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Revision Practices and Self-Regulated Learning in Collaborative Digital Writing: Implications for ESL Writing Development

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Abstract

This study examined the role of revision practices and self-regulated learning in collaborative digital writing among ESL learners. Previous studies on collaborative writing have largely focused on interaction patterns and writing outcomes, while limited attention has been given to learners' revision behavior and reflective learning strategies in digital environments. Using a mixed-methods quasi-experimental design, the study investigated how collaborative revision and self-regulated learning contributed to writing development.

Data were collected through pre-test and post-test writing tasks, revision histories, learner journals, rubric-based self-assessment forms, and semi-structured interviews. The findings showed that collaborative digital writing improved learners' organization, coherence, vocabulary use, grammatical accuracy, and overall writing quality. Learners engaged in various forms of revision, including surface-level revisions, lexical changes, meaning-level revisions, and organizational restructuring. The findings also indicated that planning, monitoring, reflection, and evaluation supported writing improvement. The study highlights the importance of reflective revision and learner autonomy in digital collaborative writing settings.

Keywords: *Revision, Self-regulated Learning, Self-assessment*

1.Introduction

Writing is widely regarded as one of the most demanding skills in second-language learning because it requires learners to manage content, organization, vocabulary, grammar, and coherence simultaneously. In many ESL classrooms, writing instruction has traditionally emphasized individual text production and teacher correction. Such approaches often limit opportunities for learners to reflect on their writing processes or participate actively in revision.

Collaborative writing has emerged as an important alternative approach in second-language writing instruction because it encourages learners to jointly construct texts, exchange feedback, and negotiate language use throughout the writing process (Storch, 2013). Through collaboration, learners become more aware of linguistic choices and textual organization while engaging in meaningful communication with peers.

The increasing use of digital technologies has changed collaborative writing practices. Platforms such as Google Docs and wiki-based writing environments allow learners to draft, edit, comment, and revise collaboratively in real time (Li & Zhu, 2017). These platforms also preserve revision histories, enabling researchers to examine how texts develop during multiple stages of drafting and revision.

Revision plays a central role in writing development because it enables learners to reorganize ideas, clarify meaning, improve coherence, and correct language errors (Flower & Hayes, 1981). Effective revision extends beyond grammar correction and involves deeper reflection on content and organization. Digital writing environments provide learners with opportunities to revisit earlier drafts, monitor textual changes, and refine written texts collaboratively.

Self-regulated learning is another important factor in writing development. Zimmerman (2000) described self-regulated learning as learners' ability to plan, monitor, and evaluate their own learning processes. In writing contexts, self-regulated learners reflect on weaknesses in their writing, revise drafts strategically, and assess progress independently. These processes are particularly relevant in collaborative digital writing, where learners must manage drafting, revision, and evaluation simultaneously.

The present study investigated how revision practices and self-regulated learning contributed to ESL learners' writing development in digital collaborative writing settings. The study focused specifically on revision behavior, reflective self-assessment, and writing improvement during collaborative writing tasks.

2.Research Gap

Although collaborative digital writing has received increasing attention in second-language writing research, important gaps remain in the literature. Many previous studies have focused primarily on interaction patterns and final writing outcomes while giving limited attention to revision processes and learners' self-regulated learning strategies.

Storch (2013) emphasized the pedagogical value of collaborative writing in L2 classrooms and showed that collaboration promotes peer learning and language awareness. However, the study concentrated mainly on patterns of interaction between learners rather than examining how learners revised texts or regulated their learning processes during collaborative writing tasks.

Similarly, Li and Zhu (2017) explored dynamic interactions in wiki-based collaborative writing environments and showed that digital collaboration supports negotiation of meaning and peer feedback. Despite these findings, the study offered limited discussion of revision behavior and reflective learning processes. The primary emphasis remained on collaborative interaction rather than on the cognitive and metacognitive processes underlying writing development.

Research on revision practices in collaborative digital writing also remains limited. Flower and Hayes (1981) conceptualized writing as a recursive process involving planning, drafting, revising, and editing. Nevertheless, many collaborative writing studies continue to treat revision mainly as a secondary activity or as a form of language correction. Few studies have examined how learners use revision strategically to refine ideas, improve coherence, and regulate their own writing processes.

