

Exploring Transitions: The Impact of Generative Artificial Intelligence on Academic Literacy in Taiwanese Higher Education

Ophelia Hsiang-Ling Huang*
Taipei Medical University, Taiwan

Abstract

Generative Artificial Intelligence (GAI) has garnered significant attention in the academic community recently (An et al., 2023; Weng & Chiu, 2023), and it has been widely adopted within Taiwanese higher education. Its incorporation into language education provides students with novel and diversified learning experiences. Previous research indicates that English as a Foreign Language (EFL) learners utilize intelligent personal assistants (IPAs) for self-directed second language (L2) learning outside of classroom settings (Dizon & Tang, 2019). GAI facilitates more efficient language acquisition among students, thereby enhancing their learning motivation and autonomy. Simultaneously, educators benefit from GAI's supplementary tools and resources, which enable them to deliver differentiated language instruction and assessment. This study examines the potential impact of GAI on students' learning motivation and performance, as well as how instructors can leverage GAI to promote self-directed learning and provide precise, personalized assessments and feedback.

Keywords: AI-powered language learning, Academic Literacy, Digital literacy, Precision instruction, EFL

Background

Generative Artificial Intelligence (GAI) has garnered significant attention in the academic community recently (An et al., 2023; Weng & Chiu, 2023), and it

*Corresponding Author E-mail: ofihuang@tmu.edu.tw

has been widely adopted within Taiwanese higher education. Its incorporation into language education provides students with novel and diversified learning experiences. Previous research indicates that English as a Foreign Language (EFL) learners utilize intelligent personal assistants (IPAs) for self-directed second language (L2) learning outside of classroom settings (Dizon & Tang, 2019). GAI facilitates more efficient language acquisition among students, thereby enhancing their learning motivation and autonomy. Simultaneously, educators benefit from GAI's supplementary tools and resources, which enable them to deliver differentiated language instruction and assessment. This study examines the potential impact of GAI on students' learning motivation and performance, as well as how instructors can leverage GAI to promote self-directed learning and provide precise, personalized assessments and feedback.

Methodology

This study employed a quasi-experimental design, focusing on the application of Generative Artificial Intelligence (GAI) in an English presentation course at a medical university. The initial phase of the intervention utilized traditional lecture-based instruction and regular communication scenario exercises. In contrast, the subsequent experimental phase incorporated GAI-supported instruction using tools such as OpenRead, ChatPDF, SciSpace, and Slidebean. By analyzing pre- and post-intervention questionnaires, the study aimed to uncover insights into GAI's role in fostering a community of practice engagement. This included interactions between teachers and students, interactions among student groups, and the enhancement of students' self-efficacy through their interactions with GAI.

Representative Results

In this study, conducted within the context of Taiwanese higher education, a total of 56 students participated in an online survey. Most of the participants were first-year university students ($n = 48$). Data were collected using a modified Technology Acceptance Model (TAM) questionnaire, which utilized a Likert scale to measure learners' AI user performance, with a maximum score of 5.00. The results (see Figure 1) indicated an improvement in students' performance from the pre-test administered in week four ($M = 3.48$, $SD = 1.02$) to the post-test conducted in week thirteen ($M = 4.35$, $SD = 1.16$). Additionally, the completion rate of communication tasks significantly increased from 71% to 93% when students were permitted to use GAI tools.

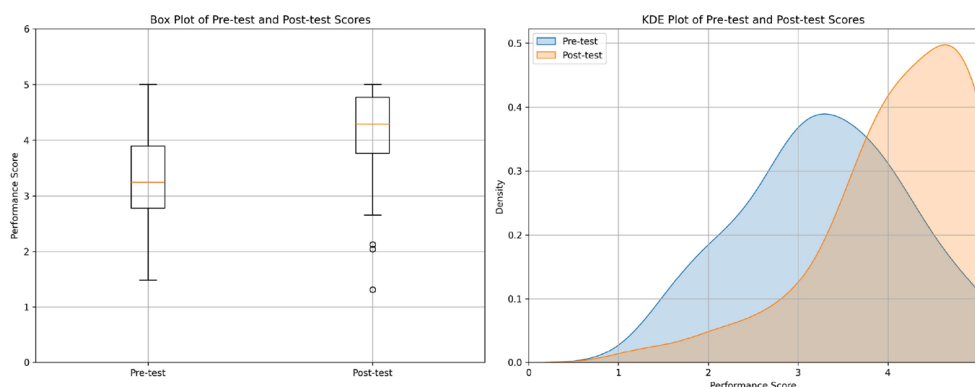


Figure 1. Learners' AI user performance.

