Investigating the Efficiency of the Rotation Model in Improving First-Year Undergraduate ESL Learners' Writing: A Quasi-Experimental Study

Basheek Beg[1], Amir[2], Sohaib Alam[3], Roman Kralik[4,5] & Wahaj Unnisa Warda[3]

[1] Department of English, Jaipur Engineering College and Research Centre, Jaipur, India

[2] Department of Humanities, Galgotias College of Engineering and Technology, Greater Noida, India

[3] Department of English, College of Sciences and Humanities, Prince Sattam Bin Abdulaziz University, Alkharj, Kingdom of Saudi Arabia

[4] Department of Russian Language Peoples' Friendship University of Russia (RUDN University), Miklukho-Maklaya, Moscow, Russian Federation

[5] Theological Institute in Spišské Podhradie, Catholic University in Ružomberok, Spišská Kapitula, Ružomberok, Slovakia

Correspondence: Sohaib Alam, Department of English, College of Sciences and Humanities, Prince Sattam Bin Abdulaziz University, Alkharj, Kingdom of Saudi Arabia.

Abstract

The present study uses a quasi-experimental design to assess the effectiveness of the Rotation Model (RM) on English as a Second Language (ESL) learners' writing errors among undergraduate students. Few studies have focused on ESL learners' writing errors in inflectional suffixation. To address this gap, the current study investigates the effect of the Rotation Model on ESL learners' writing errors in inflectional suffixation within the Cognitive Load Theory (CLT) framework. The study has collected data from 132 participants. They were divided into two groups. The first group serves as the experimental group (N=66). The experimental group undergoes an intervention through the Rotation Model to improve English writing. The second group is the Control group (N=66). The control received instruction through the grammar-translation method.) Data were collected using pretests and posttests from both groups on two different pictures. The data were analyzed using paired t-tests on SPSS. The analysis revealed that the ESL learners in the experimental group improved their writing by minimizing errors related to inflectional suffixation more than the control group. These findings suggest that the Rotation Model effectively enhances the accuracy of ESL learners' use of inflectional suffixes. The implications of these results underscore the potential of RM as a superior instructional approach over traditional methods in ESL contexts, particularly for complex grammatical structures such as inflectional suffixation.

Keywords: Rotation Model; English as a Second Language; Inflectional Suffixation; Writing Errors; Undergraduate Students

1. Introduction

Addressing inflectional suffixation errors in English as a Second Language (ESL) education is crucial, particularly for undergraduate students, as mastery of these specific grammatical structures significantly influences the clarity and effectiveness of their written communication. Inflectional Suffixation involves appending suffixes to words to modify their form while maintaining their grammatical category and meaning. For instance, in English, adding '-s' to the noun 'man' transforms it into 'mans', indicating plurality without changing the word's essential nature. This process is fundamental for expressing grammatical relationships clearly, such as number, in language use, while rotation model provides anecdotes for learners to avoid these errors demonstrating examples through virtual means of pedagogy used in classroom setting. Inflectional suffixation, essential for accurately forming verb tenses, plurals, and possessive cases, presents notable challenges for ESL learners, who must navigate these complexities in addition to their broader language learning. Despite its critical importance, there is a surprising scarcity of focused research on these errors, with most existing studies generally targeting broader grammatical inaccuracies without isolating the intricacies of suffixation that are pivotal for proficient academic writing. The Grammar Translation Method (GTM) is a traditional language teaching approach that focuses heavily on the explicit instruction of grammatical rules and the translation of literary texts from the target language into the native language. While this method emphasizes reading and writing skills, it has significant weaknesses, particularly in fostering communicative competence. GTM largely neglects listening and speaking skills, which are crucial for practical language use, often resulting in students who may be proficient in grammar but struggle with real-life communication. The method's reliance on rote memorization of grammar rules and vocabulary, rather than contextual learning, can lead to disengagement and a lack of motivation among learners (Richards & Rodgers, 2001; Thornbury, 2006; Ahmad & Alam, 2024). Additionally, the teacher-cantered nature of GTM provides minimal opportunity for student interaction or feedback, making it less effective in developing fluency or addressing diverse learning styles (Larsen-Freeman, 2000; Brown, 2007). These limitations make it less suited to modern language acquisition needs, where communicative proficiency is paramount. The Rotational Model of language learning surpasses the Grammar Translation Method (GTM) by actively engaging students in varied

instructional strategies that promote practical application and integrated skill development, which are crucial for reducing English writing errors. Unlike GTM, which focuses on rote memorization, the Rotational Model incorporates interactive exercises and writing workshops that allow immediate application of grammatical rules and contextual learning (Larsen-Freeman, 2000). This method ensures holistic language development and provides adaptive learning opportunities, enabling targeted activities to address specific writing errors (Richards & Rodgers, 2001). Such practices not only maintain student engagement but also enhance their ability to apply grammar accurately in writing, leading to significant improvements in writing proficiency and fewer errors (Nation, 2009).

This gap highlights the need for specialized interventions like the Rotation Model (RM), which this study posits as a dynamic and interactive instructional approach. It hypothesizes that RM can significantly reduce inflectional suffixation errors compared to traditional Grammar Translation methods, drawing on the principles of active learning theory, which suggests that engaging learners through varied, dynamic educational activities enhances understanding and improves retention of complex material. The primary hypothesis asserts that through such active engagement, learners may develop a deeper, more robust understanding of grammar rules, improving writing quality (Kamenická, 2021). The secondary hypothesis supports this by suggesting that RM promotes sustained grammatical accuracy through repetitive practice and feedback, which is essential for solidifying language skills. The quasi-experimental study addresses these hypotheses while linking to broader educational and cognitive psychological theories, asserting that innovative and engaging instructional methods may significantly enhance cognitive engagement, facilitating deeper learning processes (Alam & Usama, 2023; Alam et al., 2023). By evaluating the effectiveness of the RM in specifically targeting and reducing errors in inflectional suffixation, the study seeks to provide actionable insights that could profoundly influence ESL curriculum development. If successful, the broader implementation of RM techniques in language learning classrooms could revolutionize ESL instructional methodologies, ultimately elevating language proficiency standards across diverse educational settings.

