometric synthesis maps the field's established knowledge clusters and methodological turning points while isolating this underexplored intersection as its central structural gap, underscoring the need for longitudinal research designs and principled instructional models that embed form-focused grammar instruction within iterative, technology-mediated feedback cycles. Finally, the intellectual trajectory charted here suggests that the future of second-language writing pedagogy lies not in treating grammar instruction and technology-mediated feedback as separate, parallel tracks, but in purposefully fusing them into a unified, continuous learning framework. While research in this field has long hinted at such an integration, a fully realized, cohesive instructional system has yet to be achieved.

Recommendations

The structural disconnect between formal grammar instruction and sustained writing practice carries the most salient implications for the future direction of second language (L2) writing research, signaling a pressing need to move beyond examining explicit grammar instruction and written corrective feedback as isolated variables. Instead, the field's conceptual network suggests instructional design must transition toward principled embedding models that merge form-focused instruction with iterative, feedback-driven writing cycles, particularly through hybrid workflows in which Automated Writing Evaluation (AWE) and AI-assisted tools handle initial error tracking while teachers provide subsequent, contextualized scaffolding. To strengthen these weak pedagogical links, future researchers should move away from the short-term, single-intervention designs that dominate the highly cited literature and instead pursue longitudinal studies spanning at least one to two academic semesters to track long-term grammatical transfer, shifting learner attitudes, and the incremental development of syntactic complexity. Complementing these findings, future synthesis research should also conduct focused, domain-specific meta-analyses of the field's emerging, low-density peripheral clusters, namely artificial intelligence-assisted feedback, digital game-based instruction, and web-based individualized feedback tools, consolidating this currently fragmented evidence into a structured foundation capable of guiding the next generation of adaptive, technology-integrated grammar-writing instruction.

References

- Ahmadi, S., Karami, A., Mohammadi, E., & Bowles, F. (2022). Isolated, integrated, or a mixture of both? Which type of form-focused instruction leads to a more successful acquisition of different forms of past tense in English as a foreign language (EFL) classrooms? *Journal of Language Teaching and Learning*, 12(1), 16–27. <https://doi.org/10.66887/jltl.v12i1.352>
- Ajabshir, Z. F., & Ebadi, S. (2023). The effects of automatic writing evaluation and teacher-focused feedback on CALF measures and overall quality of L2 writing across different genres. *Asian-Pacific Journal of Second and Foreign Language Education*, 8, Article 26. <https://doi.org/10.1186/s40862-023-00201-9>



