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Original Paper

The Process-Performance Gap in L2 Writing: Evidence from Visualization-Based Instruction

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Abstract

This study investigates the relationship between writing processes and L2 writing performance through the effects of visualization-based instruction. Although strategy-based methods have been shown to improve engagement and idea generation, their impact on measurable writing performance remains inconclusive. Using a mixed-methods quasi-experimental design, the study collected data from 60 intermediate EFL learners divided into experimental and control groups. The experimental group received visualization-based instruction through narrative writing activities, whereas the control group received regular instruction. Pre- and post-test tasks were evaluated using an analytic rubric to measure writing performance and a structured questionnaire, supported by qualitative data, to measure writing processes. The results show that visualization significantly improved idea generation, planning, and cognitive engagement, but it did not statistically significantly improve overall writing performance. These findings indicate a process-performance gap in L2 writing, where improvements in cognitive processes do not necessarily translate into performance outcomes. The research contributes to existing knowledge on strategy-based teaching by pinpointing a structural gap between instructional impacts and evaluation standards, and it has implications for pedagogy and writing assessment.

Keywords

L2 writing, Process–Performance Gap, Visualization-Based Instruction, Cognitive Processes, Writing performance

1. Introduction

Writing in a second language (L2) is one of the most cognitively challenging skills for learners, as it involves the integration of linguistic knowledge, the organization of discourse, and the generation of ideas under constrained conditions (Hyland, 2019; Manchón, 2011). The modern theories of writing

have focused on the duality of writing as a process (planning, generating, and organizing ideas) and a product (assessed by visible textual products like accuracy, complexity, and coherence) (Bereiter & Scardamalia, 2013; Flower & Hayes, 1981). Although this difference is well established, current pedagogical practice and measurement systems tend to focus on product-level results, which may not reflect the cognitive processes that support successful writing performance.

To address current challenges in L2 writing, a growing body of research focuses on how cognitive and metacognitive strategies can support the writing process. Visualization, defined as the intentional creation of mental images, has been linked to better idea generation, more content development, and increased engagement in the learner (Agebjörn & Walldén, 2025; Paivio, 1990; Sadoski & Paivio, 2013). Strategy-based instruction research also includes positive results regarding motivation, planning behaviors, and the overall engagement of learners with writing tasks (Dörnyei, 2014; Zhang & Hyland, 2023). Theoretically, the results are consistent with dual coding theory, which assumes that needing to integrate verbal and imagery-based representations could assist in more in-depth cognitive processing and memory retrieval (Paivio, 1990).

Furthermore, although findings consistently show process-level advantages, the effects of these strategies on quantifiable writing performance remain inconclusive. The positive results of affective and cognitive features, including engagement, idea fluency, and task involvement, have been reported more often in empirical studies and do not align with an increase in perceived writing quality (Shen & Chong, 2023; L. Wang, 2026). This discrepancy points to a critical point: the presumed linear correlation between increased cognitive processes and higher writing performance may not hold in reality. Specifically, writing assessment models, which tend to focus on grammatical correctness and structural sophistication, might fail to record any improvement in higher-order writing processes, including the development of ideas and awareness of the audience (Lee, 2017).

This contradiction indicates a conceptual gap in the literature. Although the current literature has widely reported the advantages of using writing strategies, it has given relatively little consideration to the circumstances under which process-level advantages can translate into product-level advantages. Consequently, the connection between cognitive engagement and writing performance remains poorly theorized. To address this gap, we need to move beyond effectiveness studies and investigate the possible disjuncture between how learners approach writing assignments and how their performance is assessed.

The present study responds to this issue by introducing and empirically examining the notion of a process–performance gap in L2 writing. Specifically, it examines whether cognitive involvement and idea generation associated with visualization-based instruction led to measurable improvements in writing performance. The mixed-methods design will allow the researcher to combine quantitative analysis of writing outcomes with qualitative data on learners' writing processes, providing deeper insight into the effectiveness of different strategies.

