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AI Literacy and Pedagogical Transformation: Exploring the Influence on College Language Teaching

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Abstract: *This study examines how college English teachers' Artificial Intelligence (AI) literacy influences pedagogical transformation, using a mixed-methods case study of a first-year undergraduate English debate contest (N=90 students). Findings reveal a significant positive correlation ($r = 0.72$, $p < 0.01$) between higher teacher AI literacy (encompassing technical, pedagogical, critical, and ethical dimensions) and more transformative teaching practices. Teachers with robust AI literacy fostered student-centred learning, strategically integrated AI as a collaborative tool, and explicitly guided critical evaluation of outputs. Consequently, their students demonstrated significantly greater improvements ($p < 0.05$) in argument depth, research quality, and critical source evaluation compared to peers taught by instructors with lower AI literacy. While challenges like workload and ethical concerns persist, the study concludes that comprehensive teacher AI literacy is essential for harnessing AI's potential to enhance critical thinking and authentic language learning in higher education. Prioritizing discipline-specific teacher development is crucial.*

Keywords: Artificial Intelligence (AI) literacy, pedagogical transformation, language teaching

INTRODUCTION

The advent of sophisticated generative AI (GenAI) tools like Large Language Models (LLMs) has irrevocably altered the educational landscape, presenting both unprecedented opportunities and formidable challenges for language teaching and learning (Zawacki-Richter et al., 2019). College language teachers stand at the forefront of this shift, tasked with preparing students for a future where human-AI collaboration is increasingly normative (Schiff, 2021). However, the effective and ethical integration of AI into pedagogy hinges critically on the teachers' own understanding and capabilities – their AI literacy (Long & Magerko, 2020).

AI literacy extends beyond basic operational competence. It encompasses a multifaceted understanding including: Technical (understanding core functionalities, limitations), Pedagogical (knowing how to integrate AI effectively into teaching/learning activities), Critical (evaluating AI outputs for bias, accuracy, appropriateness), and Ethical (navigating issues of plagiarism, privacy, equity, and the human-AI relationship) dimensions (Ng et al., 2021; Laupichler et al., 2022). This literacy directly influences pedagogical transformation – a fundamental shift from traditional, often teacher-centered,

methods towards practices that leverage technology to enable more personalized, collaborative, critical, and authentic learning experiences (Puentedura, 2006; Mishra & Koehler, 2006).

This paper explores the crucial link between college English language teachers' AI literacy and the nature and extent of pedagogical transformation observable in their classrooms. It presents a detailed case study centred on an English debate contest for 90 first-year undergraduates, serving as a rich context to examine how varying levels of teacher AI literacy manifest in instructional design, student engagement with AI tools, and ultimately, student learning outcomes. The central research questions are:

1. How does the level of AI literacy among college English language teachers influence their pedagogical approaches when integrating AI tools into a complex speaking activity (debate)?
2. What impact does this AI-integrated pedagogy, mediated by teacher AI literacy, have on student learning processes and outcomes within the debate context?
3. What challenges and opportunities emerge for pedagogical transformation through AI integration in language teaching, as perceived by teachers and students?

LITERATURE REVIEW

AI in Language Education: Research highlights AI's potential in language learning: providing personalized feedback (e.g., writing assistants), offering conversational practice (chatbots), aiding research and content generation, and facilitating access to authentic materials (Godwin-Jones, 2022). However, concerns persist regarding over-reliance, diminishing critical thinking, ethical dilemmas (plagiarism, bias), and the potential devaluation of human interaction and creativity (Stokel-Walker, 2022; Cotton et al., 2023).

Teacher AI Literacy: Frameworks for teacher AI literacy are emerging. Building upon Technological Pedagogical Content Knowledge (TPACK) (Mishra & Koehler, 2006), scholars emphasize the need for teachers to develop specific knowledge at the intersection of AI, pedagogy, and their subject domain (e.g., language acquisition) (Kim et al., 2023). Laupichler et al. (2022) propose competencies including understanding AI concepts, applying AI tools, critically evaluating AI, and understanding AI ethics. Ng et al. (2021) stress the importance of fostering co-learning and critical examination alongside students.

Pedagogical Transformation with Technology: Technology integration doesn't automatically lead to transformation. Puentedura's (2006) SAMR model (Substitution, Augmentation, Modification, Redefinition) provides a lens, suggesting AI can move beyond replacing tasks (Substitution: AI writes an essay draft) to fundamentally redefining learning (Redefinition: AI simulates diverse perspectives for students to debate against). Transformation involves shifting towards constructivist, student-centered learning where technology acts as a cognitive partner (Jonassen, 2000).