Another major gap concerns self-regulated learning in collaborative writing contexts. Zimmerman (2000) argued that learners who actively plan, monitor, and evaluate their learning tend to achieve stronger academic outcomes. Although self-regulated learning has been widely examined in educational psychology, relatively little research has explored how learners apply self-regulated learning strategies during collaborative digital writing tasks.

Valizadeh (2022) reported that collaborative writing using Google Docs improved EFL learners' writing performance, yet the study focused primarily on overall writing scores and did not investigate how revision histories or reflective learning strategies contributed to writing improvement. Likewise, Li and Kim (2016)

examined collaborative writing tasks in wiki-based environments but paid limited attention to reflective revision practices and learner self-regulation.

Methodological limitations are also evident in previous studies. Several studies have relied heavily on questionnaires or final writing products without analyzing revision histories and learner reflections in depth. As a result, there is insufficient evidence regarding how learners' revision behavior develops over time or how self-regulated learning strategies influence writing improvement during collaborative tasks.

In addition, previous research has rarely integrated process-oriented writing theory with self-regulated learning theory. Process-oriented writing theory highlights the recursive nature of drafting and revision, whereas self-regulated learning theory focuses on planning, monitoring, and evaluation. Few studies have combined these perspectives to explain how reflective revision contributes to writing development in collaborative digital environments.

The present study addressed these gaps by examining revision practices and self-regulated learning together within digital collaborative writing settings. Unlike earlier studies that focused primarily on interaction or writing outcomes, this study investigated how learners revised collaboratively written texts, monitored their progress, and evaluated their writing through reflective self-assessment.

3.Research Questions:

RQ1. How does collaborative digital writing influence ESL learners' writing development?

RQ2. What patterns of revision behavior emerge during collaborative digital writing tasks?

RQ3. How do learners engage in self-regulated learning processes during collaborative revision activities?

RQ4. How do ESL learners perceive the role of collaborative revision and reflective self-assessment in writing development?

4.Theoretical Framework

The present study is informed by two interrelated theoretical perspectives: the Cognitive Process Theory of Writing developed by Linda Flower and John R. Hayes, and the Self-Regulated Learning Theory proposed by Barry Zimmerman. Flower and Hayes (1981) conceptualized writing as a recursive cognitive activity involving planning, drafting, revising, and reviewing. Rather than progressing linearly, writers continuously revisit earlier stages of composition to refine meaning, organization, and coherence. This perspective is particularly relevant to digital collaborative writing settings where learners repeatedly negotiate ideas, revise drafts, and restructure texts through interaction with peers.

In addition, Zimmerman's (2000) theory of self-regulated learning provides an important framework for understanding how learners actively manage and monitor their learning processes during writing tasks. Self-regulated learners engage in planning, self-monitoring, reflection, and evaluation to improve academic performance. Within collaborative digital writing contexts, these processes become visible through reflective revision practices, peer feedback, self-assessment, and strategic decision-making during text construction. The integration of process-oriented writing theory and self-regulated learning theory thus provides a comprehensive framework for examining how collaborative revision and reflective learning practices contribute to ESL writing development.

The findings suggest that revision and self-regulation functioned as interconnected processes rather than independent constructs. Meaning-level revisions frequently occurred when learners engaged in planning, monitoring, and evaluating their texts. This indicates that recursive writing processes were supported by self-regulatory behaviors, reinforcing the complementary relationship between Flower and Hayes' Cognitive Process Theory of Writing and Zimmerman's Self-Regulated Learning Theory.

5.Research Design

This study employed a mixed-methods quasi-experimental research design to investigate the role of revision practices and self-regulated learning in collaborative digital writing among ESL learners. The quantitative component of the study focused on measuring learners' writing development through pre-test and post-test writing performance, whereas the qualitative component explored learners' revision behaviors, reflective practices, and perceptions regarding collaborative writing experiences. The integration of both quantitative and qualitative approaches enabled a more comprehensive understanding of how collaborative revision and self-regulated learning influenced writing development within digital learning environments. The intervention was conducted over eight weeks.

The mixed-methods design enabled comparison of quantitative writing outcomes with qualitative evidence from revision histories, learner reflections, and interviews.

Writing performance was assessed through the ESL Composition Profile (Jacobs et al., 1981), a widely established analytic rubric in second-language writing research. Because the instrument has established reliability and validity in prior studies, additional reliability testing was not conducted.