Results

The present study aims to contribute additional evidence supporting the effectiveness of Generative Artificial Intelligence (GAI) in language education, aligning with recent research findings (Belda-Medina & Calvo-Ferrer, 2022; Su et al., 2023). This study's results reinforce GAI's crucial role in promoting students' motivation and fostering a community of practice within educational contexts. This includes facilitating diverse interactions among teachers and students and peer-to-peer collaborations mediated by GAI. Moreover, the study reveals significant changes in students' positive perceptions towards GAI, which are influenced by their level and background of digital literacy skills. These dynamics are compared with students' informal learning styles and preferences, underscoring the multidimensional impact of GAI on language learning outcomes. Consistent with previous Technology Acceptance Model (TAM) literature, students' perceptions of ease of use have been identified as the dominant predictor of perceived usefulness (Davis, 1989; Venkatesh & Davis, 2000).

The present study differentiates itself from prior research by employing academic journals as instructional materials and focusing on the development of academic literacy skills. Notably, the second experimental phase of this intervention, which utilized AI-assisted learning, reported significantly reduced levels of intrinsic and extraneous cognitive load and increased germane cognitive load compared to the first phase. Reducing intrinsic and extraneous cognitive load minimizes unnecessary mental strain, allowing learners to allocate more cognitive resources to understanding core material. Increasing germane cognitive load, on the other hand, enhances the processing of relevant information, facilitating deeper learning and better knowledge

retention. Furthermore, participants' digital literacy scores emerged as significant predictors of their academic literacy scores, derived from eight specific questions within the questionnaire. These exhibited a positive correlation with their subsequent inclination to persist in using GAI tools. These findings indicate that students' digital literacy backgrounds and the extent to which learners engage with GAI learning strategies notably influence their learning outcomes. This finding echoes the concept of "desirable difficulties" (Bjork & Bjork, 2020). Difficulties are desirable because they trigger encoding and retrieval processes that support learning, comprehension, and remembering. However, if the learner does not have the background knowledge or skills to respond to them successfully, they become undesirable difficulties. User experiences with GAI might come with difficulties, which can be desirable. It is essential to emphasize the complexities and challenges of incorporating such difficulties into teaching and students' self-regulated learning.

Conclusions and Implications

Drawing upon insights from educational technology and curriculum design research, this study explores the role of Generative Artificial Intelligence (GAI) as a personalized tutor, aiming to attract student interest and enhance their self-efficacy in academic literacy exercises. This is particularly relevant for freshman cohorts who lack exposure to authentic English communication contexts. The study's findings demonstrate significant enhancements in student performance and learning motivation, measured within the questionnaire using the ARCS model (Keller, 1983). Students' improvements are manifested through increased self-confidence and self-efficacy in completing oral tasks, as reported in the questionnaire, and a 32% reduction in the average time required for speech practice. This is reflected in the increased classroom participation of groups utilizing GAI. This underscores the transformative potential of GAI in enriching English as a Foreign Language (EFL) curriculum design and cultivating learner autonomy (Benson, 2013; Reinders & White, 2016). The GAI intervention in this study has shed new light on language education by optimizing pedagogies, lesson planning, and tailoring remedial education (see Figure 2).

GAI-driven platforms provide students with adaptive counseling and personalized learning experiences, catering to individual student needs, developing communicative competence, and increasing student engagement (Chai et al., 2019; Chen et al., 2021). As GAI continues to evolve, its integration promises innovative advancements in the field of language education, shaping the future of adaptive counseling and precision teaching in Taiwanese higher