AI and Speaking Skills/Argumentation: While AI writing tools are prevalent, research on AI for developing complex oral skills like debate is nascent. Potential uses include researching diverse viewpoints, generating argument outlines and counterarguments, practicing delivery via speech analysis tools, and simulating opponents (Huang et al., 2023). The critical role of the teacher in guiding ethical use, evaluating AI-generated content, and structuring activities that promote deep engagement rather than surface-level output is paramount (Kohnke et al., 2023).

Gap: While studies examine AI tools or teacher perceptions, there is limited empirical research directly linking *teachers' multi-dimensional AI literacy* to observable *pedagogical transformation* and concrete *student outcomes* within specific, complex language learning tasks like debate.

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METHODOLOGY: CASE STUDY OF THE ENGLISH DEBATE CONTEST

Research Design: An explanatory sequential mixed-methods case study design (Creswell & Plano Clark, 2017) was employed. A case study was chosen to provide an in-depth, contextualized exploration of the phenomenon (Yin, 2018). The quantitative phase measured outcomes and perceptions; the qualitative phase explored teacher practices, decision-making, and experiences in depth.

Context & Participants:
Setting: A comprehensive university in China. First-year non-English major students (N=90) participated in a mandatory 6-week English debate module culminating in a contest. Students were divided into 18 teams of 5.
Teachers: Three experienced college English teachers (pseudonyms: Dr. Chen, Ms. Lee, Mr. Wang) volunteered. Their self-reported and assessed AI literacy levels varied significantly (see 3.3).
Students: 90 first-year undergraduates (mixed disciplines). Pre-survey assessed initial English proficiency, debate experience, and familiarity with AI tools.

Measuring Teacher AI Literacy: A multi-method approach was used:
Self-Assessment Survey: Adapted from Ng et al. (2021) and Laupichler et al. (2022), covering Technical, Pedagogical, Critical, and Ethical dimensions (5-point Likert scales + open-ended questions).

Semi-Structured Interview: Focused on understanding of AI concepts, integration strategies, critical evaluation processes, ethical considerations, and perceived challenges/benefits.

Classroom Observation Checklist: Observers coded teacher actions related to AI use (e.g., explaining AI limitations, guiding critical analysis of AI output, discussing ethics, modeling AI prompting).

Analysis: Data triangulation led to categorizing teachers as: **High Literacy (Dr. Chen)**, **Moderate Literacy (Ms. Lee)**, and **Low Literacy (Mr. Wang)** based on consistent evidence across sources.

Intervention & AI Integration: All teachers incorporated AI tools (e.g., ChatGPT, Claude, Perplexity, Elicit) into the debate preparation process. However, the *nature* of integration differed based on their literacy:

Dr. Chen (High): Explicitly taught AI prompting, critical source evaluation (including AI outputs), ethical guidelines (citation, transparency). Structured activities: "Human-AI counterargument generation duel," "Bias audit of AI research summaries," collaborative drafting with AI as a "starting point." Focus on *process*.

Ms. Lee (Moderate): Encouraged AI for research and drafting initial arguments. Provided basic guidelines but limited explicit instruction on evaluation or ethics. Focus on AI as an *efficiency tool*.

Mr. Wang (Low): Permitted AI use but provided minimal guidance ("You can use ChatGPT if you want"). No discussion of evaluation, ethics, or limitations. Focus on AI as an *optional resource*.

Data Collection:
Quantitative:
Pre/Post-Debate Skill Assessments: Rubrics scored by blind raters (inter-rater reliability $\kappa > 0.8$) on Argument Strength/Depth, Research Quality/Breadth, Rebuttal Effectiveness, Critical Evaluation of Sources (including AI), Delivery. Team scores averaged.

Student Surveys (Pre/Post): Perceptions of AI usefulness, ease of use, impact on learning, critical engagement, ethical concerns (5-point Likert scales + open text).

Qualitative:
Teacher Interviews (Pre/Mid/Post-Module): Explored planning, implementation experiences, challenges, observations of student use, reflections on literacy.
Classroom Observations (4 sessions per teacher): Focused on teacher guidance, student interactions with AI, nature of discussions.
Teacher Reflective Journals: Weekly entries on AI integration experiences.
Student Focus Groups (3 groups, n=5 each, stratified by teacher): In-depth exploration of experiences, perceived benefits/drawbacks, ethical considerations.
Artifacts: Student debate preparation notes, AI chat logs (where consented), final debate recordings/transcripts.

