

THE INNOVATION OF COLLEGE ENGLISH MULTIMODAL TEACHING FROM THE PERSPECTIVE OF ARTIFICIAL INTELLIGENCE LITERACY--AN EMPIRICAL ANALYSIS BASED ON 127 QUESTIONNAIRES

ZhiYing Li¹, JianLong Xu², MingRui Ai³, Lv Lin^{1*}

¹*School of Foreign Studies, South China Agricultural University, Guangzhou 510642, Guangdong, China.*

²*School of Foreign Studies, South China Normal University, Guangzhou 510631, Guangdong, China.*

³*College of Mathematics and Informatics, South China Agricultural University, Guangzhou 510642, Guangdong, China.*

Corresponding Author: Lv Lin, Email: linlv@scau.edu.cn

Abstract: The rapid development of Generative Artificial Intelligence (GenAI) is reshaping the college English teaching ecosystem. The challenge of how to maintain the core value of language teaching in the face of the widespread integration of AI has become a new, urgent imperative for college English education. Based on survey data from 127 college students, this paper analyzes the current status and deficiencies of students' Artificial Intelligence Literacy (AIL) across four dimensions: AI knowledge, AI skills, AI attitude and values, and AI ethics. The results indicate significant shortcomings among students in prompt engineering and the critical evaluation of AI-generated content. Addressing these issues, this paper proposes an innovative model for college English teaching based on GenAI applications, promoting the synergistic development of students' language proficiency and AI literacy. AI literacy education (AILE) should be embedded in the language learning process, activating learners' meaning construction and creativity through multimodal tasks to achieve technology-enabled innovation in college English multimodal teaching.

Keywords: Generative artificial intelligence; Artificial intelligence literacy; College English teaching; Multimodal teaching

1 INTRODUCTION

The powerful generative capability of GenAI has brought a tremendous impact on the core value and practice of language teaching. While offering learners instant feedback, content generation, and personalized support, it also introduces potential problems such as language skill degradation, homogenization of thinking, and academic misconduct. As GenAI technologies rapidly evolve and become increasingly prevalent in foreign language education, the integration of AILE into college English curricula has become imperative for enhancing learners' AIL and enabling them to adapt to the ongoing transformation of education. Therefore, this study aims to explore the current status and overall profile of students' AIL and to analyze the implementation of general AILE in college English teaching. Building on these findings, it seeks to design an innovative AI-integrated teaching paradigm that fosters the synergistic development of learners' language proficiency and AI literacy.

2 RELATED RESEARCH

Conceptually, AIL closely overlaps with information literacy and digital literacy, and it is rapidly emerging as a focus of global educational attention. Long and Magerko define AI literacy as "a set of competencies that enable individuals to critically evaluate AI technologies; communicate and collaborate effectively with AI and use AI as a tool online, at home and in the workplace"[1]. A number of authoritative international organizations, such as UNESCO, the European Union (EU), and the Organisation for Economic Co-operation and Development (OECD), have developed influential conceptual frameworks to define and promote digital literacy worldwide. In its 2021 report, the Cyberspace Administration of China outlined four core dimensions: digital awareness, computational thinking, digital learning and innovation capabilities, and digital social responsibility, underscoring a people-centered and responsible approach to the application of AI technologies in the age of intelligence. These mainstream frameworks reveal a shared understanding that AIL extends beyond technical proficiency to encompass a broader competency for responsible reasoning and ethical action within AI-mediated contexts.

Scholars have conducted relevant research on the connotation, framework, and evaluation system of AIL. Huang et al. argue that AI literacy (AIL) represents a fundamental competency for all citizens in the AI era[2]. They proposed an AIL educational framework encompassing four core dimensions: AI knowledge, AI skills, AI application, and AI ethics, and stressed that educators should adapt instructional content and methods to the characteristics and needs of diverse learner groups. Similarly, Zhou et al. developed a conceptual framework for AIL based on the KSAVE assessment model, comprising four dimensions: AI knowledge, AI skills, AI attitudes and values, and AI ethics[3]. They highlighted that AI literacy constitutes a comprehensive competency system integrating technical proficiency, cognitive

understanding, and ethical reflection. This study developed and validated an AIL scale designed for college students, aiming to examine the multidimensional structure of their AIL through the construction and application of this measurement instrument.