- Al-Hazzani, N., & Altalhab, S. (2018). Can explicit written corrective feedback develop grammatical and lexical accuracy of Saudi EFL learners?. *International Journal of Education and Literacy Studies*, 6(4), 16-24. <https://files.eric.ed.gov/fulltext/EJ1201586.pdf>
- Barrot, J. S. (2021). Using automated written corrective feedback in the writing classrooms: Effects on L2 writing accuracy. *Computer Assisted Language Learning*, 36(4), 584-607. https://www.researchgate.net/profile/Jessie-Barrot/publication/352616797_Using_automated_written_corrective_feedback_in_the_writing_classrooms_effects_on_L2_writing_accuracy/links/671dee50acba566ad501f1f5/Using-automated-written-corrective-feedback-in-the-writing-classrooms-effects-on-L2-writing-accuracy.pdf
- Belmekki, M. (2023). Grammar competence and writing performance: A correlational study in higher education. *TESOL and Technology Studies*, 4(1), 37-44. <https://doi.org/10.48185/tts.v4i1.594>
- Boggs, J. A. (2019). Effects of teacher-scaffolded and self-scaffolded corrective feedback compared to direct corrective feedback on grammatical accuracy in English L2 writing. *Journal of Second language writing*, 46, 100671. <https://doi.org/10.1016/j.jslw.2019.100671>
- Bonilla López, M., Van Steendam, E., Speelman, D., & Buyse, K. (2018). The differential effects of comprehensive feedback forms in the second language writing class. *Language Learning*, 68(3), 813-850. <https://doi.org/10.1111/lang.12295>
- Brown, D., Liu, Q., & Norouzian, R. (2026). Effectiveness of written corrective feedback in developing L2 accuracy: A Bayesian meta-analysis. *Language Teaching Research*, 30(3), 1357-1389. <https://doi.org/10.1177/13621688221147>
- Bui, T. T. U., & Tong, T. V. A. (2025). The impact of ai writing tools on academic integrity: unveiling english-major students' perceptions and practical solutions. *AsiaCALL Online Journal*, 16(1), 83-110. <http://asiacall-acoj.org/index.php/journal/issue/view/7>
- Cheng, A., Calhoun, A., & Reedy, G. (2025). Artificial intelligence-assisted academic writing: Recommendations for ethical use. *Advances in Simulation*, 10(1), 22. <https://doi.org/10.1186/s41077-025-00350-6>
- Ciftci, H. (2025). Navigating ethics: EFL learners' awareness and use of AI tools in writing classes. *Focus on ELT Journal*, 7(2), 22-45. <https://doi.org/10.14744/felt.7.2.2>
- Cui, Y., Schunn, C. D., Gai, X., Jiang, Y., & Wang, Z. (2021). Effects of trained peer vs. teacher feedback on EFL students' writing performance, self-efficacy, and internalization of motivation. *Frontiers in Psychology*, 12, Article 788474. <https://doi.org/10.3389/fpsyg.2021.788474>
- Dokchandra, D. (2018). The effects of process writing approach on performance of an overcrowded EFL writing class at a university in Thailand. *KnE Social Sciences*, 3(4), 191-206. <https://doi.org/10.18502/kss.v3i4.1931>
- Gorman, M., & Ellis, R. (2019). The relative effects of metalinguistic explanation and direct written corrective feedback on children's grammatical accuracy in new writing. *Language Teaching for Young Learners*, 1(1), 57-81. <https://doi.org/10.1075/ltyl.00005.gor>
- Han, Y., & Hyland, F. (2015). Exploring learner engagement with written corrective feedback in a Chinese tertiary EFL classroom. *Journal of Second Language Writing*, 30, 31-44. <https://doi.org/10.1016/j.jslw.2015.08.002>
- Hashemifardnia, A., Namaziandost, E., & Sepehri, M. (2019). The effectiveness of giving grade, corrective feedback, and corrective feedback-plus-giving grade on grammatical accuracy. *International Journal of Research Studies in Language Learning*, 8(1), 15-27. <https://doi.org/10.5861/ijrsl.2019.3012>
- Huang, Y., & Zhang, L. J. (2022). Facilitating L2 writers' metacognitive strategy use in argumentative writing using a process-genre approach. *Frontiers in Psychology*, 13, Article 1036831. <https://doi.org/10.3389/fpsyg.2022.1036831>
- Kang, E., & Han, Z. (2015). The efficacy of written corrective feedback in improving L2 written accuracy: A meta-analysis. *The modern language journal*, 99(1), 1-18. <https://doi.org/10.1111/modl.12189>
- Khanlarzadeh, M., & Nemati, M. (2016). The effect of written corrective feedback on grammatical accuracy of EFL students: An improvement over previous unfocused designs. *Iranian Journal of Language Teaching Research*, 4(2), 55-68. <https://doi.org/10.30466/ijltr.2016.20365>
- Ko, C. J. (2024). Online individualized corrective feedback on EFL learners' grammatical error correction. *Computer Assisted Language Learning*, 37(7), 1449-1477. <https://doi.org/10.1080/09588221.2022.2118783>
- Koltovskaia, S. (2020). Student engagement with automated written corrective feedback (AWCF) provided by Grammarly: A multiple case study. *Assessing Writing*, 44, Article 100450. <https://doi.org/10.1016/j.asw.2020.100450>
- Kord, M. A., Samavati, N., Okati, K., & Samavati, K. (2025). The effect of teaching grammar in context on EFL learners' grammar performance. *American Journal of Creative Education*, 8(2), 15-25.



https://econpapers.repec.org/article/onlamjoce/v_3a8_3ay_3a2025_3ai_3a2_3ap_3a15-25_3aid_3a1509.htm

