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Using Learning Analytics from Digital Storytelling Platforms to Enhance ESL Students' Narrative Writing Skills

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Abstract

The integration of digital storytelling tools in English as a Second Language (ESL) instruction is gaining momentum due to their capacity to engage learners creatively while providing quantifiable data for assessment. This study investigated the impact of digital storytelling on ESL learners' writing development using platform-based learning analytics at The New College, Chennai. A quasi-experimental design involving 40 intermediate ESL learners was conducted over five weeks, with participants divided into experimental (n=20) and control (n=20) groups from II BA English. The experimental group used Storybird, a digital storytelling platform, to create multimedia narratives, while the control group completed traditional pen-and-paper writing tasks. Learning analytics data, including time-on-task, word count, number of revisions, and multimedia elements, were collected alongside pre- and post-test writing assessments scored using standardised rubrics. Results demonstrated significantly higher post-test scores for the experimental group ($p < 0.05$), with strong positive correlations between platform engagement metrics and writing performance. These findings suggest that digital storytelling platforms not only enhance student engagement but also provide valuable learning analytics that can inform data-driven ESL instruction and assessment practices.

Keywords: Digital storytelling, learning analytics, ESL writing, narrative skills, educational technology

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1. Introduction

The integration of digital technologies has significantly transformed ESL instruction, particularly in the teaching of narrative writing. Traditional pen-and-paper methods, although foundational, may not align with the multimodal learning preferences of current learners. Digital storytelling, which combines narrative with digital media, enables students to construct meaning through textual, visual, and auditory modes, thereby enhancing engagement and supporting cultural expression (Castaneda, 2013). These platforms also generate learning analytics that offer educators valuable data to inform instructional decisions. However, there remains limited research examining the relationship between student engagement with digital storytelling and measurable improvements in writing proficiency. Furthermore, learners' responses to automated and occasionally flawed feedback represent a key factor in understanding the effectiveness of such tools (Bai and Hu, 2017). This study is grounded in three interrelated theoretical perspectives that support the use of digital storytelling in ESL writing instruction. Social constructivist theory, particularly Vygotsky's emphasis on cultural tools and social interaction, positions digital storytelling as a medium through which learners construct knowledge in both collaborative and individual contexts. Multimodal literacy theory further supports this approach by recognising that effective communication today requires competence across multiple modes of meaning-making. Digital storytelling allows ESL learners to draw on their visual, cultural, and linguistic resources to communicate more effectively, thereby promoting inclusive and accessible literacy practices (Chen and Chen, 2015). Process writing theory also informs this study by highlighting the importance of recursive writing practices such as planning, drafting, revising, and editing. Digital platforms support these practices by capturing revision histories and patterns of engagement. Together, these frameworks provide a strong foundation for the pedagogical use of digital storytelling in ESL writing instruction.

2. Review of Literature

Digital storytelling platforms offer a unique intersection between pedagogical innovation and data-driven insight. These platforms not only support narrative development through multimodal composition but also generate a wide range of learning analytics data, including time spent on tasks, revision frequency, word count progression, use of multimedia elements, and patterns of collaboration. Such data provide educators with objective indicators of student engagement and cognitive effort that are not captured by traditional assessment methods (Springer, 2015). While digital storytelling has been shown to enhance learner motivation, autonomy, and linguistic expression (Lambert, 2013; Reinders, 2011), few studies have systematically examined the relationship between platform-generated analytics and measurable gains in writing performance. Most existing research emphasises

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qualitative outcomes or general engagement, without analysing how specific learner behaviours contribute to writing development (Hafner and Miller, 2011; Smeda, Dakich, and Sharda, 2014). Godwin-Jones (2017) identifies learning analytics as a growing area in language education, calling for deeper integration of data-informed strategies to support learner progress. This study addresses this gap by investigating the correlation between digital storytelling analytics and improvements in ESL learners' narrative writing. The study is guided by three research questions. First, do ESL learners using digital storytelling platforms demonstrate greater improvements in narrative writing skills compared to those using traditional writing methods? Second, which specific learning analytics metrics are most strongly correlated with improved writing performance? Third, can these analytics serve as reliable predictors of writing development in ESL learners? Through this inquiry, the study aims to advance the understanding of how platform-based learning data can inform pedagogical practice in second language writing instruction.