2. Literature Review

The framework of the present study is based on Cognitive Load Theory (CLT), formulated by John Sweller in the 1988s, and it explores how human cognitive architecture influences learning and informs instructional design, mainly focusing on the management of cognitive load, which encompasses the mental effort utilized in working memory (Sweller, 1988). CLT shows three types of cognitive load (Sweller et al., 2011): the first is intrinsic, which deals with the inherent complexity of the content; the second is extraneous, which shows how information is presented; the third is germane, which helps construct and automate schemas.) Intrinsic load is fixed to some degree by the nature of the subject matter, such as the complex grammatical rules of inflectional suffixation in English, which can pose significant challenges for ESL learners unfamiliar with such structures in their native languages. Extraneous load, however, can be manipulated through effective instructional design to reduce unnecessary cognitive strain that does not contribute to learning. This includes simplifying instructional materials and presenting information in segments, which can help prevent learners' working memory from being overwhelmed (Mayer & Moreno, 2003). Lastly, germane load enhances learning by encouraging integrating new information with existing knowledge, facilitating deep and meaningful learning processes (Paas et al., 2003; Petlák, & Birova, J. 2023).

CLT's implications for instructional design are particularly relevant in language learning environments. Techniques such as simplifying instructional materials, using pre-training sessions to introduce fundamental concepts, and providing work examples can help manage cognitive load effectively. For instance, introducing ESL learners to basic grammatical structures before advancing to more complex inflectional suffixation rules can scaffold learning and reduce intrinsic cognitive load (Alam, Ahmad & Birova, 2024; Alam et al., 2024; Van Merriënboer & Sweller, 2005). Moreover, worked examples are beneficial in the initial learning phases to reduce cognitive load and facilitate the transition to problem-solving exercises, gradually increasing the germane load necessary for developing proficiency (Sweller et al., 2019). These instructional strategies, grounded in CLT, optimize cognitive processing and could significantly improve how ESL learners acquire complex grammatical rules, enhancing overall language proficiency.

In essence, Cognitive Load Theory provides a valuable framework for designing ESL instructional materials that cater to the cognitive capabilities of learners, ensuring that cognitive resources are focused not on deciphering poorly presented information but on engaging deeply with the language learning content.

2.1 Rotation Model: A Blended Learning Paradigm

As Garrison and Kanuka (2004) detailed, the Rotation Model represents a sophisticated form of blended learning that seamlessly merges traditional classroom settings with virtual environments and digital tools. This pedagogical strategy allows students to engage in various educational activities across different stations, including online and face-to-face components, enhancing the learning experience by leveraging digital media (Jeffrey et al., 2014; Staker & Horn, 2012; Usama, 2023; Kildė, 2023). Notably, the conventional implementation of this model involves a structured schedule where students rotate between activities such as teacher-led sessions, collaborative group projects, and personalized online learning modules (Tucker, 2012; Sawchuk, 2019). This methodological blend is designed to cater to diverse learning preferences, integrating various instructional approaches that appeal to different sensory modalities, as Gardner (2011) and Fleming (2001) suggested. Such a comprehensive educational design supports academic achievement and fosters greater student engagement, as observed in studies by Means et al., (2009) and Picciano et al. (2012). In addition, the Rotation model helps the learners to be active in education as it helps to improve self-directed learning behaviors. It makes the learners more active and interactive in the learning process than passive learners (Zimmerman, 2002; Schunk, 2012).

The Rotation Model significantly enhances classroom management by organizing students into pairs and small groups, which allows for

tailored instructional approaches that cater to individual learning needs. This methodological structuring not only aids in differentiation, a pedagogical approach aimed at addressing the diverse requirements of students, but also supports focused, outcomes-based learning strategies (Tomlinson, 2014; Subban, 2006; Alam, 2024). Additionally, the model leverages technology to foster an analytics-driven approach to teaching, utilizing data from online learning platforms to refine and adapt educational practices (Sclater, 2017; Bernard et al., 2014).

However, the model is not without its drawbacks. It heavily depends on technological integration, which raises concerns about the digital divide and equitable access to learning resources (Selwyn, 2016; Cuban, 2001; Kobylarek, Alaverdov & Jakubowska, 2021; Alam et al., 2022; Alam et al., 2024). The initial costs associated with setting up technology-enhanced learning environments and the necessary professional development for teachers also pose significant challenges (Bernard et al., 2014). Despite these issues, the Rotation Model blends the benefits of digital tools with essential face-to-face interactions, offering a versatile framework that accommodates different learning styles, promotes active engagement, and enables personalized teaching. This blend of digital and direct instructional methods underscores the potential of the Rotation Model in modern education. However, it necessitates continuous evaluation and adaptation to ensure it meets the equity and accessibility needs of all students.

2.2 Impact of Rotation Model on ESL Learners' Writing

The Station Master Model has been recognized as a transformative educational strategy that significantly enhances English writing skills. Since its beginning, various aspects of writing have tested the effectiveness of the station master model through extensive research, from grammatical precision to creative articulation. Initial studies by pioneers such as Morris (2018) and Belazi and Ganapathy (2021) laid the groundwork by empirically validating the model's benefits.

Research focusing on grammatical details revealed that the model boosts grammatical accuracy. For example, Nagy (2018) documented improvements in tense usage, while Xiangze and Abdullah (2023) observed better subject-verb agreement among participants. On the qualitative side, Muhayyang et al. (2021) and Wang et al. (2021) noted advances in the coherence and logical structuring of arguments among university students, suggesting an improved ability to construct well-reasoned arguments. Despite these positive outcomes, the model has faced criticism for potentially stifling creative writing. Smalls (2019) and Alamri et al. (2021) argued that its structured nature might limit students' ability to develop individual writing styles. However, Zhao and Liao (2021) countered this viewpoint by suggesting modifications to the model's rigidity, which could allow personal writing styles to flourish (Alam et al., 2024).

Recent studies have also explored the model's efficacy in diverse settings, including virtual learning environments. Anthony et al. (2022) and Raza et al. (2020) provided evidence that the Station Master Model maintains effectiveness across physical and digital platforms. Moreover, Larsari et al. (2023) demonstrated that integrating this model with other pedagogical frameworks could enhance writing skills further. Zamri and Narasuman (2023) extended its application to professional contexts, indicating its potential beyond traditional educational settings. This breadth of research underscores the Station Master Model's adaptability and continued relevance in contemporary education systems.