- Kurzer, K. (2018). Dynamic written corrective feedback in developmental multilingual writing classes. *TESOL quarterly*, 52(1), 5-33. <https://doi.org/10.1002/tesq.366>
- Lahuerta Martínez, A. C. (2018). Study of accuracy and grammatical complexity in EFL writing. *International Journal of English Studies*. <https://doi.org/10.6018/ijes/2018/1/258971>
- Lee, I. (2019). Teacher written corrective feedback: Less is more. *Language Teaching*, 52(4), 524-536. <https://doi.org/10.1017/S0261444819000247>
- Li, S., & Vuono, A. (2019). Twenty-five years of research on oral and written corrective feedback in the system. *System*, 84, 93-109. <https://doi.org/10.1016/j.system.2019.05.006>
- Li, W.-Y., Kau, K., & Shiung, Y.-J. (2023). Pedagogic exploration into adapting automated writing evaluation and peer review integrated feedback into large-sized university writing classes. *SAGE Open*, 13(4), 1-18. <https://doi.org/10.1177/21582440231209087>
- Li, Z., Feng, H. H., & Saricaoglu, A. (2017). The short-term and long-term effects of AWE feedback on ESL students' development of grammatical accuracy. *Calico Journal*, 34(3), 355-375. <https://doi.org/10.1558/cj.26382>
- Lim, S. C., & Renandya, W. A. (2020). Efficacy of written corrective feedback in writing instruction: A meta-analysis. *Tesl-Ej*, 24(3), n3. [ERIC - EJ1275821 - Efficacy of Written Corrective Feedback in Writing Instruction: A Meta-Analysis, TESL-EJ, 2020-Nov](https://eric.ed.gov/?id=EJ1275821)
- Loncar, M., Schams, W., & Liang, J. S. (2023). Multiple technologies, multiple sources: trends and analyses of the literature on technology-mediated feedback for L2 English writing published from 2015-2019. *Computer Assisted Language Learning*, 36(4), 722-784. <https://doi.org/10.1080/09588221.2021.1943452>
- Ly, K. C. (2020). *The importance of grammar in language teaching and learning*. Workshop on Innovation in Language Teaching and Learning, Ho Chi Minh University of Food Industry. Retrieved from https://www.researchgate.net/publication/352245658_The_Importance_of_Grammar_in_Language_Teaching_and_Learning
- Mahapatra, S. (2024). Impact of ChatGPT on ESL students' academic writing skills: A mixed methods intervention study. *Smart Learning Environments*, 11, Article 9. <https://doi.org/10.1186/s40561-024-00295-9>
- Masrul, M., Erliana, S., Rasyidah, U., & Wicaksono, B. H. (2024). The effect of direct and indirect written corrective feedback on accuracy and fluency of university students' English writing. *World Journal of English Language*, 14(2), 388-388. [The Effect of Direct and Indirect Written Corrective Feedback on Accuracy and Fluency of University Students' English Writing](https://doi.org/10.1186/s40468-017-0053-0)
- Mekasha, T., & Amogne, D. (2025). Applying Corpus-Based Approach to the Teaching of Grammar in an EFL Context: Effects on Students' Grammatical Awareness, Writing Accuracy and Perceptions. *BERHAN INTERNATIONAL RESEARCH JOURNAL OF SCIENCE AND HUMANITIES* Учредителю: Debre Berhan University, 9(1), 50-80. <https://doi.org/10.61593/DBU.BIRJSH.01.09.03>
- Mekheimer, M. (2025). Generative AI-assisted feedback and EFL writing: A study on proficiency, revision frequency and writing quality. *Discover Education*, 4(1), Article 170. <https://doi.org/10.1007/s44217-025-00602-7>
- Miao, J., Chang, J., & Ma, L. (2023). Research Trends of Written Corrective Feedback in L2 Writing: A Bibliometric Analysis. *Sage Open*, 13(1). <https://doi.org/10.1177/21582440221135172>
- Nemati, M., Alavi, S. M., Mohebbi, H., & Masjedlou, A. P. (2017). Teachers' writing proficiency and assessment ability: The missing link in teachers' written corrective feedback practice in an Iranian EFL context. *Language Testing in Asia*, 7(21). <https://doi.org/10.1186/s40468-017-0053-0>
- Nguyen, H. M., & Chu, T. A. (2024). Written Corrective Feedback in Second Language Writing: A Review of Research. *Reflections*, 31(2), 858-870. <https://doi.org/10.61508/refl.v31i2.275269>
- Pawlak, M. (2021). Teaching foreign language grammar: New solutions, old problems. *Foreign Language Annals*, 54(4), 881-896. <https://doi.org/10.1111/flan.12563>
- Peungcharoenkun, T., & Waluyo, B. (2023). Implementing process-genre approach, feedback, and technology in L2 writing in higher education. *Asian-Pacific Journal of Second and Foreign Language Education*, 8, Article 34. <https://doi.org/10.1186/s40862-023-00211-7>
- Qasserras, L. (2023). Systematic review of communicative language teaching (CLT) in language education: A balanced perspective. *European Journal of Education and Pedagogy*, 4(6), 17-23. <https://doi.org/10.24018/ejedu.2023.4.6.763>
- Reynolds, B. L., & Kao, C. W. (2021). The effects of digital game-based instruction, teacher instruction, and direct focused written corrective feedback on the grammatical accuracy of English articles. *Computer assisted language learning*, 34(4), 462-482. <https://doi.org/10.1080/09588221.2019.1617747>