Data Analysis
Quantitative: Descriptive statistics, Paired Samples T-tests (pre/post), Analysis of Covariance (ANCOVA controlling for initial English proficiency) comparing outcomes across teacher groups, Correlation analysis (teacher literacy scores vs. student outcome gains). SPSS v28 used.
Qualitative: Thematic Analysis (Braun & Clarke, 2006) of interview, observation, journal, and focus group data. Initial coding followed the AI literacy dimensions and SAMR levels, with inductive codes emerging. NVivo 14 used for management. Triangulation across data sources enhanced validity.

FINDINGS

Teacher AI Literacy Profiles:
Dr. Chen (High): Demonstrated strong grasp across all dimensions. Articulated clear pedagogical strategies for critical AI integration, proactively addressed ethics (developed class citation policy for AI), emphasized evaluating bias and limitations, adapted prompts effectively. Confidently guided student exploration. ("My goal isn't just *using* AI, it's *learning through and about* AI.")

Ms. Lee (Moderate): Comfortable with basic AI use (research, drafting) but limited critical/ethical depth. Struggled to design activities beyond substitution/augmentation. Expressed concerns about plagiarism but lacked strategies beyond detection tools. ("It saves time finding information, but I worry they just copy.") Pedagogical integration was ad-hoc.

Mr. Wang (Low): Minimal understanding of AI mechanics. Viewed AI primarily as a potential cheating tool or time-saver with limited educational value. Provided no scaffolding. ("I told them they could use it, but I don't really know how it works or how to teach them to use it properly.") Integration was passive permission, not active pedagogy.

Pedagogical Transformation Manifestations: Teacher literacy directly shaped pedagogical practices:
Dr. Chen: Practices reached **Modification/Redefinition (SAMR):** AI fundamentally altered the learning process. Activities required critical interaction with AI outputs, collaborative sense-making, and meta-cognition about AI's role. Teacher acted as facilitator and critical guide. Pedagogy was demonstrably more student-centered and inquiry-based.

Ms. Lee: Practices reflected **Substitution/Augmentation (SAMR):** AI replaced/slightly improved traditional tasks (faster research, initial drafts). Pedagogy remained largely teacher-directed, with AI as an add-on tool. Limited critical discussion initiated by the teacher.

Mr. Wang: **Minimal Integration/Substitution:** AI use was largely invisible and unstructured. Pedagogy remained entirely traditional. No observable transformation related to AI.

Student Outcomes:
Quantitative: ANCOVA results showed statistically significant differences ($p < 0.05$) in post-test scores (controlling for pre-test and English proficiency) between groups taught by different teachers, particularly in **Argument Depth, Research Quality, and Critical Evaluation of Sources.** Students under Dr. Chen significantly outperformed both other groups on these dimensions. A strong positive correlation ($r = 0.72$, $p < 0.01$) was found between the composite teacher AI literacy score and average student gains in Critical Evaluation skills.

Qualitative (Focus Groups/Artifacts):
Dr. Chen's Students: Reported deeper understanding of debate topics due to engaging critically with diverse AI-generated perspectives. Valued learning "how to question the AI" and "make its work better." Artifacts showed evidence of refined prompts, annotated AI outputs identifying strengths/weaknesses/bias, clear citations of AI assistance.

Ms. Lee's Students: Appreciated AI for efficiency ("saved hours on research") but expressed uncertainty about output reliability and ethical use. Some reported copying AI drafts with minor edits. Less evidence of critical engagement in artifacts.

Mr. Wang's Students: AI use was inconsistent and often uncritical. Some teams avoided it entirely; others relied heavily on unedited outputs, leading to debates with factual inaccuracies or generic arguments. Expressed confusion about acceptable use.

Challenges and Opportunities:
Challenges: All teachers reported significant increased workload initially (learning tools, designing activities, monitoring use). Ethical anxieties (plagiarism detection difficulties, ensuring fairness) were prominent, especially for Ms. Lee and Mr. Wang. Skill gaps among students (prompt engineering, critical evaluation) required scaffolding. Uneven student access/affinity to technology was noted. Mr. Wang cited lack of institutional support/training.

Opportunities: Dr. Chen highlighted enhanced critical thinking ("They debate the AI before debating each other"), access to broader perspectives, personalization (AI tailoring content), and developing future-relevant skills. Students across groups valued AI for overcoming language barriers in research and boosting confidence with prepared content. The contest structure fostered collaborative learning around AI use.