This study makes three contributions. First, it proposes a theoretical framework to understand the

relationship between writing processes and performance outcomes, including the possibility of systematic divergence between the two. Second, it offers empirical support that challenges the notion that instruction in cognitive strategies inevitably leads to higher writing scores. Third, it offers pedagogical suggestions for matching instructional activities with assessment standards, especially in situations where writing assessment strongly emphasizes formal correctness over content construction. With these contributions, the research will refine existing insights into L2 writing strategies and inform more balanced writing teaching and assessment methods.

2. Literature Review

2.1 Writing as Process and Product: A Structural Misalignment

Principled models conceptualize writing as a recursive process where meaning is created because of the interaction of various mental processes, instead of a linear transcription act (Bereiter & Scardamalia, 2013; Flower & Hayes, 1981). These models argue that effective writing depends not only on language knowledge but also on the ability to create, organize, and transform ideas.

Moreover, this process-related theoretical consensus does not reflect the instructional and assessment practices in the L2 settings, which are product-focused. Educators usually assess writing quality based on quantifiable textual characteristics, including grammatical accuracy, lexical complexity, and textual coherence. In contrast, higher-order processes, including idea development and conceptual organization, receive limited attention. This disjuncture indicates a structural dislocation between the cognitive and institutional provisions of writing. Additionally, the subsequent positive effects on writing processes are not always evident in performance indicators, raising the basic question of the validity of widely used assessment systems.

2.2 Visualization and Cognitive Enhancement Limit

In this process approach, cognitive strategies have been popularized as the means of enhancing writing performance. In particular, visualization has been theorized as a method of improving the idea generation process and conceptual clarity by combining both verbal and non-verbal representations (Kessler, 2024). According to the explanation of Dual coding theory by Allan Paivio (1990), the idea of cognitive facilitation arises when information is coded in two distinct systems: language- and imagery-based systems, which enhances memory and retrieval. Later research has applied this model to writing, where it has been argued that mental imagery can assist in the creation and structuring of content (Sadoski & Paivio, 2013).

Empirical research partially supports these claims. Instruction based on strategy, such as visualization, has been proven to improve engagement of learners, promote fluency of ideas, and planning behaviors (Li & Li, 2022; K. Wang et al., 2025). Likewise, multimodal and digital writing tools that include visual features have been linked with increased engagement of learners and elaborated content development (Kessler, 2024).

However, the hypothesis that increased cognitive processing leads to better writing performance is not

always substantiated. Although learners can produce deeper ideas and become more active in their work, this does not necessarily translate into better writing scores. Improvements are mainly reported at the process level, without showing any product-level gains, which severely limits the explanatory power of existing strategy-based explanations. In this regard, visualization maximizes internal cognition without necessarily enhancing externally measured performance.

2.3 Engagement as an Insufficient Predictor of Performance

Learner engagement is another construct that has gained importance in recent research as a key factor in L2 writing development. The conceptualization is a multidimensional concept of engagement, which involves cognitive, behavioral, and affective investment in learning activities (Zhang & Hyland, 2023). Visualization, a strategy-based approach, is often linked to increased engagement, as students are more actively involved in generating ideas and completing tasks.

Findings on corrective feedback in written form also highlight the importance of engagement in mediating learning. As an example, Hyland (2019) show that feedback uptake relies on learners' cognitive and emotional investment. In contrast, Zhang & Hyland (2023) reveal that engagement influences the processing and integration of feedback into the writing process. These results place engagement as a pivotal factor between learning and instruction.

However, treating engagement as a measure of performance is conceptually flawed. Higher activity is not always associated with better writing skills, especially when scoring is based on language correctness rather than content development. In these instances, the learners can show greater engagement and more advanced idea generation without scoring higher (Imsa-ard, 2025). This implies that although engagement is a requirement, it is not adequate to guarantee performance improvement. The consistent use of engagement as a measure of instructional success thus veils a more multifaceted connection between process and product.

