Research on the Teaching System of Military English Courses Empowered by AI

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Abstract: This study aims to construct a dynamically updated, intelligent English teaching system utilizing a locally deployed model of DeepSeek. It encompasses general English as well as practical English corpora pertinent to specialized fields. Furthermore, it integrates the development of an intelligent teaching platform designed to foster innovation in the human-computer collaborative teaching model, thereby supporting the objectives for the intelligent and digital transformation of practical English courses.

Keywords: AI Empowerment; Military Vocational Education; Practical English; Curriculum System

1. Pain Points and Improvement Directions of the Teaching System

Through the implementation of action research on teaching, a comprehensive tracking study of students from the beginning of their enrollment through to the completion examination in the 2023-2024 academic year reveals that the teaching pain points primarily manifest in three areas

1.1 Issues at the Student Level regarding Learning Support

1). Insufficient Support for Students with Weak Foundations: Data indicates that 4.1% of students possess an unstable grasp of fundamental English knowledge. This shortcoming is attributed to a lack of sufficient language learning accumulation prior to enrollment, coupled with an inadequate focus on their individualized needs during the teaching process, which results in these students struggling to keep pace in the classroom [1].

2). Inadequate Exploration of Outstanding Students' Potential: There is a significant disparity in excellence rates across different majors. This suggests that the teaching content is overly focused on foundational skills and lacks emphasis on the cultivation of higher-order capabilities, leading to a lack of sufficient challenges for outstanding students [2].

1.2 Issues Relating to Teaching Resources and Methods

1.2.1. Variances in Teaching Quality: There are notable disparities in proportions of students achieving “Excellent” and “Good” grades across various majors. Additionally, differences surface in teaching styles, methods employed, and the utilization of teaching platforms throughout the instructional process [3].

1.2.2. Insufficient Personalized Learning Support: Some students’ learning needs remain unmet, leading to evident deficiencies in certain skills [4]

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1.3 Issues with the Evaluation and Feedback Mechanism

1.3.1. Inadequate Formative Assessment: Currently, the assessment framework for practical English courses comprises formative assessments, closed-book examinations, and oral assessments. However, this method fails to comprehensively evaluate students' speaking abilities, teamwork skills, and problem-solving capabilities in authentic scenarios [5].

1.3.2. Imperfect Feedback Mechanism: A major concern is that some students perceive their interaction with teachers as limited to classroom environments, with no available channels for feedback regarding existing teaching issues [6].

2. Constructing an Innovative Teaching Paradigm

To address the aforementioned pain points, we propose an innovative instructional model that integrates knowledge graph and AIGC educational theories with the DeepSeek+ Intelligent Teaching Platform.

2.1 Theoretical Foundations for Model

Construction

The instructional design of the DeepSeek+ Intelligent Teaching Platform is rooted in robust cognitive science theories, leveraging technological empowerment to facilitate the efficient translation of theory into practice. The system's core integrates three major theoretical frameworks:

2.1.1. Constructivist Learning Environment Design [7]: Utilizing AI-generated virtual scenarios and contextualized case studies, authentic problem situations are created to guide students in actively constructing their cognitive frameworks through knowledge application. The teaching platform offers dynamic scaffolding support, adjusting task difficulty in real-time based on student input, thereby actualizing Vygotsky's "Zone of Proximal Development" theory.

2.1.2. Mastery Learning Theory [8]: The system employs knowledge graph for competency diagnostics, automatically identifying students' areas of weakness and generating targeted supplementary learning packages to ensure mastery of prerequisite knowledge before advancing to new units.

2.1.3. Cognitive Load Optimization Strategies [9]: Techniques such as information chunking, multimedia coding, and animated demonstrations of complex processes are employed to effectively manage intrinsic and extraneous cognitive loads.

2.2 Establishing a Curriculum Content System Map

The educational value of knowledge graph is primarily manifested in three dimensions: First, at the structural level of knowledge, a graph database model based on entities, relationships, and attributes integrates discrete knowledge points into an organic network, addressing the cognitive fragmentation caused by the linear arrangement of traditional textbooks. Second, in terms of personalized learning pathways, a dynamic navigation route tailored to students' cognitive levels is generated based on graph algorithm inference mechanisms, realizing a "one-to-one" learning sequence for each individual. Third, at the level of competency assessment visualization, learning behavior data is mapped to knowledge graph nodes, creating an intuitive profile of student capabilities, thus providing a basis for precise instructional interventions [10].

2.3 Constructing an AIGC Technology Educational Application Paradigm

Generative Artificial Intelligence (AIGC) exhibits revolutionary potential in the realm of educational content creation; however, the direct application of general large language models (Large Models) often encounters three significant challenges: insufficient content specialization, weak logical coherence, and poor instructional adaptability. The DeepSeek+ Intelligent Teaching Platform innovatively employs a dual-track strategy of "domain-specific fine-tuning + educational prompts" to enhance the quality of generation through three key phases:

1). Conducting In-Depth Pre-training on Educational Corpora: A comprehensive collection of national-level premium course resources, academic literature, and teaching case studies form a specialized corpus for fine-tuning the base model, significantly enhancing its comprehension of technical terminology and its ability to express disciplinary logic.