DISCUSSION

This case study provides compelling evidence that college language teachers' AI literacy is a primary driver of pedagogical transformation and significantly impacts student learning outcomes. The findings strongly support the hypothesized link:

1) **Literacy Enables Transformation:** High AI literacy (Dr. Chen) empowered a shift beyond superficial tool use towards transformative practices redefining the learning process. This aligns with the TPACK framework, where effective integration requires deep knowledge at the AI-pedagogy-language intersection (Kim et al., 2023). Conversely, low literacy (Mr. Wang) resulted in minimal integration and no transformation, while moderate literacy (Ms. Lee) led to

augmentation without fundamental pedagogical change, highlighting the insufficiency of basic technical skill alone. The SAMR model effectively captured this gradation.

2) **Impact on Student Learning:** Students experiencing high-literacy, transformed pedagogy demonstrated superior gains in higher-order skills – deeper arguments, better research synthesis, and crucially, enhanced critical evaluation. This underscores the role of the teacher in mediating AI interactions to foster critical thinking and mitigate risks of passive consumption or plagiarism (Kohnke et al., 2023; Cotton et al., 2023). The significant correlation between teacher literacy and student critical evaluation skills is a key finding.
3) **The Centrality of Critical & Ethical Dimensions:** Dr. Chen's success stemmed significantly from integrating critical and ethical literacy explicitly into pedagogy. Teaching students to "interrogate" AI outputs for bias, accuracy, and logic transformed AI from an oracle into a collaborative partner to be engaged with critically (Ng et al., 2021). This mitigated ethical risks observed in other groups.
4) **Teacher as Facilitator & Co-Learner:** High literacy enabled Dr. Chen to move from knowledge transmitter to facilitator of human-AI collaborative learning, fostering student agency. This resonates with calls for teachers to adopt co-learner stances with students in the AI era (Schiff, 2021).
5) **Persistent Challenges:** Despite the potential, the challenges (workload, ethics, skill gaps, equity) remain substantial barriers. Addressing these requires systemic support – professional development, time, resources, and clear institutional policies – moving beyond individual teacher initiative.

CONCLUSION AND IMPLICATIONS

This research unequivocally demonstrates that college language teachers' AI literacy is a critical determinant of whether AI integration leads to meaningful pedagogical transformation or merely superficial change. The case study of the English debate contest revealed that higher teacher literacy fosters pedagogies that leverage AI to develop essential 21st-century skills—critical thinking, deep research, ethical reasoning—within the language learning context. Students benefit significantly from teachers who can skillfully guide them beyond using AI as a simple tool towards engaging with it as a critical collaborator.

Implications

1) **Prioritize Teacher AI Literacy Development:** Institutions must urgently invest in comprehensive, ongoing professional development (PD) for language teachers. PD must move beyond tool tutorials to focus on:
    a. Developing *Pedagogical AI Literacy:* Designing activities for Modification/Redefinition (SAMR).
    b. Deepening *Critical & Ethical AI Literacy:* Strategies for teaching evaluation of outputs, navigating bias, ensuring academic integrity.
    c. Fostering *Collaborative Learning Models:* Facilitating student-centered, human-AI collaborative work.
2) **Integrate AI Literacy into Teacher Education:** Future language teachers need foundational AI literacy embedded within their initial training programs.
3) **Develop Discipline-Specific Frameworks & Resources:** Support materials and frameworks tailored to the unique challenges and opportunities of AI in *language teaching* (e.g., for speaking, writing, intercultural communication) are essential.
4) **Provide Systemic Support:** Institutions must address workload implications, provide access to technology, develop clear ethical guidelines for AI use, and support communities of practice for teachers.

5) **Foster a Culture of Critical Engagement:** Curriculum and pedagogy should explicitly promote critical interaction with AI as a core literacy skill for students.

Limitations & Future Research: This study focused on one context (debate) and a small teacher sample. Future research should explore diverse language skills (writing, conversation), longitudinal impacts, the development of specific AI literacy interventions for teachers, and cross-cultural comparisons. Investigating student perspectives on AI's role in language identity formation is also crucial.

In conclusion, AI presents not just a technological challenge but a profound opportunity to reimagine language pedagogy. Realizing its transformative potential, however, hinges on equipping teachers with the sophisticated AI literacy necessary to become confident, critical, and creative guides in this new educational frontier. The future of effective and ethical language education demands nothing less.

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