2.4 Assessment Constraints and the Failure of Strategy Transfer

One reason for this disparity is the nature of writing assessment. The assessment of L2 writing is normally based on criteria prioritizing superficial aspects of linguistic knowledge, such as grammar, vocabulary, and structural arrangement (Lee, 2017). Although these dimensions are critical in determining language proficiency, they do not fully reflect increases in higher-order thinking skills such as idea development, creativity, and audience awareness.

Recent studies have raised questions about the construct validity of such assessment practices. Imsa-ard, (2025) states that writing scores are influenced by the constructs inherent in rating scales, which can systematically omit some aspects of writing competence. In a similar vein, research into task complexity and cognitive load shows that the performance outcomes depend on various interacting conditions, such as processing requirements and task conditions (Manchón et al., 2023). These results imply that strategy-based gains in measurable performance depend on the congruency between instructional emphasis and assessment criteria.

When this is not done, strategy transfer is unsuccessful. Students can improve their cognitive and

metacognitive learning processes without any growth in measured performance, not because the strategies are unhelpful. However, the performance measurement system fails to measure dimensions of learning that have been enhanced. This points to a major weakness in existing theories of L2 writing instruction, which implicitly assume that product-level results will mirror process-level ones.

2.5 Reframing the Problem: Process-Performance Gap

The literature indicates a systematic inconsistency in L2 writing research. These advantages do not consistently translate into writing performance. This gap is inconsistent with existing models, which tend to presuppose a direct correlation between strategy use and writing outcomes.

The inability to explain this deviation indicates a broader theoretical limitation. Existing studies are either process- or product-oriented and therefore do not sufficiently explore the interaction between the two. Additionally, the circumstances under which cognitive advantages translate into performance gains remain poorly understood. The most current research has once again indicated the presence of mixed relations between strategy use and writing performance (Abdelaty et al., 2025). However, researchers have not studied the mechanisms behind this variance extensively.

This study addresses this limitation by conceptualizing the difference as a process-performance gap in L2 writing. Rather than assuming that instruction effectiveness can be measured only by performance results, it examines the extent to which improvements in cognitive engagement and idea generation are reflected in quantifiable writing scores. The study integrates process-based and product-based views, better explains the strategy's effectiveness, and refutes the possibility that learning processes automatically transfer to performance results.

3. Methodology

This study adopts a mixed-methods quasi-experimental design to investigate whether gains in writing-related cognitive processes translate into quantifiable performance improvements with visualization-based teaching. The mixed-methods approach is required due to the limitations of writing scores in reflecting the cognitive processes involved in text production, and the limitations of using process data to determine the effects on performance (Kormos, 2023).

A sample of 60 intermediate-level EFL students who took a mandatory English writing course at a public university in Saudi Arabia were used to gather data. In the study, participants were divided into an experimental condition ($n = 30$) and a control condition ($n = 30$) according to intact classroom sections. While the sample (n = 60) is small, it is comparable to classroom-based quasi-experimental studies in the field of L2 writing. A priori power analysis (G Power) suggested a sample size of at least 54 participants were required to detect medium effect sizes ($f = .25$) at $\alpha = .05$ with power $= .80$ in repeated-measures designs. Its context is assessment-based, and writing is graded mostly based on grammatical correctness and structure, which is why it applies to the study of the possible misalignment between product-based assessment and process-oriented teaching (Lee, 2017).

The experimental group received visualization-based instruction within narrative writing tasks over six weeks. Visualization was operationalized through structured pre-writing tasks in which learners developed mental representations of narrative material before writing. This intervention focuses on idea generation and conceptual planning, but not linguistic form. The control group used the same curriculum without any explicit teaching strategies.

