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Customized AI Training System for Medical English Teachers in Vocational Medical Colleges: Remedying Deficiencies of Universal Digital Literacy Training

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Abstract: Against China's nationwide digital literacy promotion campaign, universal digital training fails to satisfy the teaching demands of vocational medical colleges. While most nursing teachers apply AI to design teaching courseware, few receive medical-oriented AI training. Defining teachers' AI teaching competence as situated disciplinary literacy instead of basic software skills, this study adopts TPACK , situated learning theory and activity theory to identify three drawbacks of general AI training: incorrect professional terminology usage, mixed discourse genres and missing ethical review mechanisms . Accordingly, a four-dimensional closed-loop training system is constructed, consisting of situated immersive learning, interdisciplinary collaborative construction, hierarchical training and long-term institutional guarantee. Oriented toward real medical English classrooms, this system offers operable optimization solutions for AI teacher training in vocational colleges.

Keywords: medical English teachers; generative AI literacy; TPACK; situated learning; ESP; four-dimensional closed-loop training system

Introduction

AI teaching materials are widely adopted in nursing English courses of Chinese vocational medical colleges. From 2023 to 2025, investigations of eight Hunan vocational medical colleges reveal that over 80% medical English teachers have never participated in medical-specific AI training. Domestic researches neglect the predicaments of ESP medical English teachers (Su et al., 2026), whereas overseas studies focusing on medical corpora and AI ethics cannot be adapted to China's vocational nursing education directly. This paper analyzes mismatches between universal digital training and medical English teaching and constructs a closed-loop training system to resolve the defects of one-size-fits-all training models.

A provincial medical college's three-year teaching experiment proves that teachers receiving only general digital training cannot identify terminology and stylistic errors within AI-generated medical texts (Bender et al., 2021). Combined with China's *Teacher Digital Literacy (2022)* standard (Ministry of Education of PRC, 2022), this study puts forward three innovations: focusing on medical ESP teachers to fill research gaps, establishing a four-dimensional training framework, and translating abstract AI ethical norms into executable dual-review rules for grassroots colleges.

1 Literature Review

Disciplinary AI Teaching Capacity beyond Basic Digital Literacy

The TPACK model proposed by Mishra & Koehler is mainly applied to general university courses rather than vocational medical education (Mishra & Koehler, 2006). Existing domestic AI literacy evaluation frameworks adapt to ordinary English classrooms and ignore medical ESP scenarios (Su et al., 2026). This paper builds a comparative framework to analyze flaws in universal teacher training and assess training effects based on national digital literacy standards (Ministry of Education of PRC, 2022).

1.2 Situated ESP Learning and Features of Medical Discourse

Most genre analysis studies overseas target medical academic papers instead of admission records and outpatient dialogues commonly used in vocational medical English teaching (Hirano, 2013). Dudley-Evans & St John's situated learning theory advocates professional language teaching based on workplace tasks rather than rote memorization (Dudley-Evans & St John, 1998).

Medical English integrates unique lexical rules and pragmatic logics across medical records, consultation dialogues and popular science texts. Current domestic studies mainly concentrate on students' writing performance while ignoring teachers' auditing work for AI teaching materials. This research makes up the above research gaps by combining genre theory and local teaching realities.

1.3 Causes of Mismatched Training and Teaching Needs

1.3.1 Situated Cognition Theory

Teachers accumulate professional knowledge through real teaching and workplace communication (Lave & Wenger, 1991). Software skills learned in isolated lectures cannot be transferred to clinical English teaching design. Controlled teaching experiments confirm that teachers with scenario-based medical AI training are better at detecting errors in AI-generated texts, while universal training ignores knowledge transfer rules and leads to poor training outcomes.

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1.3.2 Activity Theory

Engeström's activity theory divides teaching activities into six elements requiring cooperation among English teachers, clinicians and ethics teachers (Engeström, 1987). General AI training simplifies teaching into individual software operation, breaking interdisciplinary collaboration and causing conflicts between national training standards and grassroots teaching reality.

Deficiencies of Existing Research

Scholars mostly apply TPACK, situated cognition and activity theory separately without integrating them into a complete training system for medical ESP teachers. Existing policy suggestions lack phased training schemes for teachers at different career stages, and foreign AI ethical norms have not been localized for clinical teacher-shortage colleges (Floridi, 2018). This study addresses these deficiencies via theoretical integration and practical scheme construction.

2 Research Methodology

This study combines theoretical deduction and field investigation. Stratified sampling was adopted to select eight Hunan vocational medical colleges (6 public, 2 private). A total of 136 questionnaires were distributed, and 112 valid copies were recovered (effective recovery rate: 82.35%). A recovery rate above 70% qualifies as acceptable for social science surveys of in-service teachers.