Despite the growing body of research on digital storytelling and learning analytics in language education, several significant gaps remain. First, there is limited research that systematically examines the relationship between specific learning analytics metrics and measurable improvements in writing skills. Most existing studies rely on self-reported measures of engagement or qualitative assessments of student work without establishing clear connections to quantifiable learning outcomes. Second, while many studies report positive effects of digital storytelling on language learning, few employ rigorous experimental designs that allow for causal inferences about the effectiveness of these interventions. The lack of control group comparisons in much of the existing research limits our ability to determine whether observed improvements are specifically attributable to digital storytelling activities or general writing practice and instruction. Finally, there is insufficient research examining which specific features of digital storytelling platforms are most beneficial for ESL learners. Without this understanding, educators lack guidance on how to optimise their use of these tools and which learning analytics metrics are most meaningful for assessing student progress.

3. Methodology

This study employed a quasi-experimental design to investigate the impact of digital storytelling on ESL learners' narrative writing skills while examining the relationship between learning analytics data and writing performance. The quasi-experimental approach was selected due to practical constraints in educational settings that precluded random assignment of participants to treatment conditions. This design allowed for the comparison of outcomes between an experimental group using digital storytelling and a control group receiving traditional instruction while maintaining ecological validity within existing classroom structures. The study design incorporated both quantitative and qualitative data

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collection methods to provide a comprehensive understanding of the relationship between digital storytelling platform usage and writing development. Pre- and post-test measures were collected from both groups to assess changes in writing performance, while detailed learning analytics data were gathered exclusively from the experimental group to examine engagement patterns and platform usage behaviours. This study investigated the impact of digital storytelling on ESL learners' writing development using platform-based learning analytics at The New College, Chennai. A quasi-experimental design involving 40 intermediate ESL learners was conducted over five weeks, with participants divided into experimental (n=20) and control (n=20) groups from II BA English. Participants were classified as intermediate-level based on their scores on the Written Test, with all participants scoring between 60-80% on this standardised assessment. This level was selected to ensure that participants had sufficient English proficiency to engage meaningfully with digital storytelling activities while still having room for measurable improvement in their writing skills. The participants were divided into two groups through a convenience sampling method based on existing class sections. The experimental group (n=20) consisted of students enrolled in one section of the intermediate writing course, while the control group (n=20) included students from a parallel section of the same course. Both sections were taught by instructors with equivalent qualifications and experience in ESL instruction, and both followed the same curriculum objectives and timeline. Demographic analysis revealed no significant differences between the experimental and control groups in terms of age, gender distribution, native language backgrounds, or English proficiency levels as measured by the Online Written Test. This demographic similarity between groups strengthened the validity of comparisons between treatment conditions.

3.1 Materials and Instruments

The experimental group utilised Storybird, a web-based digital storytelling platform specifically designed for educational contexts. Storybird was selected for this study based on several criteria: its user-friendly interface suitable for intermediate ESL learners, robust learning analytics capabilities, comprehensive revision tracking features, and the ability to incorporate multiple media types, including text, images, and audio. Storybird provides users with a library of high-quality artwork and illustrations that can serve as inspiration and support for narrative creation. The platform allows for collaborative writing, peer review, and instructor feedback, all of which are tracked through the analytics system. Key features relevant to this study included automatic saving of all revisions, time-stamping of all user actions, word count tracking, and detailed engagement metrics.