3. Aims of the Study

This study aims to explore the effectiveness of the Rotation Model (RM) in enhancing the grammatical skills of English as a Second Language (ESL) learners, mainly focusing on their use of inflectional suffixes. The study is prompted by a notable gap in existing literature concerning the specific impact of innovative teaching models on the grammatical accuracy of ESL learners, particularly in higher education settings. Given the complexities associated with mastering English inflectional morphology, this research seeks to determine whether the Rotation Model can offer a more effective alternative to traditional teaching methods, such as the Grammar Translation method, which has been commonly used but critiqued for its effectiveness in active language use. Furthermore, the study is designed to shed light on how different instructional strategies may influence the learning of complex grammatical structures in ESL contexts. It hypothesizes that a dynamic and interactive learning environment, like that offered by the Rotation Model, could significantly enhance the ability of learners to understand and apply grammatical rules on inflectional suffixes, leading to fewer errors in their written English. This exploration is crucial, as mastering such grammatical nuances is often challenging for ESL learners but essential for achieving fluency and accuracy. The study aims to contribute valuable insights into the pedagogical practices that best support grammatical competence in ESL education by investigating these aspects. The following research question is formulated to perform the study:

- How does the Rotation Model (RM) impact the accuracy of inflectional suffix usage in the writing of English as a Second Language (ESL) undergraduate learners compared to traditional Grammar Translation methods?

4. Methodology

4.1 Participants and Sampling

In the current study, we adopted a random sampling method to assemble the participant group, which consisted of 132 first-year undergraduate students at a private university in Telangana, India. This method ensured that the data was representative and less biased in the quasi-experimental design. The students, all of whom had substantial prior exposure to English through advanced language courses, were evenly allocated into two groups: an experimental group and a control group, each comprising 66 students. This even division was critical in ensuring the reliability of the comparative analysis between the educational interventions (Johnson & Christensen, 2014). The

age of the participants was adequately controlled (between 19 to 21 years). This helped maintain demographic homogeneity. Gender balance was also a key consideration; the groups comprised an equal number of males and females, totaling 66 each, aligning with the best educational research practices that seek to eliminate gender as a confounding variable (Kothari, 2004). Additionally, all participants were native Telugu speakers, providing a consistent linguistic background essential for assessing the specific impact of the Rotation Model on English grammatical skills.

4.2 Treatment

The study focused on delivering targeted interventions for inflectional suffixation to the experimental and control groups. The intercession period was eight weeks (five days a week) of 90 minutes. This intensive schedule was chosen based on established research indicating that regular and concentrated instruction significantly enhances language learning outcomes (Spada & Lightbown, 2006). To facilitate this, a multi-stage instructional process was employed to teach ESL writing, structured to progressively develop students' skills in using inflectional suffixation effectively. The decision to use this particular duration and frequency of instruction was also influenced by findings from Johnson and Newport (1989), who noted the critical role of sustained engagement in fostering language learning. Additionally, the multi-stage teaching process was visualized in Figure 1, which detailed each phase of the educational intervention, demonstrating a structured approach to learning that aligns with contemporary educational theories on language learning (Ellis, 2008). This structured methodology was designed to ensure that students not only learned the rules of inflectional morphology but could also apply them practically in their writing, enhancing their understanding and practical ESL skills.
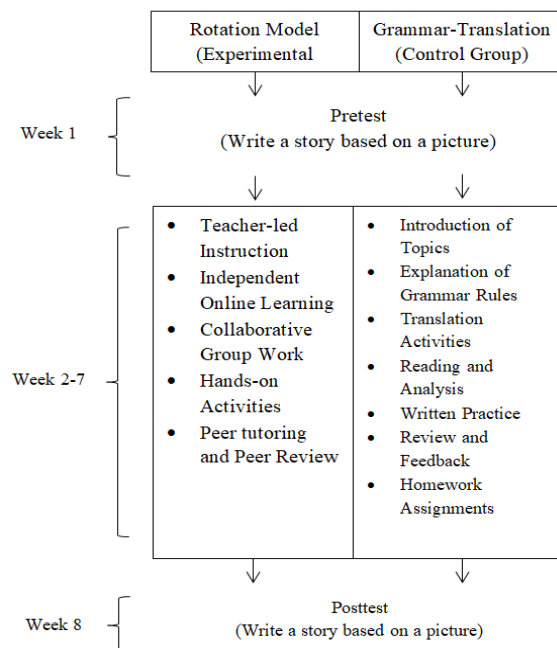

Figure 1. Design of the Quasi-Experimental Study

4.3 Experimental Group

An experimental classroom utilizing the Rotation Model establishes a dynamic, multifaceted learning environment to suit various learning preferences (see Figure 1). The learning starts with a teacher-led instructional phase where foundational concepts are introduced through deductive teaching and guided discussions. Students then move to a self-paced online learning phase, using digital tools to engage in activities like watching instructional videos and taking interactive quizzes. These transitions into collaborative group work, where students discuss, solve problems, and work on projects, enhancing subject understanding and essential soft skills such as teamwork. The next phase involves hands-on, experiential learning activities like experiments and practical applications. Optionally, a peer tutoring or review session can be added to reinforce learning by allowing students to teach and critique each other's work. The session concludes at the end of the class period, providing a holistic educational experience incorporating multiple teaching methods and learning styles.

4.4 Control Group

In the control group employing the Grammar-Translation method, the treatment began with introducing topics, followed by detailed explanations of relevant grammar rules. Students then engaged in translation activities, applying these rules by translating texts between the target language and their native language. This was supplemented by reading and textual analysis sessions, where students delved into the grammatical and syntactical structures of complex texts. The teachers evaluated the students' written practice with proper feedback. It was one of the critical components of the written practice that shows students' writing strengths and weaknesses. Students were assigned regular homework to reinforce the material outside the classroom, further solidifying their grasp of the language's structural aspects. This comprehensive approach ensured thorough engagement with the language through multiple facets of learning (see Figure 1).

5. Data Collection and Analysis Procedures

This study collected data from a respondent group before and after a forty-day (eight-week) treatment period. The data consisted of essays, ranging from 200 to 300 words, written on two pictures assigned pre- and post-treatment. These essays were created using Microsoft Word on individual computers, with all of Word's automated spelling and grammar correction features disabled to ensure data consistency and eliminate any external aids such as dictionaries.