Sample demographic information: 32 male teachers (28.57%), 80 female teachers (71.43%); 39 junior, 55 intermediate and 18 senior teachers; 35 novice teachers (0–3 years), 52 backbone teachers (3–10 years), 25 senior teachers (>10 years). The sample structure conforms to the local teacher population and ensures representativeness.

Eighteen representative teachers participated in semi-structured interviews; recordings were transcribed and coded for thematic analysis to supplement questionnaire findings. Literature retrieval covered 2018–2026 core Chinese foreign language journals and SSCI linguistic papers. This study only adopts cross-sectional investigation rather than longitudinal experiments and samples only Hunan colleges. Follow-up research will expand samples and adopt Chi-square tests to verify group differences between public and private colleges (Garcia & Lopez, 2024).

3 Research Results

The three types of training mismatches below stem from the probabilistic generation mechanism of large language models instead of teachers' negligence (Bender et al., 2021).

3.1 Questionnaire Statistics

Table 2 Core Survey Indicators (N=112)

Indicator	Classification	Public Teachers (76)	Private Teachers (36)	Overall Proportion
Received medical AI special training	Yes	16 (21.05%)	5 (13.89%)	18.75%
	No	60 (78.95%)	31 (86.11%)	81.25%
AI courseware frequency	Never	22 (28.95%)	13 (36.11%)	31.25%
	1–2 times weekly	43 (56.58%)	19 (52.78%)	55.36%
	≥3 times weekly	11 (14.47%)	4 (11.11%)	13.39%
Encounter wrong medical terms by AI	Never	8 (10.53%)	5 (13.89%)	11.61%
	Occasionally	47 (61.84%)	23 (63.89%)	62.50%
	Frequently	21 (27.63%)	8 (22.22%)	25.89%

Note: Only descriptive statistics are used currently; Chi-square tests will be applied in follow-up studies to test inter-group significance.

Only 18.75% of teachers have received medical AI training, and private college teachers have fewer training opportunities. 68.75% teachers use AI for lesson preparation, yet nearly 88% have encountered incorrect medical terms generated by AI. Quantitative data combined with interview excerpts achieve triangulation and verify the necessity of specialized AI training systems.

3.2 Terminology Deviation

Large language models generate texts probabilistically and easily produce non-standard medical terms inconsistent with clinical norms (Bender et al., 2021). Teachers without clinical backgrounds cannot identify such errors, while universal training lacks terminology verification modules.

Interview T03 (public senior teacher, 11 years, senior title): I often use AI to design exercises but find it confuses hypertensive emergency and hypertensive crisis. General training never teaches teachers to identify AI-generated medical terminology mistakes.

3.3 Genre Confusion

AI mixes formal medical record writing styles with colloquial doctor-patient dialogues frequently. Universal training merely distinguishes spoken and written English and cannot satisfy the auditing requirements of medical teaching materials (Hirano, 2013).

Interview T09 (private novice teacher, 2 years, junior title): AI mixes daily conversation into formal admission notes when generating English medical records, making the materials unusable in class.

3.4 Ethical Risks

Algorithms may fabricate patient information or violate privacy rules (Floridi, 2018), but general training only covers copyright without medical ethical censorship rules. This study supplements two practical ethical rules:

1. Teachers must desensitize patient privacy before importing real medical records into AI;
2. Limit students' AI usage in medical English assignments and randomly inspect AI-written homework.

Interview T14 (public backbone teacher, 6 years, intermediate title): Many students finish case translation fully via AI with wrong medical expressions, while no training guides teachers to standardize students' AI usage.

3.5 Four-Dimensional Closed-Loop Training System

Dimension 1: Situated Immersive Training

70% training time is arranged for practical operations in clinical scenarios, including AI material production, terminology inspection and ethical risk identification.

Dimension 2: Interdisciplinary Co-construction

Medical AI error databases, scenario operation manuals and auditing checklists are built and double-reviewed by English teachers and clinicians before classroom application.

Dimension 3: Differentiated Hierarchical Training

Combined with Fessler & Christensen's teacher career stage model and the employment status of domestic medical English teachers, the complete training system is divided into three progressive stages:

Adaptation Stage (0–3 years of teaching experience): Novice teachers mainly learn basic production skills of AI materials and simple terminology verification methods via computer skill lectures paired with one-on-one mentoring by senior teachers; **Maturity Stage** (3–10 years of teaching experience): Teachers conduct in-depth refined lexical analysis and implement the complete audit checklist, with interdisciplinary collective lesson preparation as the primary training form;

Advanced Stage (more than 10 years of teaching experience): Senior teachers are responsible for updating the error case library and guiding novice teachers, with inter-college teaching exchanges as the major training mode.

Dimension 4: Long-Term Institutional Safeguards Build a campus AI resource platform, incorporate terminology auditing accuracy into teacher assessment, and establish an annual "demand survey-training optimization" cycle based on double-loop learning theory (Argyris & Schön, 1978).

