

The Effect of AI and Multiple Intelligences in Project-Based Learning on English Achievement

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ABSTRACT

The purpose of this study is to investigate the implementation of artificial intelligence and multiple intelligences (MI) in project-based learning (PBL) to improve English language proficiency of Chinese undergraduates. A quasi-experimental design was used, with students divided into experimental and control groups that consisted of 30 students each. The PBL treatment was tailored to each individual MI throughout 16 weeks as opposed to traditional learning in controls. Opposite to the initial hypotheses, quantitative data in the form of pre-post tests and questionnaires showed that significant results in English proficiency, motivation, and engagement were accomplished in the treatment condition. The combination of artificial intelligence and MI in PBL has a significantly greater impact in language learning results compared to the control group. It offered sound evidence to confirm the effectiveness of technology-enabled personalized PBL as a new emerging English language teaching approach in English language learning.

KEYWORDS

Artificial Intelligence, Multiple Intelligences, Project-Based Learning, English Achievement, Chinese Undergraduates

INTRODUCTION

In higher education, artificial intelligence (AI) is being integrated into teaching and learning practices (Dai & Liu, 2024; Liu & Xiao, 2025). A notable development is generative artificial intelligence (GenAI), conceptualised as a class of AI systems capable of generating novel outputs such as text, images, or code by leveraging learned data representations, and characterized by interactivity, flexibility, and multi-modality (Ronge et al., 2025). Such technologies can be used to support instructional activities related to information search, writing, and oral communication (Shata & Hartley, 2025). Research has reported that the introduction of GenAI into the higher education setting has begun to transform teaching practices in terms of the design and organisation of learning activities (Shahzad et al., 2024; Wu et al., 2024). Subsequent work has explored how GenAI is integrated across

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disciplinary contexts, such as language education (Li et al., 2025; Qian, 2025). At the same time, research has indicated that the pedagogical impact of GenAI use depends on how learning activities are aligned with instructional intentions and actually carried out in practice (Belkina et al., 2025; Lee et al., 2024). These discussions have been further situated within the broader context of China's policy agenda for the digital transformation of education, in which "digitization of education" was named a national priority at the 20th National Congress of the Communist Party of China (Xinhua, 2022). This policy orientation is also exemplified by the China Education Modernization 2035 blueprint that outlines strategic guidelines for the integration of digital technologies, including emerging GenAI applications, into educational practice (Ministry of Education of the People's Republic of China, 2019).

The implementation of practical and ethical AI applications in education remains challenging, despite existing policies and AI potentialities (Allam et al., 2025; Liu, 2024). GenAI tools widely used in everyday life in China (e.g., Baidu ERNIE Bot and Doubao) are beginning to influence instructional practices (Yang & Lin, 2025). This shift is also reshaping classroom norms for learning and teaching. However, these infrastructural changes do not always proceed as smoothly as initially presumed (Ren & Wu, 2025). They may also introduce implementation-level issues into the learning environment. Examples include uneven adoption across courses and institutions (Wang et al., 2025) and uncertainty about whether AI-supported activities align with instructional goals and assessment practices (Verboom et al., 2025). These issues have been reported by students and teachers in Chinese higher education with the recent introduction of domestically developed GenAI tools, such as DeepSeek and Kimi, into university classroom teaching (Liu & Xiao, 2025). Although tools are already in place to support learning and teaching, recent empirical evidence indicates that the pedagogical impact of integrating GenAI into teaching varies across instructional settings (Alqahtani & Wafula, 2024; Fu et al., 2025; Ren & Wu, 2025). However, empirical studies have reported positive outcomes associated with GenAI-supported learning, particularly with respect to language performance (Zhou et al., 2025), quality of feedback (Li et al., 2025), and learning support (Shahzad et al., 2024). At the same time, recent evidence indicates that while GenAI could support certain learning outcomes, learner satisfaction and perceived self-efficacy appear to depend on teacher guidance (Yang et al., 2025). In assessment-driven instructional contexts, GenAI use has also been associated with constraints on learners' independent thinking or critical skills (Wang et al., 2025). In higher education settings where GenAI tools are already in use, instructors frequently report limited capacity to integrate AI chat applications into teaching (Lérias et al., 2024). This constraint has been attributed to insufficient AI literacy and a lack of targeted professional development. Lérias et al. (2024), Bian et al. (2024), and Wu (2024), among others, have further raised concerns regarding the lack of teachers' AI literacy, the inadequacy of professional development that specifically targets AI learning, and the potential displacement of the teachers' role within AI-based teaching and learning environments. Meanwhile, the privacy of personal data, algorithmic discrimination and bias, and unequal access to AI technologies and their benefits in education, pose ethically troubling risks and may further increase inequality unless laws are clearly established (Memarian & Doleck, 2023; Wagner et al., 2021). The above issues need to be addressed to ensure equal learning opportunities.

AI is highly relevant to English learning, teaching, and assessment (Koç & Savaş, 2025; Li et al., 2025; Zhao, 2025). This relevance is closely linked to the growing importance of English proficiency as a critical factor for China's reforms, development, and global engagement (Yang et al., 2025). Although English has long been central in university education, current teaching approaches may not fully engage students or address diverse needs (Hu et al., 2024; Zhang & Shi, 2023). In response to these limitations, instructional approaches that align language learning more closely with learners' academic and professional contexts have received increasing attention (Dou et al., 2024; Xue et al., 2022). One such approach is English for specific purposes (ESP). It can be understood as a form of language teaching in which decisions about content and methodology are guided by learners' specific academic and professional needs, and course design is informed by detailed needs analysis (Dudley-Evans & St John, 1998). The introduction of ESP in Chinese universities has been found to

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