For the analysis of the essays, the Error Analysis (EA) methodology, initially developed by Corder in 1981, was applied to identify and categorize linguistic errors. Preliminary assessments of these essays focused specifically on errors related to inflectional morphemes, utilizing Grammarly software—an empirically validated tool noted for its effectiveness in analyzing writing skills as per studies by Almusharraf and Alotaibi (2022). Following this initial analysis, the errors were systematically classified using the Surface Structure Taxonomy (Dulay et al., 1982). It maintained the strict criteria for including and excluding the data in the whole process.

6. Statistical Analysis of Data

This study analyzed data using IBM SPSS Statistics software, version 22, with the Paired t-test as the primary statistical tool. The test suits two pre-test and post-test scores, including experimental and control groups. This test compares two groups. The Paired t-test is advantageous due to its ability to detect changes within the same subjects across two conditions, providing a rigorous comparison of means from paired data. This method reduces the impact of inter-subject variability, enhancing the reliability of results by focusing on differences within pairs and minimizing extraneous individual differences. The Paired t-test allowed for precise quantification of the effects of various teaching interventions on learners' writing skills, highlighting differences in outcomes from the start to the end of the treatment period. This approach aligns closely with our study's goals, offering clear insights into the efficacy of educational interventions over time (Field, 2013; Maxwell & Delaney, 2017).

7. Results

The results section of this study analyses the impact of two teaching methods the Rotation Model and the Grammar-Translation method on ESL learners' command of English inflectional suffixes. Using paired t-tests, the section presents descriptive statistics (means and standard deviations) for pretest and posttest scores across both the experimental and control groups. The analysis delves into each inflectional suffix category, such as Plural (-s), Past Tense (-ed), and Present Tense (-s), detailing changes in scores from pretest to posttest and drawing comparisons between the teaching methodologies. This quantitative evaluation is supplemented with interpretations that consider educational implications, offering insights into which method better enhances grammatical accuracy. The results aim to inform pedagogical strategies and improve instructional approaches in ESL learning environments.

Table 1. Comparison of Pretest and Posttest Scores for Inflectional suffix errors among ESL Learners in Experimental and Control Groups

Sr. No.	**Inflectional Suffixes**	Experimental Group (Rotation Model)				Control Group (Grammar-Translation)			
		Pretest		Posttest		Pretest		Posttest	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
1.	Plural (-s)	3.409	0.265	2.424	0.197	4.348	0.190	4.045	0.206
2.	Past Tense (-ed)	5.121	0.302	3.833	0.333	6.076	0.201	5.803	0.219
3.	Present Tense (-s)	3.227	0.291	2.197	0.147	3.515	0.193	3.303	0.194
4.	Past Participles (en)	3.439	0.288	2.515	0.178	4.439	0.213	3.864	0.230
5.	Progressive (-ing)	4.076	0.273	3.242	0.350	4.515	0.181	3.985	0.229
6.	Possessive (-s)	1.409	0.112	0.818	0.086	1.288	0.138	1.212	0.129
7.	Comparative (-er)	3.697	0.197	2.485	0.196	3.894	0.229	3.424	0.232
8	Superlative (-est)	2.894	0.183	2.030	0.166	3.182	0.193	2.439	0.202

A. **Plural (-s):** The t-test for the plural suffix usage resulted in a t-value of 3.636 with 131 degrees of freedom, yielding a significant p-value of 0.04. This indicates a notable improvement in the learners' ability to correctly use plural suffixes, underscoring the efficacy of the educational interventions. The experimental group showed the mean scores decreased from 3.409 (SD = 0.265) in the pretest to 2.424 (SD = 0.197) in the posttest under the Rotational Model.) This decrease in score implies reduced errors made in applying plural suffixes. On the contrary, the Control group showed a higher mean pretest score of 4.348 (SD = 0.190) and decreased to 4.045 (SD = 0.206) in the post-test. This is followed by the grammar-translation Method. Moreover, this shows less error reduction compared to the experimental group. Both groups demonstrated improvements, but the Experimental Group exhibited a more significant decrease in errors, highlighting the potential advantages of the Rotation Model in enhancing grammatical accuracy.

B. **Past Tense (-ed):** In evaluating past tense marker usage among ESL students, statistical analysis utilizing a paired t-test demonstrated significant improvements, with a t-value of 3.608 and a p-value of 0.04. This indicates a substantial enhancement in mastering past tense forms attributed to effective teaching methods. Specifically, the Experimental Group, employing the Rotation Model, showed a decrease in mean scores from 5.121 (SD = 0.302) to 3.833 (SD = 0.333), signifying a significant error reduction.

Conversely, the Control Group taught using the traditional Grammar-Translation method began with a higher pretest mean of 6.076 (SD = 0.201) and decreased to 5.803 (SD = 0.219) at the post-test, indicating a smaller error decline. Despite the Control Group's slightly higher overall performance, the more significant decrease in errors observed in the Experimental Group suggests that the Rotation Model may be more effective at enhancing grammatical accuracy in using past tense markers.

C. **Present Tense (-s):** The statistical analysis of present tense usage among ESL learners highlighted significant enhancements, evidenced by a t-value of 3.649 and a p-value of 0.04. These results indicate a notable improvement in the application of present tense forms, underscoring the effectiveness of the employed instructional approaches. There was a reduction in mean scores from 3.227 (SD = 0.291) in the pretest to 2.197 (SD = 0.147) in the posttest in the Experimental group. It simply showed a decrease in errors. In contrast, the Control Group, utilizing traditional Grammar-Translation methods, began with a slightly higher pretest mean of 3.515 (SD = 0.193) and experienced a more modest decrease to 3.303 (SD = 0.194) at the post-test. This minor reduction in errors suggests that while both groups improved, the Rotation Model used by the Experimental Group was more effective in reducing errors and enhancing mastery of present tense usage compared to the more stable performance facilitated by traditional methods in the Control Group.

D. **Past Participles (en):** Significant advancements were evident in using past participles, as demonstrated by a t-value of 4.202 and a p-value of less than 0.01, signifying substantial improvement in mastering this complex grammatical structure. The mean score decreased from 3.439 (SD = 0.288) in the pretest to 2.515 (SD = 0.178) in the posttest in the Experimental Group. It shows that there is progress in learners and a reduction in errors. On the other hand, the control group showed a high mean score of 4.439 (SD = 0.213), decreasing to 3.864 (SD = 0.230) in the posttest. It showed less reduction. Although both groups improved, the more significant decrease in mean scores in the Experimental Group underscores the effectiveness of the teaching methods they were exposed to, particularly in reducing errors in using past participles compared to the Control Group's performance, which was more stable but less improved.