6.Participants

The participants of the study consisted of undergraduate ESL learners enrolled in an academic writing course at a university-level institution. A total of forty learners participated in the study and were engaged in collaborative digital writing activities during the intervention period. The participants represented mixed proficiency levels and shared a common background as second-language learners of English.

The learners were organized into collaborative writing groups and completed writing tasks using digital platforms such as Google Docs. These platforms enabled learners to draft, revise, comment upon, and edit texts collaboratively in real time. The collaborative grouping structure allowed participants to engage in peer interaction, reflective revision, and shared problem-solving throughout the writing process.

6.1 Group Assignment: Forty undergraduate ESL learners participated in the study. Following the administration of the pre-test, participants were assigned to an experimental group (n = 20) and a control group (n = 20). The experimental group engaged in collaborative digital writing activities using Google Docs combined with rubric-guided self-assessment and reflective revision. The control group completed the same writing tasks collaboratively but did not receive structured self-assessment guidance during revision

7.Data Collection Methods

Data were collected through multiple instruments to ensure methodological triangulation and obtain a comprehensive understanding of learners' writing development and revision practices. Pre-test and post-test expository writing tasks were administered to assess learners' improvement in organization, coherence, vocabulary, grammatical accuracy, and overall writing quality over the course of the study.

Revision histories generated through collaborative digital platforms were examined to identify patterns of textual modification and revision behavior. These revision records provided insight into how learners revised collaboratively written texts at different stages of the writing process. Learner journals were also collected to explore participants' reflective learning experiences, self-monitoring practices, and perceptions regarding collaborative writing tasks.

In addition, rubric-based self-assessment was employed to encourage learners to evaluate their own writing performance in relation to specific writing criteria. The ESL Composition Profile (Jacobs et al., 1981) was employed both as an analytic scoring instrument and as a rubric-guided self-assessment framework during collaborative revision activities. Learners used the rubric criteria to reflect upon organization, content development, vocabulary use, grammatical accuracy, and mechanics while revising collaboratively written drafts. Semi-structured interviews were conducted at the end of the intervention to gain deeper insight into learners' experiences, challenges, and perceptions regarding collaborative digital writing and reflective revision practices.

8.Data Analysis

The quantitative data of the study were analyzed through both descriptive and inferential statistical techniques to examine learners' writing development and revision practices in digital collaborative writing settings.

Descriptive statistics, including mean scores and standard deviations, were used to summarize learners' performance in the pre-test and post-test writing tasks. Inferential statistical techniques were employed to determine whether the observed differences between the two stages were statistically significant.

An independent samples t-test was used to compare the performance of groups at the pre-test stage to determine baseline equivalence. A paired samples t-test was conducted to examine within-group improvement between pre-test and post-test writing scores. In cases where assumptions of normality were not fully satisfied, non-parametric procedures such as the Mann–Whitney U test were used to compare group performance.

In addition, revision frequencies and categories were analyzed quantitatively to identify patterns of surface-level revisions, lexical revisions, meaning-level revisions, and organizational revisions. Qualitative data obtained from learner journals and semi-structured interviews were analyzed thematically to explore learners' reflective practices, self-monitoring strategies, and perceptions regarding collaborative digital writing. Two independent raters scored all writing scripts using the ESL Composition Profile. Inter-rater agreement was established through discussion and calibration prior to scoring.

8.1 Revision Coding Procedure: Revision histories were coded using the framework developed by Faigley and Witte (1981). Revisions were classified into four categories: surface-level revisions, lexical revisions, meaning-level revisions, and organizational revisions.A second coder independently coded 20% of the revision data. Disagreements were discussed until consensus was reached.

Research Objective	Data Source	Statistical / Analytical Technique
To examine improvement in writing performance	Pre-test and post-test writing scores	Descriptive statistics (Mean, SD), Paired Samples t-test
To compare group performance at baseline	Pre-test scores	Independent Samples t-test
To compare groups where assumptions were violated	Writing scores	Mann–Whitney U Test
To analyze revision behavior	Revision histories	Frequency counts and revision coding analysis
To identify patterns in learner reflections	Learner journals	Thematic analysis
To explore learners' perceptions	Semi-structured interviews	Thematic analysis

Group	Mean Gain Score	t value	p value	Interpretation
Experimental Group	17.85	8.72	< .001	Significant Improvement
Control Group	6.25	3.14	.005	Moderate Improvement

Table 1. Paired Samples t-Test for Writing Improvement

Revision Category	Frequency	Percentage
Surface-level Revisions	84	31%
Lexical Revisions	63	23%
Meaning-level Revisions	71	26%
Organizational Revisions	54	20%

Table 2: Revision Categories Observed in Collaborative Writing

Theme	Sample Evidence
Reflective Learning	"The rubric helped me identify weaknesses in organization."
Self-Monitoring	"I checked each paragraph before submitting."
Peer Collaboration	"My partner noticed ideas I had missed."