· Build a campus AI resource sharing platform connected to the college academic affairs system to regularly clean invalid and erroneous teaching materials every quarter;

· Revise the teacher assessment system and add three quantitative assessment indicators (accuracy rate of terminology verification, compliance rate of clinical texts, completion rate of ethical checklist inspection), which are bound to annual assessment and professional title evaluation;

· Establish an annual cycle mechanism of "demand survey – training optimization". Researchers collect practical difficulties of frontline teachers through questionnaires and classroom observations to optimize training schemes for the next cycle.

Table 1 Framework Correspondence of Four-Dimensional Training System

Dimension	Mechanism	Carrier	Responsible Department
Situated Teaching	Clinical workshop training	Clinical lesson preparation drills	Foreign Language Teaching Section
Interdisciplinary Collaboration	Cross-department double audit	Error library & audit checklists	Foreign Language + Clinical Medicine + Ethics Sections
Hierarchical Cultivation	Stage-based training matching teaching years	Three-stage teacher growth scheme	Teacher Development Center
Institutional Guarantee	Annual training optimization cycle	Resource platform & assessment indicators	Academic Affairs & Human Resources Office

4 Discussion

4.1 Theoretical Contributions

First, this study defines medical teachers' AI competence as situated TPACK capability instead of simple operational skills (Mishra & Koehler, 2006), which can also be extended to legal English and engineering English research. Second, it integrates TPACK, situated cognition and activity theory into a unified analytical framework. Third, foreign AI ethical norms are localized into operable auditing rules for domestic vocational colleges (Floridi, 2018).

4.2 Practical Implications

Based on this framework, three feasible reform paths are summarized for college administrators. First, transform traditional training forms. Abandon lecture-style software training and replace it with clinical task-centered research workshops, wherein no less than 70% of training class hours are used to revise ward medical records and outpatient teaching materials generated by AI. Second, normalize interdisciplinary communication mechanisms. Arrange regular interdisciplinary collective lesson preparation among English teachers, clinicians and ethics teachers, and incorporate double auditing of all campus AI teaching materials into daily teaching management. Third, optimize assessment rules.

Abolish the single evaluation standard centered on software proficiency, incorporate terminology verification accuracy rate, standardization of clinical genres and quality of ethical auditing into annual assessment, and link assessment results with teaching rewards and qualification for project application.

4.3 Limitations & Future Directions

This study has obvious boundary limitations: stratified sampling was only carried out in eight medical vocational colleges in Hunan Province without multi-provincial investigations, so the universality of the constructed training framework needs further verification via expanded samples. Vocational colleges in Hunan Province mainly focus on nursing majors; therefore, this training framework adapts to vocational colleges dominated by nursing and clinical medicine majors and requires targeted adjustment when applied to colleges specializing in traditional Chinese medicine and medical aesthetics. This framework is built on China's higher vocational medical education system and also needs adaptive revision if applied to overseas medical colleges and public English teaching in comprehensive universities. This study mainly adopts theoretical deduction and cross-sectional questionnaire surveys, lacking two-year longitudinal controlled experimental verification data, so it cannot quantify the improvement effect of hierarchical training models for the time being. The implementation of the complete training mode requires sufficient school-running resources, which most county-level medical vocational colleges do not possess at present. In addition, this framework adapts to public medical vocational colleges in China, and its actual implementation effect in private medical colleges and affiliated medical schools of comprehensive universities remains to be verified.

Future research directions are set as follows:

1.Carry out cross-national comparative researches on ESP, adjust terminology verification modules and ethical auditing modules to improve the cross-cultural applicability of the framework;

2.Set experimental groups and control groups of teachers to conduct two-year controlled teaching experiments and quantify the improvement effect of this training model on teachers' terminology identification ability and ethical auditing level;

3.Develop two sets of training schemes: a complete version for comprehensive medical universities and a lightweight simplified version for resource-deficient vocational colleges.

5 Conclusion

Uniform national digital literacy training cannot meet the dual requirements of language teaching and clinical teaching in medical English courses. This paper summarizes three defects of traditional training: wrong terminology output, genre confusion and missing ethical supervision, and constructs a four-dimensional closed-loop training system covering situated learning, interdisciplinary collaboration, hierarchical training and institutional guarantee.

Theoretically, this study expands the application scope of TPACK in ESP education (Mishra & Koehler, 2006). Practically, it solves the long-standing problem that universal digital training is disconnected from clinical teaching (Garcia & Lopez, 2024). Restricted by regional samples and lack of longitudinal data, this research can be supplemented by longitudinal experiments in follow-up studies. This study transforms fragmented AI skill training into customized systematic training and provides references for intelligent teaching reform in grassroots vocational colleges (Zhang & Brown, 2025).

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