3.2 Writing Assessment Instruments

Both groups completed identical pre- and post-test writing assessments consisting of narrative writing prompts designed to elicit personal storytelling. The prompts were carefully

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selected to be culturally neutral while providing sufficient structure to support intermediate-level writers. Examples of prompts included "Tell the story of a memorable day in your life" and "Describe a time when you faced a significant challenge". Writing samples were evaluated using a modified version of the Narrative Writing Assessment Rubric developed by the Centre for Applied Linguistics. This rubric assesses five key dimensions of narrative writing: organisation and structure, language use and vocabulary, grammar and mechanics, content and ideas, and narrative elements (character development, setting, plot). Each dimension is scored on a 4-point scale, with detailed descriptors for each level. To ensure scoring reliability, all writing samples were evaluated by two trained raters who were blind to group assignment and testing conditions (pre- or post-test). Raters participated in a comprehensive training session using sample essays and achieved an inter-rater reliability coefficient of 0.89 before beginning the assessment process.

3.3 Learning Analytics Data Collection and Procedures

The learning analytics data for this study were obtained through the Storybird platform, which automatically captured detailed interaction metrics for participants in the experimental group. These data included key indicators such as total time-on-task, progression in word count across multiple writing sessions, frequency and type of revisions, and the extent of multimedia integration. The platform tracked collaboration activities, including instances of peer feedback, and recorded navigation patterns such as feature usage sequences. These analytics provided a rich dataset that enabled the researchers to examine not only final writing outcomes but also the writing processes that contributed to those outcomes. After export, the data were cleaned to remove anomalies, such as extended periods of inactivity or technical interruptions, and were anonymised through the use of coded identifiers to ensure participant confidentiality, consistent with ethical research protocols (Warschauer & Grimes, 2007). Before the implementation of the intervention, all participants completed consent procedures and demographic questionnaires. A baseline measure of writing ability was obtained through a narrative writing pre-test administered in computer laboratories under standardised conditions. Each participant had 60 minutes to complete a narrative composition of at least 250 words, responding to one of three randomly assigned prompts. Following this, the experimental group received structured training on the Storybird platform, including guided activities on story creation, image selection, text editing, and submission protocols. The training ensured technological familiarity and equitable starting conditions for all participants, a critical consideration in studies involving digital tools (Godwin-Jones, 2017).

Over a five-week implementation period, both experimental and control groups engaged in identical curriculum-aligned writing instruction sessions, held twice weekly for 90 minutes each. The experimental group completed their writing tasks using Storybird,

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incorporating text and multimedia components, and participating in digital peer review. The control group followed the same instructional sequence using traditional pen-and-paper methods, with typed submissions for final drafts. Both groups received formative feedback aligned with a standard rubric, and instructors documented all feedback interactions to ensure consistency and transparency across conditions. At the end of the intervention, all participants completed a post-test under conditions equivalent to the pre-test, using prompts of equal difficulty to assess narrative writing improvement. The learning analytics data for the experimental group were then compiled for analysis. Data from the entire intervention period were processed and linked to each participant's pre- and post-test scores via anonymised codes. This allowed for correlational and predictive analyses to explore the relationship between platform usage patterns and writing development.

4. Data Analysis

Quantitative data analysis was conducted using SPSS version 28. Descriptive statistics were calculated for demographic characteristics, writing scores, and each learning analytics metric. Measures of central tendency and dispersion, including means, medians, standard deviations, and ranges, were used to characterise the dataset. Paired-samples t-tests were conducted within each group to examine changes in writing performance from pre- to post-test. These analyses tested whether participants showed significant improvement in their narrative writing scores throughout the intervention period.

4.1 Descriptive Statistics

The analysis began with a comprehensive examination of descriptive statistics for all variables in the study. Table 1 presents the demographic characteristics of participants in both the experimental and control groups, confirming the similarity between groups that was established during the selection process.

Table 1: Participant Demographics

Characteristic	Experimental Group (n=20)	Control Group (n=20)	Total (N=40)
Age (Mean ± SD)	17.2	17.3	34.5
Gender (% Male)	100%	100%	--
Online Written Test Score	71.2 ± 6.8	69.8 ± 7.2	70.5 ± 7.0

Pre-test writing scores showed no significant differences between groups (t (38) = 0.34, p = 0.74), with the experimental group achieving a mean score of 2.15 ± 0.52 and the control group scoring 2.11 ± 0.48 on the 4-point narrative writing rubric. This confirmed that both groups began the study with equivalent writing abilities. The digital storytelling platform generated extensive learning analytics data for the experimental group participants. Table 2 summarises the key metrics collected during the five-week intervention period.