Table 3: Themes Identified Through Qualitative Analysis

9.Discussion

The findings of the present study indicate that collaborative digital writing contributed positively to ESL learners' writing development. Although both groups demonstrated improvement between the pre-test and post-test stages, the experimental group achieved comparatively stronger gains in organization, coherence, vocabulary use, and overall writing quality. These findings suggest that collaborative revision combined with reflective self-assessment facilitated deeper engagement with the writing process and supported more effective text development.

The improvement observed in the experimental group supports Flower and Hayes' (1981) Cognitive Process Theory of Writing, which conceptualizes writing as a recursive process involving planning, drafting, revising, and reviewing. Learners engaged in repeated cycles of revision during collaborative writing tasks and continuously revisited earlier drafts to reorganize ideas, refine coherence, and clarify meaning. The collaborative digital environment thus encouraged learners to treat writing as an evolving process rather than a one-time product-oriented activity.

The revision analysis further showed that learners engaged in both surface-level and meaning-level revisions during the study. Surface-level revisions remained comparatively frequent because ESL learners often prioritize grammar correction, spelling, punctuation, and sentence-level modification during drafting and revision. However, the presence of substantial meaning-level revisions indicates that learners gradually moved beyond simple error correction toward deeper engagement with textual organization, idea development, and semantic clarity. This finding suggests that collaborative interaction encouraged learners to critically evaluate the effectiveness of their written communication rather than focusing solely on linguistic accuracy.

The results support Zimmerman's (2000) theory of self-regulated learning. Learners actively engaged in planning, monitoring, reflection, and evaluation during collaborative writing activities. Learner journals and interview responses revealed that participants became increasingly aware of weaknesses in organization and coherence during drafting and revision. The collaborative writing environment thus functioned not merely as a platform for peer interaction but also as a mechanism for reflective learning and metacognitive regulation.

Another important finding concerns the pedagogical role of revision visibility within digital writing environments. Google Docs revision histories enabled learners to observe textual development across multiple drafts, making revision processes more transparent and reflective. The ability to revisit earlier versions of texts appears to have strengthened learners' awareness of writing as a developmental process and encouraged more deliberate revision practices during collaborative writing tasks.

The qualitative findings further suggest that peer collaboration contributed positively to learner confidence and writing awareness. Participants reported that peer feedback enabled them to identify weaknesses that were frequently overlooked during individual writing. Collaborative interaction also reduced writing anxiety and encouraged learners to participate more actively in revision processes. Nevertheless, unequal participation was occasionally observed, as some learners relied more heavily on stronger peers for idea generation and textual revision during collaborative activities. This indicates that collaborative writing environments may still require careful instructional monitoring to ensure balanced learner participation.

10. Limitations

Several limitations should be acknowledged. First, the sample size was relatively small and drawn from a single institution, limiting generalizability. Second, the intervention was conducted over a relatively short

period. Third, the study focused primarily on expository writing tasks and may not reflect revision practices in other genres.

11. Conclusion

This study demonstrated that collaborative digital writing supported ESL learners' writing development by promoting reflective revision and self-regulated learning. Learners engaged in both surface-level and meaning-level revisions while actively planning, monitoring, and evaluating their writing. The findings suggest that collaborative digital environments can facilitate writing improvement by making revision processes more visible and encouraging learner reflection.

12. Ethical Considerations

Ethical considerations were carefully observed throughout the study. Participation in the research was entirely voluntary, and all participants were informed about the aims, procedures, and significance of the study prior to data collection. Informed consent was obtained from all participants, and they were assured that their academic standing would not be affected by their participation or withdrawal from the study.

Confidentiality and anonymity were maintained throughout the research process by removing identifying information from all collected data and research records. Participants were informed that the data collected during the study would be used solely for academic and research purposes. Institutional approval was obtained prior to the commencement of the study, and all research procedures were conducted in accordance with established ethical standards for educational research involving human participants.

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