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Interaction Patterns between Learners and AI Tools for English Writing

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Abstract: The advancement of artificial intelligence (AI) has drawn educators' attention to its educational potential. However, the efficacy of AI depends on learners' effective interaction, avoiding either neglect or excessive dependence. Despite the significance of learner-AI interaction, research on interaction patterns remains limited. This study investigates how EFL (English as a foreign language) learners interact with an AI tool for English writing and explores the effects of different interaction patterns on their writing performance. Through an experiment involving 29 EFL undergraduates, three distinct interaction patterns emerged, exhibiting significant differences in their engagement with the AI tool. The comparisons of the three clusters indicate that different AI interaction patterns lead to varied interaction approaches, and not all learners equally benefit from AI's potential. In order to promote productive learner-AI interaction in educational environments, instructors should provide personalized support and feedback.

Keywords: Artificial intelligence, Interaction, English writing, EFL

1. Introduction

Technological advancement has AI playing an increasingly vital role in the education field, particularly in enhancing English learning. The AI tools have been demonstrated to enhance learners' writing skills by systematically providing feedback about incorrect grammar, spelling and so on (Liu et al., 2021). As a tutor, a companion, or a fellow student, AI has the potential to exert cognitive and affective influences on learners (Engwall & Lopes, 2020). However, it should be noted that not all learner-AI interactions are uniformly effective, the success of these interactions depends on how they are conducted (Wang et al., 2023). Limited understanding exists regarding the process of learning through learner-AI interactions, and the variations in interactions among different learners, although such research could contribute to the design of AIED by illuminating effective ways of learner-AI interaction. The purpose of this study is to explore learner-AI interaction patterns during English writing tasks and the effects of interaction patterns on learners' performance.

2. Literature Review

AI has been reported to positively contribute to enhancing learners' English writing skills. EFL learners provided with AI-based semantic and syntactic feedback outperformed those without AI support (Hwang et al., 2023). Learners of different competence levels may interpret the same learning activity differently, resulting in diverse approaches to interacting with AI. Wang et al. (2023) identified four learner-AI interaction clusters based on system usage data in EFL learning: effective learners, passive learners, well-balanced learners, and inefficient learners. They observed that the primary beneficiaries were those utilizing deep learning methods, engaging in the critical reception of AI feedback rather than following it mechanically. Previous research on English writing with an AI translator also categorized learner-AI interaction into AI-dependent, limited, and collaborative interaction (Kim et al., 2023). Collaborative interaction

exhibits the most effective patterns as learners go beyond copying the AI's responses, actively modifying inputs to meet their specific needs and fostering two-way interactions.

3. Method

This study involved 29 EFL undergraduates from diverse academic majors in South Korea. QuillBot (https://quillbot.com), a user-friendly AI system, was used to support English essay writing. Participants had no prior experience with QuillBot and received instructions on the AI tool. There was a practice session before carrying out English essay writing in two conditions: (1) independent writing and (2) AI-supported writing conditions. Participants conducted think-aloud while carrying out the writing tasks in a laboratory, and all activities were recorded with video. Three researchers independently analyzed videos using a coding scheme of learner-AI interaction and the inter-rater reliability was high (Cohen's Kappa at .96). All disagreements were resolved through discussions. English writing performance was assessed by two high school teachers using a rubric.

4. Results

This study found that the AI tool, QuillBot, was helpful for EFL learners who might lack English writing skills. Wilcoxon Signed-Rank Test showed that learners achieved significantly higher scores in the AI-supported writing condition ($M = 7.37$, $SD = 1.50$) than in the independent writing condition ($M = 6.55$, $SD = 1.72$, $Z = 3.01$, $p < .01$).

This study explored learner-AI interaction patterns by investigating the number of clusters with hierarchical cluster analysis and carrying out k-means cluster analysis. Three types of learner-AI interaction patterns were identified: limited, AI-dependent and collaborative interactions (see Table 1). Cluster 1, limited interaction patterns, showed high independence with minimal AI usage. Cluster 2, AI-dependent interaction patterns, frequently relied on the AI tool to accomplish tasks and seldom modified AI recommendations, consistently monitoring the progress of English writing. It is noteworthy that Cluster 2 identified the benefits of the AI tool more favorably than the others. Cluster 3, collaborative interaction patterns, valued feedback and recommendation from the AI tool and engaged in critical thinking to revise the recommended words and sentences rather than mechanically following it. Furthermore, according to the result of Kruskal Wallis H test, there were significant differences between mean rank of three clusters in task strategy ($H = 17.06$, $p < .01$), individual work ($H = 22.45$, $p < .01$), revision-oriented interaction ($H = 13.77$, $p < .01$), acceptance-oriented interaction ($H = 15.36$, $p < .01$), performance monitoring ($H = 9.91$, $p < .01$), interaction monitoring ($H = 12.34$, $p < .01$), positive evaluation of AI ($H = 11.13$, $p < .01$), and negative evaluation of AI ($H = 13.08$, $p < .01$).

An ANCOVA was conducted to examine the influence of learner-AI interaction patterns on English writing performance in the AI-supported writing condition, using English writing performance in the independent writing condition as a covariate. Although the independent writing performance significantly influenced the AI-supported writing performance ($F = 23.32$, $p < .01$), there was no significant influence of learner-AI interaction patterns ($F = .17$, $p = .849$).

Table 1. *Types of interaction between learners and the AI tool*

Codes	Sub Codes	Cluster 1 (n = 15, 52%)		Cluster 2 (n = 6, 21%)		Cluster 3 (n = 8, 27%)		H	*p*
		M	SD	M	SD	M	SD		
Planning	Task analysis	2.87	4.30	1.04	1.76	3.30	5.07	.84	.658
	Task strategy	.00	.00	1.26	1.39	.00	.00	17.06	<.01
	AI function exploration	0.737	1.59	0.65	1.36	2.48	3.56	2.20	.332
Task Performance	Individual work	73.18	7.42	38.11	6.56	52.17	6.52	22.45	<.01
	Revision-oriented interaction	2.31	3.36	0.45	1.11	9.51	7.34	13.77	<.01
	Acceptance-oriented interaction	10.72	6.37	26.71	7.40	21.42	7.02	15.36	<.01
	Rejection-oriented interaction	4.49	4.78	7.09	3.20	3.86	2.44	3.81	.149
Monitoring	Performance monitoring	5.33	5.71	15.35	3.97	5.26	5.11	9.91	<.01
	Interaction monitoring	.00	.00	1.63	2.67	.00	.00	12.34	<.01
	Positive evaluation of AI	0.31	0.61	5.67	5.48	1.99	2.11	11.13	<.01
	Negative evaluation of AI	0.05	0.20	2.05	2.28	.00	.00	13.08	<.01

5. Conclusion

This study found three types of learner-AI interaction patterns (i.e., limited, AI-dependent and collaborative interactions), each of which showed a distinct way of interacting with AI for English writing. This result is consistent with Kim et al. (2023). Compared to Kim et al. (2023), the AI tool in this study provided continuous feedback based on input, and engaged in a more flexible, personalized and active interaction with learners. Consequently, a wider range of learner-AI interactions were analyzed. Due to the nature of the task, differences of interaction patterns might have no statistically significant effect on English writing performance. This study explored the influence of learner-AI interaction patterns on an AI-enhanced task, not an AI-enabled task, which could not be conducted without AI tools. The influence of learner-AI interactions would be enlarged in the AI-enabled task like English conversation with AI. This study implies that instructors should provide scaffoldings to enhance collaborative interaction with AI tools and encourage learners to reflect on their interaction patterns in or after using AI tools for learning activities.

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