The rubric was adapted from existing L2 writing assessment rubrics (e.g., Hyland, 2019) to include five elements (content, organization, vocabulary, grammar, and mechanics) on a 5-point scale. The rubric was trialed before the study to ensure clarity and consistency. Two trained raters rated the scripts independently, and inter-rater reliability was measured using intra-class correlation coefficients (ICC = 0.87), indicating high agreement. To identify a difference in the effects across the writing dimensions, whether an increase in idea development is manifested in content, as opposed to linguistic accuracy, analytic scoring was chosen.

A Likert-scale questionnaire measuring idea generation, planning, and cognitive engagement assessed writing processes and was supplemented by learner reflections and semi-structured interviews. Adequate internal consistency was found for the questionnaire (Cronbach's $\alpha = 0.88$). Two applied linguists reviewed the questionnaire for content validity.

ANOVA was used to analyze quantitative data in IBM SPSS (Version 26) to compare differences between and within groups across time, with effect sizes (η^2) reported. Qualitative data were analyzed thematically (Braun & Clarke, 2006) using NVivo (Version 14).

The design does not assume that cognitive processes will improve and lead to better performance; instead, it directly tests whether process-level gains translate into performance gains, providing a foundation for testing the proposed process-performance gap.

4. Results

Baseline comparability was established using pre-test scores. The means of the experimental ($M = 60.8$) and control groups ($M = 60.5$) were almost equal, indicating no significant difference in baseline writing performance. At the end of the intervention, the changes in both groups were modest and not statistically significant, and only a slightly higher mean in the experimental group ($M = 63.1$) compared to the control group ($M = 62.0$).

Table 1. Descriptive Statistics for Writing Performance

Group	Pre-test Mean	Post-test Mean	SD (Post)	N
Experimental	60.8	63.1	5.2	30
Control	60.5	62.0	5.0	30

A repeated-measures ANOVA was performed to determine whether these changes reflected differential

improvement. There was a marginal main effect of time, $F(1, 58) = 3.21, p = .078$, which showed a general rise in writing scores in both groups. The time-by-group interaction was not statistically significant. However, $F(1, 58) = 1.12, p = .295$, meaning that there was no meaningful difference between conditions in the pattern of improvement. All effects had small effect sizes ($\eta^2 \leq .05$), which validated the small extent of change.

Table 2. Repeated-Measures ANOVA for Writing Performance

Source	F	p	η²
Time	3.21	.078	.05
Group	0.84	.364	.01
Time × Group	1.12	.295	.02

These findings indicate that while both groups demonstrated marginal improvement over time, the absence of a significant interaction effect confirms that visualization-based instruction did not produce differential gains in writing performance.

Table 3 shows statistically significant differences in process-related measures. The experimental group scored significantly higher in terms of idea generation (M = 4.2), planning ($M = 4.0$), and engagement ($M = 4.3$) than the control group ($M = 3.2, 3.1, and\ 3.3, respectively$). Independent-samples t-tests showed that these differences were statistically significant in all variables, $t\,(58) \geq 5.21, p < 0.001$. The magnitude of these differences was consistently large, indicating that the instructional condition strongly influenced the cognitive processes related to writing.

Table 3. Comparison of Process Variables Between Groups

Variable	Experimental Mean	Control Mean	t	p
Idea Generation	4.2	3.2	5.84	< 0.001
Planning	4.0	3.1	5.21	< 0.001
Engagement	4.3	3.3	6.02	< 0.001

A more detailed study of the writing performance shows that not all dimensions improved equally. The experimental group showed gains that were greater in content $(+2.1)$ and organization $(+1.8)$ but showed minimal gains in grammar $(+0.6)$ and mechanics $(+0.4)$. The same tendency was noted in the control group, where the gains were equally small in all dimensions, and there was no significant difference between groups.