Regarding AILE, Zhang et al. conceptualize it as a set of initiatives designed to help the public, particularly non-professionals, understand, evaluate, and effectively apply AI technologies, while cultivating critical awareness of their ethical, social, and risk-related implications[4]. They further underscore the need to promote AILE strategically in higher education. In higher education, three types of institutional bodies play a central role in promoting AIL among faculty and students. First, cross-departmental collaborations and expert teams offer general AI courses. Second, teaching and learning development centers, including writing centers, establish guidelines and standards for AI practice and application. Third, university libraries provide lectures, training programs, consultation services, and elective courses. Zhang advocates that universities, in addition to providing specialized AI literacy courses, should further define educational objectives and content within a pervasive AI education framework[5]. Thematic instruction should be offered to address the needs of different application scenarios and academic disciplines.

Existing research on AILE has mainly concentrated on the development of AIL concepts and frameworks, thus offering theoretical foundations and guiding principles for AIL education. However, research on discipline-specific AIL and the integration of AILE into subject courses remains limited and warrants further investigation. Therefore, this paper aims to adapt an existing AIL scale for application in English course teaching. Using a questionnaire survey, it seeks to assess the current status of college students' AIL, identify areas for improvement, and explore approaches for the deeper integration of language learning and intelligent technologies. The study addresses the following research questions:

- (1) What is the overall level and profile of college students' AI literacy?
- (2) What are the key factors influencing the development of college students' AI literacy?
- (3) How can AI literacy development be effectively integrated into college English teaching to promote the synergistic advancement of language learning and AI literacy?

3 RESEARCH METHODS

The study employed a questionnaire adapted from the AIL scale developed by Zhou et al. for college students[3], which underwent expert evaluation by four specialists and was refined through two rounds of pilot testing. Reliability and validity were subsequently verified through statistical analyses, confirming the instrument's scientific rigor and construct specificity. This study preserved the core structure of the original AIL scale while adapting it to specific English learning contexts. Prior to formal administration, a small-scale pilot test was conducted with 55 participants. The reliability of the scale was assessed via the Cronbach's α coefficient, which exceeded 0.7, demonstrating high internal consistency and stability.

The adapted questionnaire comprises 22 items, including fill-in-the-blank, multiple-choice, and 7-point Likert scale questions (1 = Strongly Disagree; 7 = Strongly Agree). It is organized into three sections. The first section collects demographic information, including age, gender, and region. The second section assesses participants' educational experience, attitudes toward AI, frequency of AI use, and purpose of AI engagement. The third section constitutes the AIL measurement scale, covering four dimensions: AI knowledge (Q7-Q10), AI skills (Q11-Q14), AI attitude and values (Q15-Q19), and AI ethics (Q20-Q22). The survey participants were freshmen at the first author's university.

4 RESULTS ANALYSIS

A total of 127 valid questionnaires were obtained for this study. The results were analyzed in three stages: first, descriptive statistical analysis; second, evaluation of AIL dimensions and identification of areas for improvement; and third, multiple regression analysis to examine the impact of variables on the overall AIL score.

4.1 Descriptive Statistical Analysis

As shown in Table 1, the sample's demographic characteristics and AI usage behavior are as follows. The gender distribution is approximately equal, with 48.03% male and 51.97% female participants. The majority of respondents (69.29%) have a professional background in STEM fields. In terms of AI usage, students exhibit a high overall frequency of use: 66.15% engage with AI several times a week or more, and 19.69% use it almost daily. Additionally, 51.97% of students have participated in AI-related courses or training, slightly exceeding the proportion of students without such exposure.

Table 1 Sample Demographic Characteristics and AI Usage Behavior (N=127)

Variable	Category	Frequency	Percentage (%)
Gender	Male	61	48.03
	Female	66	51.97
Professional Background	STEM (Sci/Eng/Med/Agr)	88	69.29
	Humanities/Social Sciences	18	14.17
	Economics/Management/Arts	16	12.60
	Other	5	3.94
AI Usage Frequency	Almost Daily/Several Times a Week (High Frequency)	84	66.15

AI Education Experience	Several Times a Month/Rarely Used (Low Frequency)	43	33.85
	No Training	61	48.03
	Any Form of Training	66	51.97

4.2 Analysis of AIL Dimensions and Areas for Improvement

Table 2 presents the descriptive statistics for the four dimensions of AI literacy and the overall score. The total AI literacy score ranged from 50.00 to 112.00 ($M = 89.76$, $SD = 13.11$), reflecting an overall high level of AI literacy among the participants, with a moderate degree of individual variation.