E. **Progressive (-ing):** Significant improvements in the use of progressive markers were observed, as indicated by a t-value of 3.714 and a p-value of 0.03, substantiating the effectiveness of the applied instructional methods in teaching the representation of ongoing actions in English. The mean score decreased from 4.076 (SD = 0.273) to 3.242 (SD = 0.350) in the Experimental group. It showed a reduction in errors). Conversely, the Control Group, which utilized the Grammar-Translation method, saw a smaller decline in their scores from 4.515 (SD = 0.181) to 3.985 (SD = 0.229). Although both groups experienced improvements, the more substantial decrease in errors in the Experimental Group suggests that the instructional methods it employed were more effective in enhancing proficiency in using progressive markers than the Grammar-Translation method used by the Control Group.

F. **Possessive (-s):** The analysis of possessive usage revealed the most significant improvement among all grammatical aspects studied, as evidenced by a t-value of 4.984 and an exceptionally low p-value of less than 0.01, indicating highly effective instruction in possessive constructions. The experimental group is related to an innovative teaching method that reduces errors. The mean score decreases from 1.409 (SD = 0.112) to 0.818 (SD = 0.086). In comparison, the Control Group, following traditional Grammar-Translation methods, also showed improvement but to a lesser extent, with scores decreasing from 1.288 (SD = 0.138) to 1.212 (SD = 0.129). The more substantial decrease in errors in the Experimental Group indicates that their instructional methods enhanced learners' proficiency with possessive constructions more effectively than the more traditional approaches used by the Control Group.

G. **Comparative (-er):** Significant improvements were seen in comparative forms, underscored by a t-value of 4.163 and a p-value of less than 0.01. It shows the enhancement in the use of comparative adjectives. However, there was a decrease in errors in the experimental group from 3.697 (SD = 0.197) to 2.485 (SD = 0.196). At the same time, the control group also shows a decrease in the mean scores from 3.894 (SD = 0.229) to 3.424 (SD = 0.232). Despite both groups showing improvements, the Experimental Group's more significant reduction in errors indicates that their teaching methods were more effective in reducing mistakes in forming comparatives, highlighting the advantages of the approaches used in the Experimental Group over those employed in the Control Group.

H. **Superlative (-est):** A notable improvement was also seen in the superlative forms, with a t-value of 4.381 and a p-value of less than 0.01. It shows promising results of the superlative adjectives in learning. On the other hand, the mean score decreases from 2.894 (SD = 0.183) to 2.030 (SD = 0.166). It simply shows decreases in errors. There was progress as their mean scores decreased from 3.182 (SD = 0.193) to 2.439 (SD = 0.202) in the Control Group. While both groups showed enhanced proficiency, the more significant decrease in errors within the Experimental Group suggests that the instructional methods utilized were more effective at reducing mistakes in forming superlatives than those employed in the Control Group.

8. Discussion

The results from the study show significant improvements in the mastery of various inflectional suffixes, validating the efficacy of the employed teaching methods. Across categories like plural (-s), past tense (-ed), present tense (-s), past participles, progressive markers, possessive suffixes, comparatives, and superlatives, both experimental and control groups demonstrated reduced mean scores from pretest to posttest, indicative of fewer errors and enhanced grammatical accuracy. Notably, the Experimental Group, which utilized the Rotation Model, consistently exhibited more significant error rate declines than the Control Group, which followed traditional

Grammar-Translation methods. This was particularly evident in categories such as plural (-s) and past participles, where the Experimental Group saw more significant error reductions. These findings suggest that while traditional methods help stabilize learning outcomes, the innovative strategies incorporated in the Rotation Model lead to more significant improvements in grammatical proficiency, highlighting its potential as a more effective teaching approach for ESL learners.

The current study's findings, when viewed through the lens of Cognitive Load Theory (CLT), as proposed by John Sweller in late 1988, offer substantial insights into the differential impacts of traditional and innovative teaching methods on language learning. CLT posits that the design of instructional materials and activities can significantly influence learning outcomes by affecting the types and levels of cognitive load imposed on learners (Sweller, 1988). Traditional teaching methods, such as the Grammar-Translation method used by the Control Group in this study, may provide stability in learning outcomes. However, they often require learners to process and remember many rules, thus imposing a high intrinsic cognitive load. This can potentially overwhelm learners, leaving limited cognitive resources for deeper understanding and integration of language concepts (Paas et al., 2003).

In contrast, the Rotation Model employed by the Experimental Group strategically reduces extraneous cognitive load and enhances germane cognitive load. It means diversifying learning activities and contexts makes learning more engaging. It also helps facilitate properly integrating new information into existing cognitive schemas. By varying the instructional delivery and context, this model helps manage the cognitive load more efficiently, thereby supporting the cognitive architecture that underpins language learning (Van Merriënboer & Sweller, 2005). Such an approach not only aligns with CLT principles but also harnesses them to optimize learning, resulting in more significant improvements in grammatical proficiency among learners.

Furthermore, the Rotation Model's ability to reduce unnecessary cognitive load while focusing on schema construction and automation is particularly critical in language learning, where mastering complex grammatical structures is essential. The significant decreases in error rates in the Experimental Group underscore the efficacy of this model in enhancing learners' grammatical proficiency, thereby highlighting its potential as a superior instructional approach in ESL contexts (Ayres & Paas, 2009; Usama et al., 2024a; Usama et al., 2024b; Alam, Karim & Ahmad, 2020; Alam et al., 2023). The study's findings generally ensure the importance of instructional design in language education. Moreover, it also implies that methodologies like CLT and the rotation model are much better in the learning experience. This study's findings underscore the Rotation Model's efficacy in boosting grammatical proficiency among ESL learners, with notable reductions in error rates compared to the traditional Grammar-Translation methods employed by the Control Group. This observation aligns with recent scholarly assertions that interactive, dynamic teaching methods surpass more conventional approaches in language instruction, facilitating superior educational outcomes (Slavich & Zimbardo, 2012; Ramalingam et al., 2021). Research by Duong et al. (2019) further corroborates those methods like the Rotation Model address diverse learner needs, thereby enhancing personalized learning and engagement—critical components for mastering complex grammatical structures. In contrast, while traditional methods like grammar translation offer stability, their efficacy in fostering practical language application remains limited (Lee & Davis, 2020; Alam, 2023). This limitation is highlighted in studies by Maftuna (2023), which indicate that traditional methods may not adequately prepare learners for real-world language use, focusing instead on rote memorization and rule-based learning. Furthermore, Roscoe et al. (2014) suggests that innovative teaching approaches, including direct instruction and interactive activities, significantly enhance language retention and usability (Alam & Hameed, 2023). This body of research collectively supports the finding that by promoting active engagement and practical application of language skills, the Rotation Model leads to substantial improvements in grammatical accuracy and overall language proficiency, offering a compelling alternative to more traditional, less interactive educational methodologies.