Table 4. Changes in Writing Sub-Dimensions

Dimension	Experimental Change	Control Change
Content	+2.1	+1.5
Organization	+1.8	+1.3
Vocabulary	+1.5	+1.2
Grammar	+0.6	+0.5
Mechanics	+0.4	+0.3

The uneven distribution of gains across sub-dimensions suggests that improvements were concentrated in higher-order aspects of writing rather than linguistic accuracy, reinforcing the distinction between process-level and product-level outcomes.

5. Discussion

The results indicate a divergence between process and performance; visualization-based teaching made a significant difference in idea generation, planning, and engagement. However, it did not result in statistically significant increases in overall writing performance. These findings directly challenge the assumption that the increase in cognitive engagement will be reflected in the objective performance results (Shen & Chong, 2023; Zhang & Hyland, 2023).

These results are further explained through cognitive theories of L2 writing, such as the separation of conceptualization and linguistic encoding (Kormos, 2023). Visualization affects the conceptualization stage of writing more than the linguistic encoding stage. This imbalance suggests that gains in higher-level cognitive processes do not necessarily translate into gains in linguistic processes.

One main reason is the lack of correspondence between the effects of instruction and the assessment constructs. Visualization is considered to be at the conceptual processing level, which improves the development and organization of ideas (Paivio, 1990; Sadoski & Paivio, 2013), and writing performance is usually measured by the ability to write correctly and with proper structure (Lee, 2017). The sub-dimension results reinforce this disproportion: gains were more noticeable in content and organization, whereas changes in grammar and mechanics were insignificant. Additionally, performance scores can only partially reflect higher-order processes.

The findings also indicate a non-linear strategy transfer. The existing literature has largely assumed the success of strategy-based instruction based on process-level improvements, without systematically considering how these gains transfer to performance. Furthermore, the process of writing performance depends on the coordination of various systems, such as linguistic resources and processing capacity (Kormos, 2023). Visualization reinforces the conceptual layer of writing without lessening the requirements of linguistic encoding. As a result, students can produce more sophisticated concepts without improving accuracy and complexity. This interpretation aligns with recent studies that show the

distinction between the process of cognitive revision and the visible writing results (Kessler, 2024; Sadoski & Paivio, 2013).

Moreover, although engagement increased dramatically, it did not validly predict performance. This finding supports a growing body of evidence that engagement supports participation in writing activities, but not quantifiable improvement in the results (Zhang & Hyland, 2023). It was also recently found that the learner can use a combination of compensatory strategies, such as external resources, without proportional increases in measured performance, which further complicates the relationship between process and product. This finding undermines linear perspectives of teaching effectiveness and supports a conditional and mediated view of strategy use and learning outcomes, mediated by assessment constructs and cognitive limitations

Taken together, these results justify the presence of a process performance gap in the L2 writing. The value of this research lies in showing that this disjunction is not accidental but a structural effect of the interaction between cognitive processes and assessment systems. Rather than assessing effectiveness based on performance gains, the results suggest that effectiveness can be based on the correspondence among instructional focus, cognitive development, and evaluation criteria.

Pedagogically, visualization-based teaching should be incorporated with an explicit emphasis on linguistic form when performance improvements are anticipated. Meanwhile, the results raise important questions about whether current assessment practices can capture higher-order characteristics of writing. This implies that the success of strategy-based instruction cannot be measured without the evaluation systems used to assess writing.

6. Conclusion

This study shows that improvements in cognitive processes related to writing do not always translate into a tangible increase in writing performance. Although the visualization instruction improved idea generation, planning, and engagement, the impact was largely confined to process-level dimensions.

The results add to L2 writing research by revealing a gap between process and performance and a mismatch between instructional emphasis and assessment constructs. This implies that the success of strategy-based instruction depends on how well assessment standards capture cognitive development.

Pedagogically, the findings suggest combining process-based instructional strategies with form-based teaching to improve performance outcomes. Further studies are needed to determine whether other assessment methods could more effectively measure the relationship between performance and writing processes.

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