- Sarré, C., Brudermann, C., & Grosbois, M. (2024). Using learner corpus data for grammatical accuracy development in written productions: The role of corrective feedback. *International Journal of Learner Corpus Research*, 10(1), 107-145. <https://doi.org/10.1075/ijlcr.00042.sar>
- Shi, H., & Aryadoust, V. (2024). A systematic review of AI-based automated written feedback research. *ReCALL*, 36(2), 187-209. <https://doi.org/10.1017/S0958344023000265> [Opens in a new window]
- Shintani, N., & Aubrey, S. (2016). The effectiveness of synchronous and asynchronous written corrective feedback on grammatical accuracy in a computer-mediated environment. *The Modern Language Journal*, 100(1), 296-319. <https://doi.org/10.1111/modl.12317>
- Shintani, N., & Ellis, R. (2015). Does language analytical ability mediate the effect of written feedback on grammatical accuracy in second language writing?. *System*, 49, 110-119. <https://doi.org/10.1016/j.system.2015.01.006>
- Song, C., & Song, Y. (2023). Enhancing academic writing skills and motivation: Assessing the efficacy of ChatGPT in AI-assisted language learning for EFL students. *Frontiers in Psychology*, 14, Article 1260843. <https://doi.org/10.3389/fpsyg.2023.1260843>
- Sun, Y., & Lan, G. (2023). A bibliometric analysis on L2 writing in the first 20 years of the 21st century: Research impacts and research trends. *Journal of Second Language Writing*, 59, 100963. <https://doi.org/10.1016/j.jslw.2023.100963>
- Tan, K. E., & Manochphinyo, A. (2017). Improving grammatical accuracy in Thai learners' writing: Comparing direct and indirect written corrective feedback. *Journal of Asia TEFL*, 14(3), 430. <http://dx.doi.org/10.18823/asiatefl.2017.14.3.4.430>
- Tan, S., Cho, Y. W., & Xu, W. (2023). Exploring the effects of automated written corrective feedback, computer-mediated peer feedback and their combination mode on EFL learner's writing performance. *Interactive Learning Environments*, 31(10), 7276-7286. <https://doi.org/10.1080/10494820.2022.2066137>
- Teng, M. F. (2024). "ChatGPT is the companion, not enemies": EFL learners' perceptions and experiences in using ChatGPT for feedback in writing. *Computers and Education: Artificial Intelligence*, 7, Article 100270. <https://doi.org/10.1016/j.caeai.2024.100270>
- Tran, T. T. T. (2025). Enhancing EFL writing revision practices: The impact of AI- and teacher-generated feedback and their sequences. *Education Sciences*, 15(2), Article 232. <https://doi.org/10.3390/educsci15020232>
- Werdiningsih, I., Marzuki, & Rusdin, D. (2024). Balancing AI and authenticity: EFL students' experiences with ChatGPT in academic writing. *Cogent Arts & Humanities*, 11(1), Article 2392388. <https://doi.org/10.1080/23311983.2024.2392388>
- Williams, C., & Beam, S. (2019). Technology and writing: Review of research. *Computers & Education*, 128, 227-242. <https://doi.org/10.1016/j.compedu.2018.09.024>
- Willis, J., Gibson, A., Kelly, N., Spina, N., Azordegan, J., & Crosswell, L. (2021). Towards faster feedback in higher education through digitally mediated dialogic loops. *Australasian Journal of Educational Technology*, 37(3), 22-37. <https://doi.org/10.14742/ajet.5977>
- Wonglakorn, P., & Deerajviset, P. (2023). The effects of collaborative process writing approach on Thai EFL secondary school students' writing skills. *LEARN Journal: Language Education and Acquisition Research Network*, 16(1), 495-522. <https://eric.ed.gov/?id=EJ1380755>
- Yang, Y., Hussin, S., & Hashim, H. (2025). Revising with intelligence: ChatGPT feedback and its impact on EFL students' revision and self-efficacy. *Forum for Linguistic Studies*, 7(7), 352-367. <https://doi.org/10.30564/fls.v7i7.9845>
- Zhang, L. J., & Cheng, X. (2021). Examining the effects of comprehensive written corrective feedback on L2 EAP students' linguistic performance: A mixed-methods study. *Journal of English for Academic Purposes*, 54, 101043. <https://doi.org/10.1016/j.jeap.2021.101043>
- Zhang, Z. (V.), & Hyland, K. (2018). Student engagement with teacher and automated feedback on L2 writing. *Assessing Writing*, 36, 90-102. <https://doi.org/10.1016/j.asw.2018.02.004>
- Zheng, Y., & Yu, S. (2018). Student engagement with teacher written corrective feedback in EFL writing: A case study of Chinese lower-proficiency students. *Assessing Writing*, 37, 13-24. <https://doi.org/10.1016/j.asw.2018.03.001>