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Table 2: Learning Analytics Descriptive Statistics (Experimental Group)

The distribution of time-on-task showed considerable variation among participants, with some students spending nearly three times as much time on the platform as others. Revision frequency also varied substantially, indicating different approaches to the writing and editing process. These variations provided valuable opportunities to examine relationships between engagement patterns and writing outcomes.

Metric	Mean	Standard Deviation	Minimum	Maximum
Total Time-on-Task (minutes)	347.2	89.6	186.3	523.7
Number of Writing Sessions	12.4	3.2	7	19
Total Word Count (final stories)	1,284.70	267.3	832	1,847.00
Revision Events	23.8	8.4	12	42
Images Used	4.2	1.8	1	8
Peer Reviews Given	3.1	1.4	1	6
Peer Reviews Received	3.3	1.2	2	6

4.2 Pre- to Post-Test Comparisons

Within-Group Analyses

Paired-samples t-tests were conducted to examine changes in writing performance within each group from pre- to post-test. The experimental group showed significant improvement in narrative writing scores, with a mean increase of 0.67 points on the 4-point scale ($t(19) = 6.23$, $p < 0.001$, Cohen's $d = 1.39$). This represents a large effect size according to Cohen's conventions. The control group also demonstrated significant improvement from pre- to post-test, with a mean increase of 0.34 points ($t(19) = 3.45$, $p = 0.003$, Cohen's $d = 0.77$

Table 3: Pre- and Post-Test Writing Scores by Group and Rubric Dimension

Dimension	Experimental Group	Control Group
Organization & Structure		
Pre-test	2.20 ± 0.52	2.15 ± 0.49
Post-test	2.95 ± 0.51	2.45 ± 0.50
Improvement	0.75 ± 0.44*	0.30 ± 0.47*
Language Use & Vocabulary		

Pre-test	2.05 ± 0.51	2.10 ± 0.45
Post-test	2.70 ± 0.47	2.35 ± 0.49
Improvement	0.65 ± 0.49*	0.25 ± 0.44*
Grammar & Mechanics		
Pre-test	2.10 ± 0.55	2.05 ± 0.51
Post-test	2.65 ± 0.49	2.30 ± 0.47
Improvement	0.55 ± 0.51*	0.25 ± 0.44*
Content & Ideas		
Pre-test	2.25 ± 0.55	2.20 ± 0.52
Post-test	3.05 ± 0.51	2.60 ± 0.50
Improvement	0.80 ± 0.52*	0.40 ± 0.50*
Narrative Elements		
Pre-test	2.15 ± 0.49	2.15 ± 0.49
Post-test	2.90 ± 0.45	2.45 ± 0.51
Improvement	0.75 ± 0.44*	0.30 ± 0.47*

However, the magnitude of improvement was notably smaller than that observed in the experimental group, representing a medium-to-large effect size. Table 3 provides detailed information about pre- and post-test scores for both groups across all dimensions of the narrative writing rubric.

Figure 1 Post-Test Writing Scores by Group and Rubric Dimension
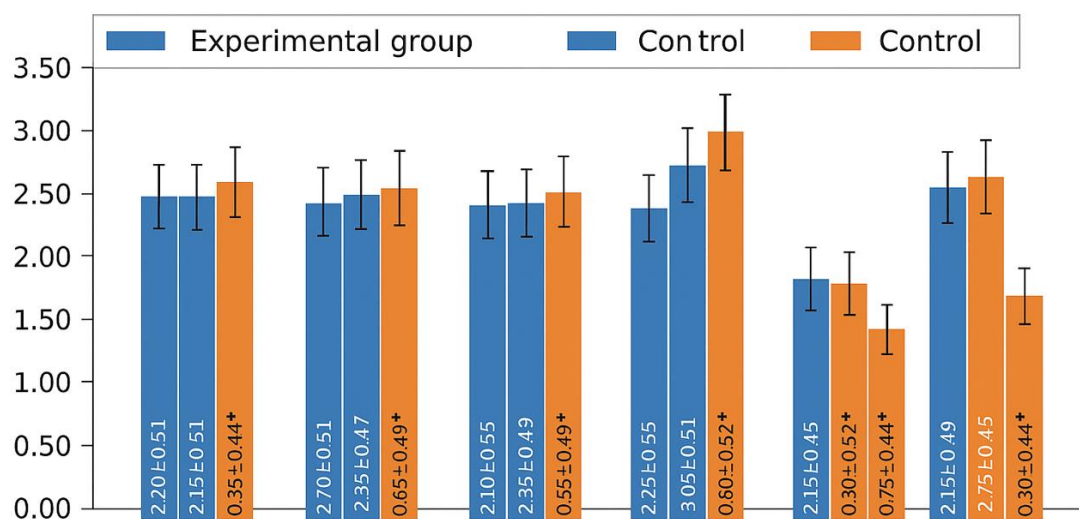
*p < 0.05 for within-group paired t-test