9. Conclusion

The study convincingly demonstrated that the Rotation Model significantly enhances grammatical accuracy in ESL learners' use of inflectional suffixes, outperforming the traditional Grammar-Translation method. This model reduced error rates more effectively and facilitated a deeper understanding and application of complex grammatical rules, as supported by Cognitive Load Theory. The findings suggest that integrating the Rotation Model into the ESL curriculum could substantially improve language learning outcomes by leveraging active, dynamic instructional strategies that manage cognitive load efficiently. However, the study's limitations, including its confined demographic and educational setting, suggest that further research is needed to explore the effectiveness of the Rotation Model across varied linguistic backgrounds and more prominent, more diverse populations. The study may also help in future research on the long-term impact of the rotation model on learner proficiency. It may also help explore other aspects of language learning. This research underscores the potential of innovative teaching methods like the Rotation Model to revolutionize ESL education, offering substantial improvements in language proficiency that could significantly influence global educational practices.

Acknowledgement

Authors' Contributions

Dr. SA were responsible for study design and revising. Dr. BB, Dr. A was responsible for data collection. Dr. SA and WW drafted the manuscript and Prof. RK and Dr. A revised it. All authors read and approved the final manuscript. All authors contributed equally to writing, editing, and proofreading the manuscript

Competing Interests

The authors declare that they have no competing interests.

Informed consent

Obtained.

Ethics approval

The Publication Ethics Committee of the Sciedu Press.

The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

Provenance and peer review

Not commissioned; externally double-blind peer reviewed.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

Open access

Copyrights

References

Alam, S. (2024). Efficacy of mixed model instruction to improve English language skills of business management students: an experimental study. *Journal of Education Culture and Society*, *15*(2), 387-402. https://doi.org/10.15503/jecs2024.2.387.402

Alam, S., & A. Hameed. (2023). "Teaching concerns in higher education: impact of covid-19 in pedagogy". *Journal of Education Culture and Society,* 14(1)*,* 318-332. https://doi.org/10.15503/jecs2023.1.318.332

Alam, S., Ahmad, F., & Biryukova, Y. N. (2024). Incorporating artificial intelligence and MALL strategies in EFL classrooms: interactive pedagogical praxis. *Journal of Education Culture and Society, 15*(1), 181-198. https://doi.org/10.15503/jecs2024.1.181.198

Alam, S., Hameed, A., Madej, M. & Kobylarek, A. (2024). Perception and practice of using Artificial Intelligence in education: An opinion based study. *XLinguae, 17*(1), 216-233. https://doi.org/10.18355/XL.2024.17.01.15

Alam, S., Madej, M., Warda, W., & Kobylarek, A. (2024). Utilizing process drama in education: a study of pedagogical perceptions. *XLinguae*, *17*(2), 132-149. https://doi.org/10.18355/XL.2024.17.02.09

Alamri, H. A., Watson, S., & Watson, W. (2021). Learning technology models that support personalization within blended learning environments in higher education. *TechTrends*, *65*, 62-78. https://doi.org/10.1007/s11528-020-00530-3

Almusharraf, N., & Alotaibi, H. (2022). An error-analysis study from an EFL writing context: Human and Automated Essay Scoring Approaches. *Technology, Knowledge and Learning*. https://doi.org/10.1007/s10758-022-09592-z

Anthony, B., Kamaludin, A., Romli, A., Raffei, A. F. M., Phon, D. N. A. L. E., Abdullah, A., & Ming, G. L. (2020). Blended Learning Adoption and Implementation in Higher Education: A Theoretical and Systematic Review. *Technology, Knowledge and Learning*, *27*. https://doi.org/10.1007/s10758-020-09477-z

Alam, S., A. Hameed, A. K., M. Madej & F. Ahmad. (2023). Drama approaches across higher education in the English curriculum: students' perspectives on holistic activity-based teaching. *XLinguae*, *16*(2), 54-68. https://doi.org/10.18355/XL.2023.16.02.05

Alam, S., M., Usama, A., Hameed & Iliyas, S. (2024). Analyzing Facebook mobile usage: efficacy and ESL learners' writing proficiency. *International Journal of Interactive Mobile Technologies (iJIM), 18*(3), 1-15. https://doi.org/10.3991/ijim.v18i03.44959

Alam, S., & M. Usama. (2023). "Does e-feedback impact minimizing ESL writing errors? An experimental study". *International Journal of Emerging Technologies in Learning (iJET), 18*(4), 156-169. https://doi.org/10.3991/ijet.v18i04.36349

Alam, S., H. Faraj Albozeidi., B. Okleh Salameh Al-Hawamdeh & Ahmad, F. (2022). Practice and principle of blended learning in ESL/EFL pedagogy: strategies techniques and challenges. *International Journal of Emerging Technologies in Learning (ijet), 17*(11), 225-241. https://doi.org/10.3991/ijet.v17i11.29901

Alam, S., M. R., Karim, & F. Ahmad. (2020). Process drama as a method of pedagogy in ESL classrooms: articulating the inarticulate. *Journal of Education Culture and Society,* 11(1), 255-272. https://doi.org/10.15503/jecs2020.1.255.272

Alam, S., M., Usama., M., Moshabbir, Alam., I. Jabeen, & F. Ahmad. (2023). "Artificial intelligence in global world: a case study of Grammarly as E-tool on ESL Learners' of Darul Uloom Nadwa". *International Journal of Information and Education Technology, 13*(11), 1741-1747. https://doi.org/10.18178/ijiet.2023.13.11.1984

Alam, S., (2023). "Pedagogical implications in EFL classrooms: a reflective praxis of vocabulary strategies and techniques". *Journal of Language Teaching and Research*, vol. 14, no. 5, pp. 1422-1429. https://doi.org/10.17507/jltr.1405.31.