Table 2 Mean Scores and Standard Deviations for AIL Dimensions (N=127)

Dimension	Minimum	Maximum	Mean (M)	Standard Deviation (SD)
AI Knowledge (Q7-Q10)	1.25	7.00	5.64	1.21
AI Skills (Q11-Q14)	2.00	7.00	5.28	1.06
AI Attitude and Values (Q15-Q19)	3.40	7.00	5.56	0.98
AI Ethics (Q20-Q22)	4.00	7.00	6.09	0.92
Total AIL Score	50.00	112.00	89.76	13.11

Among the dimensions, AI ethics demonstrated the highest mean score ($M = 6.09$, $SD = 0.92$). Specific items, including “Ethical Consideration” (6.20) and “Privacy Protection” (6.07), ranked among the highest across all items, indicating a generally high level of ethical awareness among students. AI knowledge ($M = 5.64$, $SD = 1.21$) and AI attitude and values ($M = 5.56$, $SD = 0.98$) also showed high levels, suggesting that students generally possess a solid understanding of AI concepts and maintain a positive orientation toward AI use. In contrast, AI skills exhibited the lowest mean ($M = 5.28$, $SD = 1.06$), implying that practical abilities in operating AI tools and employing effective strategies (e.g., prompt design, tool selection) may be comparatively less developed. Further analysis of individual items identified two major shortcomings in students’ AIL:

(1) Limited critical evaluation capability. Among all items, the “Ability to evaluate the reliability of AI-generated content” obtained the lowest mean score ($M=4.86$), indicating that students generally demonstrate insufficient critical evaluation skills. Consequently, they may struggle to use AI cautiously, verify information, and integrate content critically within AI-supported learning environments.

(2) Insufficient prompt engineering skills. The “Prompt capability” item received the lowest self-assessment among operational skills ($M=5.10$), with only 22.8% of students reporting proficiency in producing high-quality prompts. Considering that prompts are pivotal for effective human-AI interaction, this deficiency considerably constrains students’ ability to engage productively and accurately with generative AI systems.

4.3 Correlation and Regression Analysis of AIL Dimensions

In order to examine the independent contributions of different factors to the overall AIL score, a multiple regression analysis was conducted. Table 3 presents the correlation coefficients (r) and standardized regression coefficients (β) obtained from this analysis for the key predictor variables.

Table 3 Pearson Correlations and Standardized Regression Coefficients for AIL Dimensions (N=127)

Dimension	Pearson r	$p(r)$	Standardized β	$p(\beta)$	Relative Influence Strength
AI Attitude and Values	0.823	<0.001	0.373	<0.001	Strong
AI Knowledge	0.731	<0.001	0.368	<0.001	Strong
AI Skills	0.831	<0.001	0.323	<0.001	Strong
AI Ethics	0.738	<0.001	0.211	<0.001	Moderately Strong

All dimensions show strong and significant positive correlations with total AIL scores ($r = .731-.831$, $p < .001$). Among them, AI skills ($r = .831$) and AI attitude and values ($r = .823$) exhibit the strongest bivariate associations, followed by AI ethics ($r = .738$) and AI knowledge ($r = .731$).

After controlling for intercorrelations among the four AIL dimensions, AI attitude and values ($\beta = .373$, $p < .001$) demonstrated the strongest independent predictive effect on overall AIL, followed closely by AI knowledge ($\beta = .368$, $p < .001$) and AI skills ($\beta = .323$, $p < .001$). These findings indicate that learners’ perspectives toward AI, cognitive understanding of AI concepts, and practical ability to use AI tools each make substantial and unique contributions to AIL. In comparison, AI ethics ($\beta = .211$, $p < .001$), while still significant, showed a moderately strong effect. This suggests that ethical awareness’s predictive power is relatively smaller once attitudes, knowledge, and skills are taken into account.

