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ChatGPT as a scaffolding tool in English Language Teaching

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Abstract: Scaffolding is an essential instructional strategy in English Language Teaching (ELT), particularly in developing academic and technical writing skills. This study examines ChatGPT's role as a digital scaffolding tool in guiding learners through the process of writing technical reports. Grounded in Vygotsky's Zone of Proximal Development (ZPD), the research explores how ChatGPT provides cognitive, metacognitive, and linguistic support, enabling learners to structure, refine, and enhance their technical writing proficiency.

Through qualitative and quantitative analysis, the study investigates how ChatGPT assists learners in organizing content, maintaining clarity and coherence, improving grammatical accuracy, and adhering to technical writing conventions. The findings indicate that ChatGPT facilitates report writing by generating structured templates, suggesting formal language, providing contextual feedback, and encouraging iterative revisions. However, challenges such as over-reliance on AI, limited domain-specific accuracy, and the need for critical evaluation of AI-generated content are also identified.

The study concludes that ChatGPT can serve as an effective scaffolding tool in technical writing when integrated thoughtfully with human instruction. Future research should explore adaptive AI-driven scaffolding models that cater to individual learning needs in technical and academic writing.

Keywords: ChatGPT, scaffolding, technical report writing, English Language Teaching, AI in education

1. Introduction

Technical writing is a critical skill in academic and professional settings, requiring precision, clarity, and adherence to specific formatting conventions. For non-native English speakers and novice writers, mastering technical report writing presents significant challenges, including structuring content, using appropriate language, and maintaining coherence. Traditional scaffolding methods, such as instructor feedback and peer collaboration, have long been used to support learners in developing these skills. However, the integration of artificial intelligence (AI) in education has introduced new possibilities for digital scaffolding, with tools like ChatGPT offering real-time, personalized assistance.

Scaffolding, a concept rooted in Vygotsky's Zone of Proximal Development (ZPD), refers to the temporary support provided to learners until they can perform tasks independently. In the

context of technical report writing, scaffolding includes guiding students through organizing information, refining language use, and improving technical accuracy. ChatGPT, a generative AI model, serves as a digital scaffold by providing structured templates, suggesting formal expressions, offering grammar corrections, and prompting self-revisions.

This paper explores ChatGPT's role as a scaffolding tool in technical report writing, examining how it supports learners in overcoming common writing challenges. Through an analysis of AI-assisted writing processes, the study investigates the extent to which ChatGPT enhances cognitive, metacognitive, and linguistic scaffolding in technical communication. Additionally, the paper discusses the benefits, limitations, and pedagogical implications of integrating ChatGPT into English Language Teaching (ELT) for technical writing.

By evaluating ChatGPT's effectiveness in structuring reports, enhancing language accuracy, and fostering independent learning, this study aims to contribute to the growing body of research on AI in education. The findings will provide insights into optimizing AI-based scaffolding while maintaining a balance between technological assistance and human instruction.

2. Literature Review

2.1. Traditional Scaffolding in ELT

Scaffolding in English Language Teaching (ELT) has traditionally been rooted in Vygotskian socio-cultural theory, emphasizing guided support provided by teachers and peers to help learners bridge their knowledge gaps (Hammond & Gibbons, 2005). Traditionally, scaffolding in ELT occurs in the form of teacher-led instruction, peer collaboration, and structured learning tasks that provide incremental support until students can function independently. Techniques such as modeling, feedback, and questioning have been widely used in classroom settings to facilitate learning (Wood, Bruner, & Ross, 1976).

The role of scaffolding is particularly evident in writing and speaking tasks, where teachers provide structured support to help students develop language proficiency. Storch (2013) highlighted that collaborative writing fosters co-construction of knowledge, where stronger learners support weaker ones in developing linguistic competence. In recent years, peer-led scaffolding has also gained attention, as it encourages active participation and learner autonomy in ELT settings (Lee & Kim, 2022). However, one challenge of traditional scaffolding is that it is often dependent on the availability and expertise of teachers and peers, which may limit its accessibility and effectiveness in larger or resource-constrained classrooms (Zhai, 2022).

2.2. Digital Scaffolding: The Role of AI in Language Learning

The rise of Artificial Intelligence (AI) has led to the development of digital scaffolding tools that offer real-time feedback and personalized learning experiences. AI-powered language learning tools such as automated writing evaluation (AWE) systems, AI tutors, and intelligent chatbots are increasingly being used to provide learners with adaptive support (Godwin-Jones, 2021). AI-based scaffolding is particularly effective in providing immediate corrective feedback, helping learners self-regulate their learning process (Wu, Zhai, & Ren, 2023).

Al-driven scaffolding extends beyond grammar correction to include metacognitive and affective support. Hwang, Chen, and Hsu (2021) found that AI tutors help reduce language learning anxiety and improve motivation by offering non-judgmental, personalized guidance. Similarly, Li, Sun, and Zhang (2023) explored AI-assisted scaffolding in technical writing and

found that AI tools enhance students' ability to organize ideas, refine structure, and improve coherence in their writing. However, despite these advantages, AI scaffolding has limitations, such as the potential lack of contextual understanding and the risk of students becoming overly reliant on AI-generated suggestions (Sun, Wang, & Liu, 2023).