Ahmad, F. & Alam, S. (2024). Role of achievement motivation and metacognitive strategies use for defining self-reported language proficiency. *World Journal of English Language, 14(*6), 77-86. https://doi.org/10.5430/wjel.v14n6p77

Ayres, P., & Paas, F. (2008). Interdisciplinary perspectives inspiring a new generation of cognitive load research. *Educational Psychology Review*, *21*(1), 1-9. https://doi.org/10.1007/s10648-008-9090-7

Belazi, N., & Ganapathy, M. (2021). The effects of the station rotation model in promoting libyan students' EFL writing: Blended learning. *AJELP: Asian Journal of English Language and Pedagogy*, *9*(1), 111-127. https://doi.org/10.37134/ajelp.vol9.1.10.2021

Bernard, R. M., Borokhovski, E., Schmid, R. F., Tamim, R. M., & Abrami, P. C. (2014). A meta-analysis of blended learning and technology use in higher education: From the general to the applied. *Journal of Computing in Higher Education*, *26*(1), 87-122. https://doi.org/10.1007/s12528-013-9077-3

Brown, H. D. (2007). Principles of Language Learning and Teaching. Pearson Education.

Corder, S. P. (1981). *Error analysis and interlanguage*. Oxford University Press.

Cuban, L. (2001). *Oversold and underused*. https://doi.org/10.4159/9780674030107

Dulay, H., Burt, M., & Krashen, S. (1982). Language two. *The Modern Language Journal*, *67*(3), 273. https://doi.org/10.2307/327086

Duong, M. T., Pullmann, M. D., Buntain-Ricklefs, J., Lee, K., Benjamin, K. S., Nguyen, L., & Cook, C. R. (2019). Brief teacher training improves student behavior and student–teacher relationships in middle school. *School Psychology*, *34*(2), 212-221. https://doi.org/10.1037/spq0000296

Ellis, N. C. (2008). The dynamics of second language emergence: Cycles of language use, language change, and language acquisition. *The Modern Language Journal*, *92*(2), 232-249. https://doi.org/10.1111/j.1540-4781.2008.00716.x

Field, A. (2013). *Discovering Statistics Using IBM SPSS Statistics* (5th ed.). Sage Publications.

Fleming, N. D. (2001). *Teaching and learning styles: VARK strategies*. Neil Fleming.

Gardner, H. E. (2011). *Frames of mind: The theory of multiple intelligences*. Basic books.

Garrison, D. Randy., & Kanuka, H. (2004). Blended learning: Uncovering its transformative potential in higher education. *The Internet and Higher Education*, *7*(2), 95-105. https://doi.org/10.1016/j.iheduc.2004.02.001

Jeffrey, L. M., Milne, J., Suddaby, G., & Higgins, A. (2014). Blended learning: How teachers balance the blend of online and classroom components. *Journal of Information Technology*, *13*. https://doi.org/10.28945/1968

Johnson, J. S., & Newport, E. L. (1989). Critical period effects in second language learning: The influence of maturational state on the acquisition of English as a second language. *Cognitive Psychology*, *21*(1), 60-99. https://doi.org/10.1016/0010-0285(89)90003-0

Kamenická, J. (2021). Apple Tree Model of Emotion-Involved Processing: Videos for Emotions and Foreign Language Learning. *Journal of Education Culture and Society*, *12*(1), 103-116. https://doi.org/10.15503/jecs2021.1.103.116

Kildė, L. (2023). ESL Teachers' Approaches towards the Acceptance of Educational Technology Integration in Non-Formal Education: A Case from Kenya. *Journal of Education Culture and Society*, *14*(1), 634-649. https://doi.org/10.15503/jecs2023.1.634.649

Kobylarek, A., Alaverdov, E., Jakubowska, L, (2021)*,* The significance of a pandemic in teaching foreign languages, with special regard to the teaching of seniors, *XLinguae*, *15*(1), 73-80. https://doi.org/10.18355/XL.2021.14.01.06

Kothari, C. R. (2004). *Research methodology: Methods and techniques*. New Age International.

Larsari, V. N., Dhuli, R., & Chenari, H. (2023). Station rotation model of blended learning as generative technology in education: An evidence-based research. *Lecture Notes in Networks and Systems*, 441-450. https://doi.org/10.1007/978-3-031-29857-8_45

Larsen-Freeman, D. (2000). *Techniques and Principles in Language Teaching.* Oxford University Press.

Lee, Y. J., & Davis, R. O. (2020). University ells' perceptions, evaluations, and satisfaction with EMI courses in korea: Focusing on communicative language teaching (CLT) and the grammar-translation method (GTM). *The Journal of AsiaTEFL*, *17*(3), 1068-1076. https://doi.org/10.18823/asiatefl.2020.17.3.23.1068

Maftuna, A. (2023). Developing EFL students speaking skills through task-based instructions, importance of dialogues to develop students speaking skills. *Journal of Education, Ethics and Value*, *2*(3), 48-50. Retrieved from

https://jeev.innovascience.uz/index.php/jeev/article/view/47

Maxwell, S. E., Delaney, H. D., & Kelley, K. (2017). *Designing experiments and analyzing data*. Routledge. https://doi.org/10.4324/9781315642956

Mayer, R. E., & Moreno, R. (2003). Nine Ways to Reduce Cognitive Load in Multimedia Learning. *Educational Psychologist*, *38*(1), 43–52. https://doi.org/10.1207/s15326985ep3801_6

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2009). *Evaluating evidence-based practices in online learning: A meta-analysis and review of online learning studies*. Association for Learning Technology. Retrieved from https://repository.alt.ac.uk/629/

Morris, A. M. (2018). *Knowledge, intentions, and beliefs about fertility and assisted reproductive technology among illinois college students*. Southern Illinois University at Carbondale.

Muhayyang, M., Limbong, S., & Ariyani, A. (2022). Students' Attitudes on Blended Learning-Based Instruction in Indonesian EFL Classroom. *REPOSITORI*, *1*(01), 1-27.