5 DISCUSSION

5.1 Current Status and Primary Shortcomings of College Students' AI Literacy

A questionnaire survey of 127 college students revealed that the overall level of AIL was relatively high, but with notable imbalances across dimensions. Participants displayed high ethical awareness and positive learning attitudes, including a willingness to engage with new AI tools. Moreover, students demonstrated a solid understanding of AI's fundamental characteristics, such as inaccuracy and inherent limitations. Collectively, these results indicate that college students possess awareness of AI's social implications and basic risks, and are inclined to accept and learn this emerging technology.

However, two primary deficiencies in college students' AIL were identified: prompt engineering capability and critical evaluation capability. Multiple regression analysis confirmed that prompt capability constitutes the largest independent predictor of overall AI literacy among AI skill dimension ($M=5.10$). A deficiency in this skill substantially constrains students' capacity to interact with generative AI effectively and accurately, thereby diminishing the potential of AI as a learning tool. The ability to evaluate the reliability of AI-generated content received the lowest mean score ($M=4.86$), indicating that students generally lack the competencies to critically scrutinize, verify, and assimilate AI outputs. Such shortcomings may introduce risks in academic research and language learning, including exposure to inaccurate information and the fostering of cognitive complacency.

Moreover, students exhibited relatively low awareness of AI-related social biases, including gender and racial bias ($M=4.93$). Multiple regression analysis demonstrated that knowledge-based cognition and ethical understanding do not make significant independent contributions to overall AIL; their impact is realized only when transformed into concrete skills and practical behaviors, such as tool operation, prompt engineering, and critical evaluation. These results imply that AIL development in college English teaching should not be limited to AI knowledge education, but should emphasize core skills training and the practical application of AI technologies.

5.2 Path for Integrating AIL into College English Teaching

The application of GenAI in language education introduces potential issues, such as the degradation of language skills, homogenization of thinking, and challenges to the authenticity and effectiveness of teaching evaluation. Consequently, literacy development objectives in the GenAI era must be restructured to include AIL as a core component. Given that AIL encompasses practical and multimodal competencies, the New London Group's Multiliteracies theory developed by Cope & Kalantzis offers a suitable pedagogical framework to address the limitations of traditional monolingual literacy instruction in the context of globalization, multiculturalism, and digital media[6]. Empirical evidence indicates that multimodal teaching grounded in the Multiliteracies framework effectively promotes the development of literacy-related competencies, such as critical thinking[7], suggesting that it can serve as an effective approach to fostering AIL in GenAI-enabled language learning. Nevertheless, prior multimodal instruction was largely constrained to receptive multimodal input, and productive multimodal tasks were rarely implemented due to technical limitations. The advent and rapid advancement of GenAI, with its robust multimodal generation capabilities, provides the necessary technical support to implement productive multimodal tasks. Recent studies, including explorations of AI text-to-image models in foreign language instruction, present promising pathways for enhancing the efficacy of multimodal teaching[8].

The questionnaire survey results indicate that in terms of AI skills prompt engineering capability ($r=0.682$, $\beta=0.168$) constitutes the most significant predictors of overall AIL, followed by. The "skill triangle" comprising tool use, prompt engineering, and critical evaluation—exerts a central influence on students' AIL development. Given these findings, effective AILE requires students to complete task-based activities involving extensive engagement with GenAI, thereby promoting the development of prompt engineering and critical evaluation competencies through hands-on practice. In light of this, the present study proposes a targeted, innovative pathway for college English multimodal instruction.

First, it is necessary to reformulate teaching objectives. Based on existing language and intercultural goals, relevant AIL components should be integrated, with a focus on cultivating critical thinking and digital innovation competencies. Survey findings indicate that while students frequently use AI and demonstrate a willingness to engage with it, such usage has not yet been fully translated into advanced skills that support deep language learning and critical thinking. Given these findings, the primary focus of teaching innovation should be the restructuring of objectives to develop competencies for effective human-AI collaboration through prompt engineering and critical evaluation. Consequently, critical thinking and innovation competencies should be established as core teaching objectives alongside language proficiency and intercultural competence. This objective-level restructuring ensures that instructional practices target students' weaknesses in prompt writing and critical evaluation, shifting learners' focus from passive information retrieval to active knowledge construction in collaboration with AI.