2.3. Studies on ChatGPT and AI Tools in Language Education

Recent studies have specifically explored the impact of AI models like ChatGPT in language education. ChatGPT, as a large language model, provides various forms of scaffolding, including cognitive (explaining grammar and vocabulary), metacognitive (encouraging reflection on errors), and affective (reducing learning anxiety) support (Du & Alm, 2024). In an empirical study, Kostka and Toncelli (2023) examined the integration of ChatGPT into ELT and highlighted its potential to support individualized learning by generating contextually relevant explanations and examples.

Han et al. (2023) proposed a structured approach to integrating ChatGPT into EFL writing education, emphasizing its role in guiding students through brainstorming, drafting, and revising their work. Similarly, Woo, Guo, and Susanto (2023) investigated how EFL secondary students use ChatGPT for writing tasks and found that prompt engineering plays a crucial role in maximizing AI's effectiveness. However, the use of ChatGPT is not without challenges— Shaikh and Yayilgan (2023) cautioned against issues such as factual inaccuracies and the overreliance on AI-generated content, which may hinder students' independent language development.

From a pedagogical perspective, Al-Khresheh (2024) explored teachers' attitudes toward ChatGPT in ELT, noting that while some educators view AI as a valuable supplement, others express concerns about its potential to replace traditional instructional methods. Furthermore, Zhai (2022) emphasized the need for a balanced approach, where AI-generated feedback is complemented by human intervention to ensure meaningful learning experiences.

3. Methodology

3.1. Research Design

This study adopts a mixed-methods approach, combining both quantitative and qualitative methods to analyze the effectiveness of ChatGPT as a scaffolding tool in technical report writing. The quantitative aspect focuses on evaluating students' writing performance before and after using ChatGPT, while the qualitative aspect explores students' and faculty members' perceptions of ChatGPT's role in improving technical writing skills. A mixed-methods design provides a comprehensive understanding of both measurable outcomes and subjective experiences related to AI-assisted scaffolding.

3.2. Participants

The study involves students and faculty members from Annamacharya University, Rajampet. Participants include:

- 50 undergraduate students from engineering and science disciplines, who are engaged in technical report writing as part of their coursework.
- 10 faculty members from the Department of Humanities and Sciences and the English Language Teaching (ELT) faculty, who provide feedback on students' writing and assess the effectiveness of AI-assisted scaffolding.

Students are selected through random sampling, ensuring representation from different academic disciplines, while faculty members are chosen based on their expertise in technical writing instruction.

3.3. Data Collection

The study employs multiple data collection methods to capture both quantitative performance improvements and qualitative insights:

3.3.1. Pre- and Post-Writing Assessments

Students are asked to complete a technical report before and after receiving ChatGPT-assisted scaffolding. Reports are evaluated based on structure, coherence, grammar, vocabulary usage, and technical accuracy.

3.3.2. Surveys

A structured questionnaire is administered to students to assess their experiences using ChatGPT for technical writing. Questions focus on ease of use, perceived improvements, limitations, and overall effectiveness of AI-based scaffolding.

3.3.3. Interviews

Semi-structured interviews with faculty members are conducted to explore their perspectives on ChatGPT's role in scaffolding technical writing. Topics include the quality of AI-generated suggestions, its impact on student learning, and challenges in integrating AI into the writing process.

3.3.4. Classroom Observations

Instructors observe students using ChatGPT in a writing workshop setting. Observations focus on student engagement, AI interaction patterns, and common challenges faced while using ChatGPT for technical writing tasks.

3.4. Tools for Analysis

3.4.1. Quantitative Analysis

Paired t-tests are conducted to compare students' pre- and post-writing scores, measuring statistical improvements in technical writing. Descriptive statistics (mean, standard deviation) are used to analyze survey responses, evaluating trends in student perceptions.

3.4.2. Qualitative Analysis

Thematic analysis is applied to faculty interviews and open-ended survey responses to identify recurring themes related to AI-assisted scaffolding. Content analysis is used to evaluate the quality of ChatGPT-generated writing support in students' reports.

4. Findings and Discussion

This section presents the findings based on student and faculty responses, writing assessments, and classroom observations. The discussion highlights the types of scaffolding ChatGPT provides, specific examples from student interactions, and potential limitations in using AI-assisted scaffolding for technical report writing. ChatGPT serves as a scaffolding tool by offering different forms of support: cognitive, metacognitive, and affective scaffolding. Each of these contributes to enhancing students' technical writing skills. Scaffolding can be categorized into four types.

4.1. Types of Scaffolding

4.1.1. Cognitive Scaffolding: Cognitive scaffolding refers to direct support that aids students in understanding language structures and technical writing conventions. ChatGPT helps in:

Grammar and syntax correction: Students receive real-time feedback on grammatical errors and sentence structure.

