

Innovative Practice and Exploration of Large-Model-Empowered Project-Based Teaching in Higher Vocational Education

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Abstract: With the rapid development of generative artificial intelligence represented by large language models, vocational education is encountering critical opportunities for teaching model transformation. At present, project-based teaching for software technology majors in higher vocational colleges faces prominent challenges, including insufficient differentiated instruction, lack of personalized guidance, and disconnection between teaching content and industrial demands. Taking the course Fundamentals of HTML5 Application Development as a practical carrier and drawing on the reform practice of “Large Model + Smart Shipping” in our college, this paper systematically elaborates the implementation path of large-model-empowered project-based teaching. This study proposes an innovative teaching mode integrating a three-tier hierarchical project system, human-AI collaborative learning guidance, and multi-dimensional process-oriented assessment. By constructing a course-specific prompt library, a hierarchical project case library and an intelligent auxiliary evaluation system, full-chain teaching empowerment of large models is realized throughout pre-class, in-class, after-class and assessment phases. Practical results show that full-process empowerment by large models can effectively address pain points such as inadequate hierarchical adaptation and shortage of personalized guidance in project-based teaching. It provides a replicable practical paradigm for the digital and intelligent transformation of curriculum teaching for software technology majors in higher vocational colleges.

Keywords: Large Model; Project-based Teaching; HTML5 Application Development; Smart Shipping; Three-tier Hierarchy.

1. Introduction

Generative artificial intelligence represented by Large Language Models (LLMs) is profoundly reshaping the education ecosystem. From ChatGPT to DeepSeek, large-model technologies have not only transformed the ways of knowledge acquisition, but also posed fundamental challenges to traditional teaching modes. Since 2025, the widespread application of domestic large models has further accelerated this transformation. Shanghai Maritime University has adopted large-model-powered “intelligent assisted programming” in courses such as Marine Internet of Things Technology, shortening the code debugging cycle from two weeks to three days. Taking the course Fundamentals of HTML5 Development and Application as a test-bed, Liaoning Jianzhu Vocational University has carried out project-based teaching reform, achieving a 96 % project completion rate in experimental classes. These practices demonstrate that large-model technologies offer new possibilities for tackling teaching bottlenecks in vocational education.

Meanwhile, the digital transformation of the transportation industry has raised higher requirements for technical-skill talents. Jiangsu Maritime Safety Administration is comprehensively promoting the all-element “Water-borne Grand Traffic Management”, emphasizing that “every employee shall adapt to new job requirements and be proficient in operating information systems”. This strategic initiative requires maritime higher vocational colleges to strengthen students’ capabilities in information technology application during talent cultivation, so as to effectively align professional teaching with the development demands of smart shipping.

Nevertheless, most existing research on the integration of artificial intelligence and vocational education remains at a macro level, lacking targeted implementation research for individual front-end courses. Current practices mostly employ large models merely as Q-A assistants, failing to achieve in-depth integration with the whole workflow of project-based teaching. Against this backdrop, it has become an urgent research task to construct theoretical frameworks and implementation paths for large-model-empowered project-based teaching for software-technology-major courses in higher vocational education.

2. Current Status and Pain-point Analysis of Course Teaching

Fundamentals of HTML5 Application Development is a technical platform course for the front-end development direction of software technology majors, targeting first-year students. It has passed the college-level accreditation for project-based courses in 2022. Adopting the teaching philosophy of “work-orientation and task-driven”, the curriculum designs 23 tasks and 241 task points around nine learning scenarios. Teaching is carried out with the comprehensive project “Haishang Mall” as the carrier. Ideological and political elements are also integrated to foster students’ patriotism and sense of social responsibility.

Teaching investigations reveal three prominent problems in the current project-based teaching:

(1) Insufficient differentiated instruction. Uniform project tasks cannot accommodate learning demands of students with varied foundations. Students with weak foundations struggle to keep pace, while high-achieving students face insufficient learning challenges. Research from Liaoning Jianzhu Vocational University also indicates that traditional

project-based teaching leads to the dilemma that “students are unable to develop complete web pages after finishing the course”.

(2) Shortage of personalized guidance. In large-class project-oriented teaching, teachers have limited energy and cannot attend to every student’s code debugging and problem-solving. Students often spend a long time waiting for instructors when encountering bugs, which restricts learning efficiency.

(3) Disconnection between teaching content and industrial requirements. Most course projects are simulated cases, lacking real-world enterprise scenarios. The curriculum is not closely aligned with the demands of information-oriented development for Jiangsu Maritime’s “Water-borne Grand Traffic Management”.

The root cause of the above-mentioned pain points lies in the fact that traditional project-based teaching relies solely on teachers, making it difficult to deliver large-scale, personalized and precise teaching support. The introduction of large-model technologies offers technical feasibility for solving these problems. As pointed out in relevant studies, large models can act as “intelligent teaching assistants” to fill teachers’ energy gaps[1] and realize collaborative teaching by “human-AI dual instructors”.