Second, reshape the teaching process through the design of multimodal tasks grounded in the skill triangle framework. Following Zhang, who emphasizes that practical engagement is a crucial component of AI literacy education and that instructional methods should balance theory with hands-on operation across all course levels[5], multimodal tasks should be integrated throughout the curriculum. Such tasks aim to foster the integration of tool use, prompt engineering, and critical evaluation competencies within authentic language use contexts. Illustrative examples include analyzing AI-generated images and textual content, producing AI-assisted podcasts, and translating video subtitles. By engaging in these activities, students can comprehensively apply the three core competencies in practice, thus facilitating the simultaneous advancement of both language proficiency and AIL.

Finally, it is essential to integrate a critical evaluation component into all GenAI-based tasks. Given students' relatively weak critical evaluation competency alongside their awareness of AI inaccuracy, each task should require students to

evaluate AI-generated content using a structured rubric, providing reasoned justification for accepting or rejecting AI suggestions. This approach transforms students' engagement from passive information reception to active knowledge construction and meaning negotiation, thereby fostering the development of critical evaluation competency. Moreover, assessment should not be limited to the final language output; it should also consider the quality of prompts, the interaction logs with AI, and a critical reflection report on AI-generated content, thus enabling a comprehensive characterization of students' overall AI literacy.

6 CONCLUSION

The empirical survey conducted in this study indicates that college students exhibit generally high levels of AI literacy, yet significant competency gaps remain, particularly in the areas of prompt engineering and critical evaluation. In response, college English teaching should proactively integrate GenAI technology, embedding AIL development across the entire instructional process. Through a systematic re-constructing of teaching objectives, instructional procedures, and assessment strategies, a novel paradigm for multimodal English instruction is proposed. This paradigm not only addresses students' competency gaps but also promotes intrinsic motivation through structured engagement with multimodal tasks. It facilitates the development of competencies for effective communication and collaboration with AI while maintaining critical thinking in authentic language application contexts. Such an approach is both essential for adapting to technological transformations and pivotal for cultivating students with integrative competencies encompassing language proficiency, intercultural understanding, critical thinking, and digital innovation.

Future research may examine the differential effects of various multimodal tasks on specific AIL sub-dimensions, optimize the deployment of GenAI in formative assessment, and explore strategies to mitigate technology dependence while ensuring the sustainable development of students' language proficiency.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

FUNDING

This work is supported by Guangdong Provincial Education Science Project (Higher Education Special Project) (2022GXJK143), South China Agricultural University (JG2023103), Guangdong-Hong Kong-Macao Greater Bay Area University Online Open Course Alliance (WGKM2024041), Guangdong Provincial Education Science Project (Higher Education Special Project) (2024GXJK380).

REFERENCES

- [1] Long D, Magerko B. What is AI literacy? Competencies and design considerations. *Proceedings of the 2020 CHI conference on human factors in computing systems*. New York: ACM, 2020: 1-16.
- [2] Huang R H, Shi L Y, Wu Y Q, et al. Constructing content framework for artificial intelligence literacy instruction in China from a global perspective. *Documentation, information & knowledge*, 2024, 41(3): 27-37.
- [3] Zhou Q, Xu Y P, Cai Y C. An examination of AI literacy among university students: current status and multifaceted influencing factors. *Documentation, Information & Knowledge*, 2024, 41(3): 38-48.
- [4] Zhang J B, Yu C L, Cai Y C. Artificial intelligence literacy education: global progress and prospects. *Documentation, information & knowledge*, 2024, 41(3): 15-26.
- [5] Zhang M. Research on the practice of AI literacy education in university libraries in China. *Library and Information Service*, 2025, 69(18): 98-108.
- [6] Cope B, Kalantzis M. *A pedagogy of multiliteracies: learning by design*. London: Palgrave Macmillan, 2015.
- [7] O'Halloran K, Tan S, Marissa K L. *Multimodal analysis for critical thinking*. *Learning, Media and Technology*. 2015, 42 (2): 147-170.
- [8] Fan B B, Li Z Z. Exploring AIGC-aided approaches to multimodal discourse teaching. *Foreign Language Education in China*, 2025, 8(2): 47-57.