Nagy, N. M. A. H. (2018). *The effect of using the station rotation model on preparatory students' writing performance*. ERIC. Retrieved from https://eric.ed.gov/?id=ED596979

Nation, P. (2009). *Teaching ESL/EFL Reading and Writing*. Routledge. https://doi.org/10.4324/9780203891643

Paas, F., Renkl, A., & Sweller, J. (2003). Cognitive load theory and instructional design: Recent developments. *Educational Psychologist*, *38*(1), 1-4. https://doi.org/10.1207/s15326985ep3801_1

Petlák, E., & Birova, J. (2023). General Soft Skills and Sub-competencies Developing Plurilingual Intercultural Competence by Students´ Self-Reflective Understanding. *Journal of Education Culture and Society*, *14*(2), 257-267. https://doi.org/10.15503/jecs2023.2.257.267.

Picciano, A. G., Seaman, J., Shea, P., & Swan, K. (2012). Examining the extent and nature of online learning in american K-12 education: The research initiatives of the alfred P. sloan foundation. *The Internet and Higher Education*, *15*(2), 127-135. https://doi.org/10.1016/j.iheduc.2011.07.004

Ramalingam, S., Yunus, M. M., & Hashim, H. (2021). Exploring ESL learners' blended learning experiences and its effectiveness through web-based technologies. *International Journal of Evaluation and Research in Education*, *10*(4), 1436-1445. https://doi.org/10.11591/ijere.v10i4.21465

Raza, S. A., Qazi, W., Khan, K. A., & Salam, J. (2020). Social isolation and acceptance of the learning management system (LMS) in the time of COVID-19 pandemic: An expansion of the UTAUT model. *Journal of Educational Computing Research*, *59*(2), 073563312096042. https://doi.org/10.1177/0735633120960421

Richards, J. C., & Rodgers, T. S. (2001). *Approaches and Methods in Language Teaching*. Cambridge University Press. https://doi.org/10.1017/CBO9780511667305

Roscoe, R. D., Allen, L. K., Weston, J. L., Crossley, S. A., & McNamara, D. S. (2014). The Writing Pal Intelligent Tutoring System: Usability Testing and Development. *Computers and Composition*, *34*, 39-59. https://doi.org/10.1016/j.compcom.2014.09.002

Sawchuk, S. (2019). Are schools prepared to respond to sex abuse? Latest probe reveals shortcomings. *Education Week*, *24*.

Schunk, D. H. (2012). *Learning theories an educational perspective*. Pearson Education, Inc.

Sclater, N. (2017). *Learning analytics explained*. Routledge. https://doi.org/10.4324/9781315679563

Selwyn, N. (2016). *Is technology good for education?*. John Wiley & Sons.

Slavich, G. M., & Zimbardo, P. G. (2012). Transformational teaching: Theoretical underpinnings, basic principles, and core methods. *Educational Psychology Review*, *24*(4), 569-608. https://doi.org/10.1007/s10648-012-9199-6

Smalls, L. (2019). *Effectiveness of The Station Rotation Model and Flipped Classroom Model in The Middle School Setting in Increasing Students' Scores on Classroom and District Assessments* (Doctoral dissertation, Brenau University).

Spada, N., & Lightbown, P. M. (2006). *How languages are learned*. Oxford University Press.

Staker, H., & Horn, M. B. (2012). *Classifying K–12 blended learning*.

Subban, P. (2006). Differentiated instruction: A research basis. *International education journal*, *7*(7), 935-947.

Sweller, J. (1988). Cognitive load theory, learning difficulty, and instructional design. *Learning and instruction*, *4*(4), 295-312.

Sweller, J., Ayres, P., Kalyuga, S., Sweller, J., Ayres, P., & Kalyuga, S. (2011). Measuring cognitive load. *Cognitive load theory*, 71-85. https://doi.org/10.1007/978-1-4419-8126-4_6

Thornbury, S. (2006). *An A-Z of ELT*. Macmillan Education.

Tomlinson, C. A. (2014). *The differentiated classroom: Responding to the needs of all learners*. Ascd.

Tucker, C. R. (2012). *Blended learning in grades 4–12: Leveraging the power of technology to create student-centered classrooms*. Corwin Press.

Usama, M. (2023). Does blended learning approach affect madrasa students english writing errors? A comparative study. *International Journal of Advanced Engineering Research and Science*, *10*(3), 097-108. https://doi.org/10.22161/ijaers.103.10

Usama, M., Alam, S., Hameed, A., Ahmad, F., & Iliyas, S. (2024a). Web-Based vs. mixed mode instruction utilizing e-learning via LMS: A comparative study. *International Journal of Information and Education Technology*, *14*(4), 612-619. https://doi.org/10.18178/ijiet.2024.14.4.2084

Usama, M., Alam, S., Tarai, S., & Banu, S. (2024b). The impact of rotation model on minimizing inflectional morphemes errors in english writing: A comparative study of error analysis. *Theory and Practice in Language Studies*, *14*(2), 307-318. https://doi.org/10.17507/tpls.1402.01

Van Merriënboer, J. J. G., & Sweller, J. (2005). Cognitive load theory and complex learning: Recent developments and future directions. *Educational Psychology Review*, *17*(2), 147-177. https://doi.org/10.1007/s10648-005-3951-0

Wang, L., Huang, Y., & Omar, M. (2021). Analysis of blended learning model application using text mining method. *International Journal of Emerging Technologies in Learning (IJET)*, *16*(1), 172-187. https://doi.org/10.3991/ijet.v16i01.19823

Zamri, M. Z., & Narasuman, S. (2023). The effect of blended learning models on ESL students' self-efficacy and proficiency. *3L the Southeast Asian Journal of English Language Studies*, *29*(1), 139-153. https://doi.org/10.17576/3l-2023-2901-10

Zhao, C. G., & Liao, L. (2021). Metacognitive strategy use in L2 writing assessment. *System*, *98*, 102472. https://doi.org/10.1016/j.system.2021.102472

Zhao, X. Z., & Abdullah, Z. (2023). Station rotation with gamification approach to increase students' engagement in learning english online. *Social Science Research Network*. https://doi.org/10.2139/ssrn.4534571

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory into Practice*, *41*(2), 64-70. https://doi.org/10.1207/s15430421tip4102_2