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EVALUATING THE COGNITIVE IMPACT OF GENERATIVE AI TUTORS ON SECOND LANGUAGE ACQUISITION IN ACADEMIC WRITING

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ANNOTATSIYA:

Generative Artificial Intelligence (GenAI) and Large Language Models (LLMs) help students learn self-directed academic writing in english as a Foreign Language (EFL). This research shows how AI feedback helps students learn and write better. 80 undergraduate EFL students joined an eight-week writing project. We measured their mental effort during draft revisions. The results show that simple AI prompts lower stress with grammar and formatting. Because of this, students can focus more on main ideas, strong arguments, and clear writing structure.

Introduction

Conversational Large Language Models (LLMs) have changed computer-assisted language learning a lot. Traditional grammar tools only show errors. However, generative AI acts like an interactive teacher. It gives fast feedback, style ideas, and structure help. In english as a Foreign Language (EFL) classes, students often feel anxious and tired when writing complex academic texts. AI gives tailored support to help these students.

However, we need to study how AI assistance affects the learning process. Cognitive Load Theory shows that human working memory is limited. Mental effort has three types: intrinsic load (difficulty of the task), extraneous load (extra effort from poor instruction), and germane load (deep effort to build long-term memory). When students spend too much mental effort on basic errors, they cannot focus on building strong arguments or formal style. This

study checks if AI writing support helps students use their mental energy better during essay writing.

Methods and Materials

This study included 80 second-year undergraduate EFL students in an eight-week intensive writing course:

1. **Experimental Grouping:** We split students into two groups. The experimental group (40 students) used guided GenAI prompts to edit drafts. The control group (40 students) used standard dictionaries and grammar books.
2. **Data Collection:**

Writing Scores: Essays were graded using standard IELTS Writing Task 2 rules (Task Achievement, Coherence and Cohesion, Lexical Resource, Grammatical Range and Accuracy).

Mental Effort Measurement: We used self-report forms and eye-tracking tools to check how much mental effort students used after revision sessions.

Results and Discussion

The study showed clear differences in mental effort and writing quality between the two groups.

Performance / Cognitive Dimension	Control Group (Mean Score)	Experimental Group (GenAI)	Statistical Significance (p-value)
Extraneous Cognitive Load Index	68.4 / 100 (High)	38.2 / 100 (Low)	$p < 0.001$
Germane Processing Engagement	42.1 / 100 (Moderate)	74.5 / 100 (High)	$p < 0.001$
Coherence & Cohesion Gain	$+0.4$ Band Score	$+1.2$ Band Score	$p < 0.01$
Grammatical Accuracy Gain	$+0.6$ Band Score	$+0.8$ Band Score	$p < 0.05$

The numbers show that interactive GenAI tools lower unnecessary mental effort significantly (38.2 compared to 68.4). AI tools explain grammar rules fast and suggest right words. This reduces pressure on working memory.

Because of this, students in the AI group used more memory capacity for deep learning (74.5). This led to better essay structure, smooth flow, and logical arguments. AI support

works as a helpful step in learning. It speeds up language learning without making students lazy.

Conclusion

Generative AI tools help reduce mental pressure in english as a Foreign Language (EFL) writing classes. By fixing basic errors quickly, AI assistants lower unnecessary mental stress. This allows language students to focus on important tasks like critical thinking and argument building. From a teaching view, teachers should show students how to write good prompts and check AI answers critically. This ensures that AI helps active learning instead of creating lazy habits.

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