2). Generating a Template Library for Teaching Scene Prompts: A library of prompt templates covering eleven categories of teaching scenarios is developed, allowing structured prompts to harmonize seamlessly with instructional needs, thereby greatly reducing the editing burden on teachers.

3). Implementing a Multi-round Generation and Validation Loop: An iterative mechanism of "generation-expert evaluation-reinforcement learning optimization" is utilized to perpetually enhance the educational efficacy of the generated content.

3. Implementation Path for an AI-Empowered Personalized English Teaching Model

3.1 Construction of a Teaching Content Corpus

3.1.1 Objectives and planning

The corpus centers around the essential elements of military English. During its construction, the instructional objectives are clearly defined to enhance students' comprehension of military-specific terminology and to bolster their capacity to utilize language effectively in practical contexts, simultaneously providing educators with a wealth of teaching resources.

3.1.2 Data collection and processing

In the data collection phase, information can be sourced from publicly available documents. During the cleansing process, sensitive information and redundant content are eliminated, and text formatting is standardized. Subsequently, core vocabulary and phrases are extracted, accompanied by annotations for specialized terminology.

3.1.3. Quality control and application

In terms of quality control, it is crucial to ensure the accuracy and practicality of the corpus content while avoiding the inclusion of outdated or irrelevant information. Through these applications, students can gain a deeper mastery of the fundamental expressions in military English, enabling them to apply their acquired knowledge in real-world situations.

3.2 Fine-Tuning the DS Model

The fine-tuning of large models is a transfer learning technique that involves additional training using domain-specific data based on a pre-trained large model, thereby adapting the model for specific tasks.

3.2.1. Data preparation

A high-quality training dataset that aligns with the target task must be constructed. This involves collecting data, annotating it, and applying noise reduction and cleansing techniques, as well as standardizing the format to ensure that the fine-tuning data is consistent with the distribution of real-world application scenarios.

3.2.2. Model selection and configuration

Selecting an appropriate pre-trained model and configuring a fine-tuning strategy is essential. Fine-tuning strategies can be categorized into full parameter fine-tuning and parameter-efficient fine-tuning. Common methods include LoRA, which injects low-rank matrices to train additional parameters, the Adapter method that inserts small adaptation modules between layers of the Transformer, and Prefix-Tuning, which adds learned prefix vectors to the input.

3.2.3. Fine-tuning training: model compression via knowledge distillation

To enhance efficiency, knowledge distillation—a model compression technique—is employed to facilitate the transfer of knowledge from a complex large model to a more lightweight small model, thereby reducing the model’s size and computational resource requirements while striving to retain the performance characteristics of the original model.

3.3 Establishing a Multi-Dimensional Dynamic Learning Assessment System

3.3.1. Assessment objectives and evaluation Framework

Grounded in the principles of Outcome-Based Education (OBE), the following assessment objectives have been established:

Knowledge Objective: Mastery of core vocabulary, grammar, and sentence structures within the practical English curriculum.

Ability Objective: The capacity to execute tasks such as delivering instructions, operating equipment, and engaging in emergency communications in English.

Qualitative Objective: Development of cross-cultural communication awareness and collaborative teamwork skills.

3.3.2. Assessment methods and tools

3.3.2.1 Process-Oriented Data Collection: Utilize ClassIn and the Intelligent Teaching Platform to document students' online learning behaviors, complemented by teachers' classroom record books.

3.3.2.2 AI Empowerment: Employ DeepSeek to curate and generate a repository of military scenario questions, enhancing the Intelligent Teaching Platform, and regularly administering intelligent diagnostic tests. Additionally, perform in-depth analyses of final examination results through big data analytics.

3.3.2.3 Multi-Dimensional Evaluation Entities: Classroom performance incorporates student self-assessment, peer evaluation, and teacher assessment, with respective weightings of 10%, 20%, and 70%.

4. Teaching Case

Based on the integration of AIGC and Knowledge Graphs, this section outlines the specific steps and content design for classroom implementation, culminating in a practical teaching solution that incorporates educational practices and technological tools.

4.1 Constructing a Teaching Coupling Model to Achieve Functional Differentiation

In the actual teaching process, the instruction adopts a dual-hybrid approach that integrates both online-offline modalities and military content-NCO training components, emphasizing the flexibility of teaching content during the pre-class, in-class, and post-class stages.

Online content primarily focuses on foundational

English education. Resources are collected based on unit knowledge modules, selectively curated to upload suitable English materials that align with students' capabilities onto the cloud-based self-study teaching software platform. This includes foundational phonetics, syntactic knowledge, grammatical principles, and vocabulary pertinent to workplace contexts. Complementary exercises are designed to align with the teaching content, and the platform's interactive features are employed to gather students' questions and challenges encountered during independent study for clarification during class discussions.