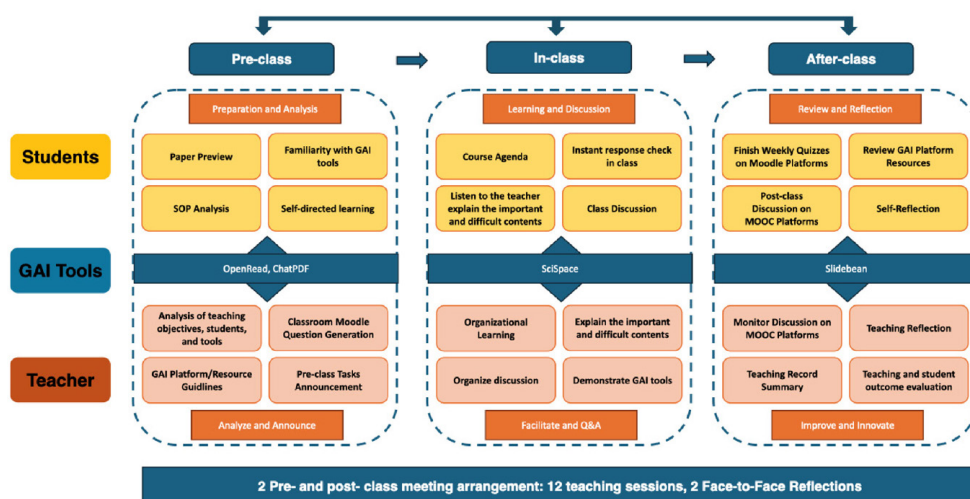


Figure 2. Structure of the GAI intervention.

education institutions. These findings contribute to the ongoing evolution of language education practices and highlight GAI's potential to transform EFL teaching and learning.

References

- An, X., Chai, C. S., Li, Y., Zhou, Y., & Yang, B. (2023). Modeling students' perceptions of artificial intelligence assisted language learning. *Computer Assisted Language Learning*, 1–22. <https://doi.org/10.1080/09588221.2023.2246519>
- Belda-Medina, J., & Calvo-Ferrer, J. R. (2022). Using chatbots as AI conversational partners in language learning. *Applied Sciences*, 12(17), 8427. <https://doi.org/10.3390/app12178427>
- Benson, P. (2013). *Teaching and researching: Autonomy in language learning*. Routledge. <https://doi.org/10.4324/9781315833767>
- Bjork, R. A., & Bjork, E. L. (2020). Desirable difficulties in theory and practice. *Journal of Applied Research in Memory and Cognition*, 9(4), 475–479. <https://doi.org/10.1016/j.jarmac.2020.09.003>
- Chai, C. S., Hwee Ling Koh, J., & Teo, Y. H. (2019). Enhancing and modeling teachers' design beliefs and efficacy of technological pedagogical content knowledge for 21st century quality learning. *Journal of Educational Computing Research*, 57(2), 360–384. <http://doi.org/10.1177/0735633117752453>

- Chen, X., Lake, J., & Padilla, A. M. (2021). Grit and motivation for learning English among Japanese university students. *System*, 96, 102411. <https://doi.org/10.1016/j.system.2020.102411>
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 319–340. <https://doi.org/10.2307/249008>
- Dizon, G., & Tang, D. (2019). A pilot study of Alexa for autonomous second language learning. In F. Meunier, J. Van de Vyver, L. Bradley & S. Thouësny (Eds), *CALL and complexity – short papers from Eurocall 2019*(pp. 107–112). Research-publishing.net. <https://doi.org/10.14705/rpnet.2019.38.994>
- Keller, J. M. (1983). Motivational design of instruction. In C. M. Reigeluth (Ed.), *Instructional design theories and models: An overview of their current status*. Erlbaum.
- Reinders, H., & White, C. (2016). 20 years of autonomy and technology: How far have we come and where to next? *Language Learning & Technology*, 20(2), 143–154. Retrieved from <http://llt.msu.edu/issues/june2016/reinderswhite.pdf>
- Su, J., Ng, D. T. K., & Chu, S. K. W. (2023). Artificial intelligence (AI) literacy in early childhood education: The challenges and opportunities. *Computers and Education: Artificial Intelligence*, 4, 100124. <https://doi.org/10.1016/j.caeai.2023.100124>
- Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, 46(2), 186–204. <http://www.jstor.org/stable/2634758>
- Weng, X., & Chiu, T. K. (2023). Instructional design and learning outcomes of intelligent computer assisted language learning: Systematic review in the field. *Computers and Education. Artificial Intelligence*, 4, 100117. <https://doi.org/10.1016/j.caeai.2022.100117>