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The results show that the experimental group achieved greater improvements than the control group across all five dimensions of narrative writing assessed by the rubric. The largest differences between groups were observed in the areas of content and ideas, organisation and structure, and narrative elements, suggesting that digital storytelling may be particularly beneficial for developing these aspects of narrative writing.

5. Discussion

The findings of this study demonstrate the effectiveness of digital storytelling platforms in enhancing narrative writing skills among intermediate ESL learners. Participants in the experimental group showed significantly greater improvement in post-test performance compared to those in the control group, with a large effect size indicating the practical impact of the intervention. These results support the growing body of research that highlights the benefits of technology-enhanced writing environments for language learners, particularly those that facilitate multimodal composition and offer process-oriented scaffolding (Reinders, 2011). One of the key contributions of this study is the identification of specific learning analytics metrics, particularly revision frequency, as strong predictors of writing improvement. This supports theoretical perspectives that conceptualise writing as a recursive process, where iterative revision plays a central role in the development of writing proficiency. The ability of the digital platform to log detailed revision data and track time-on-task enabled a deeper understanding of individual writing behaviours and their relation to learning outcomes. Although the inclusion of multimedia elements did not significantly predict post-test performance, their presence may have supported learner engagement and cultural expression in ways not fully captured by traditional assessment rubrics. The findings align with prior research suggesting that digital storytelling promotes learner autonomy and engagement, even when its most visible features are not directly linked to text-based outcomes (Hafner & Miller, 2011). Overall, the results affirm the pedagogical potential of digital storytelling when integrated with data-informed instructional strategies. The analytic capabilities of these platforms offer new opportunities for educators to monitor student progress, tailor feedback, and support differentiated instruction. These findings also point to future directions for research, including the exploration of multimodal assessment frameworks and the application of more advanced learning analytics techniques to better understand long-term writing development.

6. Conclusion

This study shows that digital storytelling can improve ESL learners' narrative writing skills. Students in the experimental group performed better than those in the control group in all assessed areas. They showed stronger organisation, better vocabulary use, improved grammar, richer content, and more developed narrative elements. The use of the Storybird platform supported these gains through its multimodal features and structured

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feedback process. Data from the platform revealed that revision frequency and time spent on tasks were key factors in improving writing. This finding supports the view that writing develops through repeated practice and review. Multimedia features did not directly raise writing scores, but they kept students motivated and allowed them to express cultural ideas. The study's design, which included a control group, makes the results more reliable and adds to existing research on technology use in ESL writing. The study ran for only five weeks and involved a small number of learners from one institution. These factors may affect how far the results can be applied in other contexts. Future studies should test the approach over longer periods and with more diverse groups. They should also explore new ways to assess multimodal work, capturing both text and media elements. Using advanced learning analytics could give deeper insight into student behaviour and its effect on writing growth. For teachers, the message is clear. Digital storytelling, when combined with careful analysis of learner data, can make writing classes more engaging and effective. It can also give teachers better tools to track progress and adapt lessons. In this way, creative narrative tasks and data-based feedback can work together to build stronger and more confident writers.

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