The objective of online instruction is to generate questions through the learning process, which can then be revisited and transformed into knowledge transfers, ultimately solidifying the foundational elements of the English language. During implementation, teachers meticulously design instructional tasks tailored to the varying learning abilities and needs of students. Adopting an approach of "teaching students according to their aptitude and differentiated learning", diverse tasks of varying complexities are created, allowing students to select content that resonates with their individual circumstances. In conjunction with AI assistants, students engage in pre-class exploratory, fragmented, and immersive learning experiences.

4.2 Meticulously Designing Knowledge Maps to Enhance Learning Quality and Efficiency

4.2.1 Pre-class preparation: knowledge graph construction and learning situation diagnosis

4.2.1.1. AIGC-generated course knowledge graph

Taking the fourth unit text from *New Horizons in English* titled "Making History Through Scientific Training and Willpower" (highlighting Su Bingtian's historical achievements through scientific training and tenacious will) and "Military Training" from *Practical English for Radar Officers* as an example of cognitive difficulty transition: the text is first uploaded to the teaching platform, where tools automatically extract core entities and relationships.

4.2.1.2. Dynamic learning situation analysis

Upon completion of the pre-class quizzes uploaded by the teacher onto the platform, AIGC analyzes error rates to generate a "Problem Knowledge Graph", identifying areas of weakness and delivering personalized resources.

4.2.2 Classroom Instruction Implementation: AIGC-Driven Deep Interaction

Step 1: Contextual Introduction—AI-Generated Multi-Modal Case Studies

By inputting the prompt: "Generate a one-minute comparative video illustrating the similarities in the mechanical principles of sprint starting techniques (Su Bingtian) and military combat force application", AIGC produces a comparative video marked with key frames, guiding students to observe the "commonalities of scientific training".

Step 2: Inquiry-Based Learning—Knowledge Graph-Directed Group Tasks

First, students interactively operate a group task through the interactive graph, clicking the node "willpower" to examine case studies. Next, using the AI assistant, they input arguments within the group, and AIGC generates a repository of supporting and opposing arguments for dialectical discussion. Finally, real-time writing feedback occurs as students craft sentences describing the "value of sportsmanship to military personnel", with AIGC providing immediate grammar corrections and terminology suggestions.

Step 3: Integration of Ideological and Political Education—Transcending Contextual Values

The graph invokes the "Spirit of the Chinese Women's Volleyball Team" node, linking to video clips and bilingual keywords related to strengthening the military through technology. A reflective task is generated by AIGC to provoke critical thinking.

(3) Post-Class Consolidation: Personalized Graphs and Generative Tasks To achieve dynamic knowledge reinforcement, the system pushes "sub-graphs highlighting learning deficiencies", associating common writing errors with targeted practice. Alternatively, AIGC generates variant exercises, such as transforming the original phrase "Scientific training enhances performance" into sentences relevant to military contexts.

4.3 Constructing an AI-empowered Teaching Model to Achieve Interactive Classroom Reform

The AI-BOPPPS teaching model is employed, revolutionizing the traditional BOPPPS framework by embedding AI-enhanced functionalities into each stage:

-Introduction Phase: AIGC delivers video clips of historical events to captivate student interest.

- Pre-Test Phase: Mini knowledge graphs are utilized to swiftly pinpoint students' cognitive starting points.
- Engaged Learning: Through the teaching platform, real-time polling and grouping strategies automatically generate differentiated discussion topics.
- Post-Test Phase: Dynamic difficulty assessments are implemented to ensure that 80% of students meet foundational learning objectives.
- AI-Empowered Teaching Assistant Support: A classroom perception system based on voice recognition and emotional computing is deployed. When student expressions of confusion are detected, explanatory case studies are automatically provided; conversely, if concentration levels fall below a certain threshold, interactive games are triggered to rekindle engagement.

5. Innovations

The core innovative value of this achievement is reflected across three dimensions

5.1 Innovation in "Technology Integration"

The AIGC generation model, driven by a dual-track approach of "Domain-Specific Large Models + Educational Prompts", addresses the industry challenges of generating content with insufficient professionalism and poor teaching adaptability. Through the deployment of local DS facilities, an AI-assisted complete learning chain for military English is established.

5.2 Innovation in "Integrating English with Military Training"

A new concept is proposed: "Knowledge Graphs as Educational Cognitive Infrastructure". This leads to the development of a four-layer framework for constructing educational knowledge graphs (Concept - Relationships - Capabilities – Ideological and Political Education), providing a systematic methodology for course structuring.

5.3 Innovation in "New Paradigms"

Model Innovation: The creation of AI-empowered teaching methodologies such as AI-BOPPPS facilitates the unification of large-scale teaching with personalized training, merging classroom instruction with individualized guidance. This presents a technical pathway to resolving the longstanding contradiction between large-scale education and personalized learning.

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