Technical vocabulary enhancement: The AI suggests domain-specific terms, improving clarity in technical reports.

Paragraph organization: ChatGPT provides guidance on structuring introductions, body sections, and conclusions effectively.

For instance, when students submitted poorly structured technical reports, ChatGPT suggested reorganization strategies, improving coherence and readability. One student noted: "ChatGPT helped me restructure my introduction to make it more engaging and formal. It also pointed out inconsistencies in my argument flow."

These findings align with previous studies emphasizing Al's role in improving language accuracy and coherence in writing (Zhai, 2022; Fitria, 2023).

4.1.2. Metacognitive Scaffolding: Metacognitive scaffolding encourages students to reflect on their writing process and develop self-regulation strategies. ChatGPT facilitates this by:

Prompting self-correction: Instead of directly providing answers, ChatGPT often asks students to rethink their word choices and sentence structures.

Encouraging revision strategies: It suggests alternative phrasings and asks follow-up questions to refine clarity.

Providing writing templates: ChatGPT offers structured formats for reports, helping students plan their writing systematically.

A faculty member observed: "Students who struggled with organizing their ideas found ChatGPT useful in prompting them to refine their arguments instead of just fixing errors."

This aligns with research by Wu et al. (2023), which found that AI tools enhance self-regulated learning in language acquisition.

4.1.3. Affective Scaffolding: Affective scaffolding involves reducing anxiety and building confidence in language use. ChatGPT contributes to this by:

Creating a low-stress environment: Unlike human instructors, ChatGPT allows students to practice writing without fear of judgment.

Providing encouragement: The AI offers positive reinforcement, making students feel more confident in their writing.

Enhancing engagement: The interactive nature of AI-driven feedback keeps students motivated.

A student mentioned: "I used to hesitate while writing technical reports, but ChatGPT made me feel more comfortable. I can experiment with different writing styles without fear of making mistakes."

Studies have confirmed that AI-based writing tools help reduce writing anxiety and increase student motivation (Hwang et al., 2021).

These findings support the growing consensus that AI-based tools serve as effective writing tutors, improving both linguistic accuracy and writing fluency (Li et al., 2023).

4.2. Limitations of ChatGPT as a Scaffolding Tool

Despite its advantages, ChatGPT has several limitations:

4.2.1. Over-Reliance on AI: One key concern is students' dependence on AI for writing instead of actively developing their skills. Some students reported copying ChatGPT's suggestions without fully understanding the underlying grammatical rules. This echoes the findings of Lee & Kim (2022), who caution against passive learning with AI tools.

4.2.2. Lack of Human Interaction: While ChatGPT provides structured feedback, it cannot replace human instructors who offer nuanced explanations and emotional support. Faculty members pointed out that AI lacks contextual awareness, leading to occasional generic or misleading suggestions in highly technical content.

4.2.3. Limited Creativity and Critical Thinking: ChatGPT is designed to generate coherent and structured responses, but it does not foster critical thinking in writing. Some students reported that ChatGPT's suggestions were formulaic and lacked originality, which aligns with research highlighting AI's limitations in creative language tasks (Sun et al., 2023).

5. Conclusion

This study explored ChatGPT's role as a scaffolding tool in English Language Teaching (ELT), particularly in technical report writing. The findings indicate that ChatGPT provides three key types of scaffolding: cognitive, metacognitive, and affective. Cognitive scaffolding enhances students' grammar, vocabulary, and report structure, while metacognitive scaffolding encourages self-reflection and revision. Affective scaffolding reduces writing anxiety and fosters confidence. Student interactions demonstrated that ChatGPT improved language accuracy, writing fluency, and engagement. However, challenges such as over-reliance on AI, lack of human interaction, and limited critical thinking development highlight the need for a balanced approach to AI integration in ELT.

5.1. Practical Applications for Teachers and Students

For educators, ChatGPT can be incorporated as a supplementary tool to enhance students' writing skills. Teachers can use AI-generated prompts for peer review exercises, guide students in evaluating AI feedback critically, and design activities that blend human and AI-assisted learning. For students, ChatGPT serves as a personalized writing assistant, helping them refine technical reports through structured feedback. However, it is essential for students to engage actively with AI suggestions rather than relying on them passively.

5.2. Future Research Directions

Further research is needed to examine long-term impacts of AI-assisted scaffolding on students' writing development. Studies could explore blended AI-human models that maximize AI's strengths while preserving creativity and critical thinking. Additionally, research on AI's effectiveness across different proficiency levels and its role in spoken English development can offer deeper insights into its pedagogical value.

While ChatGPT is a valuable scaffolding tool, it should be integrated thoughtfully into ELT, complementing—not replacing—traditional teaching methods. A well-balanced approach will ensure that students develop both linguistic competence and independent critical thinking skills, preparing them for the demands of technical communication in academic and professional settings.

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