3. Innovative Paths for Large-Model-Empowered Project-Based Teaching

Taking the course Fundamentals of HTML5 Application Development in our college as a practical carrier, this research deeply integrates large-model technologies with the front-end project of the “Water-borne Grand Traffic Management” data display page, and constructs an innovative teaching mode of “three-tier hierarchical project system + human-AI collaborative learning guidance[2] + multi-dimensional process-oriented assessment”.

3.1. Construction of the “Three-Tier Hierarchical” Project System

Based on the personalized teaching capabilities of large-model technologies, the curriculum reconstructs a three-tier hierarchical project system: basic tier, improvement tier and comprehensive tier.

The basic tier focuses on code imitation to consolidate coding specifications, covering core knowledge points such as HTML tags, basic CSS styles and simple page layouts. It suits students with weak foundations. Guided by structured prompts, large models help students comprehend code logic instead of providing ready-made answers.

The improvement tier centers on code rewriting to cultivate knowledge transfer capabilities. It covers advanced CSS layouts, float and flexbox layouts, and simple interactive pages, targeting students at the intermediate proficiency level. Acting as an “on-demand technical consultant”, the large model inspires students’ thinking during code error correction rather than directly outputting solutions.

The comprehensive tier emphasizes original development to develop engineering thinking, including responsive web design, complete project development workflows and team collaboration. It is designed for high-ability students. Large models assist students in developing real-world-scenario projects such as the front-end data-display page for “Water-borne Grand Traffic Management”, which matches enterprise post requirements.

Drawing on progressive project-oriented teaching ideas, this hierarchical design realizes dynamic adaptation empowered by large models, surpassing static stratification.

3.2. Full-Workflow Implementation Path of “Human-AI Collaboration”

A full-chain large-model-empowered implementation path for project-based teaching is designed around four phases: pre-class, in-class, after-class and assessment.

Pre-class learning guidance: As a “learning-guidance intelligent agent”, the large model generates customized self-test exercises and preview experiments according to students’ ability levels. It also assists teachers in designing hierarchical projects and preview task sheets.

In-class learning and research: Build a “human-AI dual-instructor” classroom. Teachers concentrate on macro-logical guidance and value-oriented education; large models provide real-time Q&A and code debugging. During interactions, the large model inspires thinking through questioning rather than offering direct answers to prevent over-reliance among students. This approach shares similarities with Shanghai Maritime University’s practice of “continuous AI prompting to guide students to verify conclusions with real-world data”.

After-class extended learning[3]: According to students’ project completion quality in class, the large model dynamically assigns personalized iterative tasks for students to deepen and internalize their technical skills.

Project assessment: Establish a multi-dimensional evaluation system consisting of AI-aided code-norm assessment, maritime-industry standards, project completion degree, on-site defense and comprehensive teacher comments. Artificial intelligence assists static code inspection[4], while teachers mainly evaluate interaction logic and creative design.

3.3. Development of Supporting Course Resources

(1) Build a dedicated Prompt library. Develop a Prompt library specifically for HTML5 application-development teaching, covering scenarios including code writing, bug troubleshooting and optimization, project decomposition and knowledge summarization. Socratic questioning strategies are embedded so that large models function as “guides” instead of “answer providers”.

(2) Develop a hierarchical project case library. Each project includes business requirement documents, technical schemes, code templates and evaluation indicators. Real-world scenario projects for “Water-borne Grand Traffic Management” are introduced to align teaching content with maritime post requirements.

(3) Formulate teaching implementation standards. Develop templates for lesson plans, classroom implementation workflows and task sheets for large-model-assisted project-based teaching, lowering teachers’ barriers to adoption.

4. Practical Significance and Future Research Directions

Based The practical significance of this research lies mainly in the following aspects:

(1) It provides a reform paradigm for curriculum reform of software-technology majors in higher vocational colleges. Large models are upgraded from isolated Q-A tools to a

full-process empowering teaching-assistance system, advancing the digital and intelligent transformation of project-based curriculum teaching.

(2) It serves the digital transformation of water-borne transportation in Jiangsu Province. By introducing the front-end project of the “Water-borne Grand Traffic Management” data-display page, students’ development capabilities for water-transport-oriented information systems are improved, delivering qualified talents for smart-maritime construction.

(3) It facilitates teachers’ role transformation and professional development. Teachers are relieved from heavy-duty elementary code debugging work, allowing them to focus more on value-oriented education, advanced problem tutoring and teaching innovation.

Future research will further construct curriculum knowledge systems based on knowledge graphs, and explore in-depth applications of large models in personalized learning-path recommendation and intelligent learning-situation diagnosis. The “teacher-student-machine” tripartite interactive collaborative education mechanism[5] will be continuously refined, so as to contribute more practical experience to the digital transformation of vocational education.

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