

# UbD-Anchored Generative AI-Empowered Teaching Model Innovation in the “English Micro-Major for International Construction Workplace”

Yanli Ge

Changchun University of Architecture and Civil Engineering, Changchun, Jilin Province, China 130021

**Abstract:** Addressing critical pain points in the “English Micro-Major for International Construction Workplace”—including fragmented disciplinary integration, rigid teaching models, and superficial AI adoption—this study proposes a dual-driver teaching innovation framework powered by Backward Design Theory (UbD) and Generative AI. The study examines core principles of UbD and generative AI, analyzes their synergistic compatibility, constructs an UbD-anchored generative AI-driven pedagogy, explores implementation pathways and challenges in micro-credential contexts, and delivers scalable teaching reform blueprints for higher education. This framework drives deep integration of educational technology and instructional design while advancing students’ professional English application and cross-cultural communication competencies.

**Keywords:** Understanding by Design (UbD); Generative AI, International Construction Engineering English; Micro-Major; Teaching Model Innovation

**DOI:10.12417/3029-2328.26.04.017**

## 1. Introduction

With globalized construction engineering industry continuously develops, and international project cooperation becomes increasingly common, market demand is intensifying for multi-competency professionals who possess both foundational construction expertise and sophisticated English cross-cultural communication skills, capable of handling engineering documentation and business negotiation procedures. The “English Micro-Major for International Construction Workplace” was thus established, predominantly aiming to align architecture programs with English application, cultivate special talents that meet industry demands. Its courses cover reading, translation, writing, speaking, Engineering Design Reading, and many other engineering English content. This study, from the perspective of backward design, utilizes generative AI technology to explore the pathways for innovating teaching models of the “English Micro-Major for International Construction Workplace”, addressing the pain points in teaching and enhancing teaching quality.

## 2. Core Concept Definition and Theoretical Underpinnings

### 2.1 Core Tenets of the Understanding by Design (UbD)

The Understanding by Design (UbD) epitomizes "teaching for understanding". Its core logic departs from traditional forward-design approaches—which sequence instruction before assessment—by instead commencing with desired learning outcomes. This reverse-engineering process maps required content, teaching methods, and evaluation mechanisms, ultimately forming a trinity of “Objective-Instruction-Assessment” that constitutes a coherent design loop. Compared with traditional teaching design, backward design places greater emphasis on

---

Foundation Item: Research on the Practical Reform of Generative AI-Empowered Micro-Major Teaching Model in Universities Based on Backward Design Theory: A case study of "English Micro-Major for International Construction Workplace"(Project Number:JGJX25D0969)Supported by Jilin Provincial Association of Higher Education in 2025; "Telling Jilin Stories Well and Strengthening National Identity", Research and Practice on the Teaching Mode of Ideological and Political Education in College English Courses from the Perspective of "Three- Entry Initiatives"(Project Number:JLJY202625663297)Supported by Jilin Higher Education Teaching Reform Project in 2026; The 2025 Annual Planning Project of The China Association for Non-Government Education: "Research on Micro-Specialization Practices in Digital New Liberal Arts Empowered by Industry-Education Integration" (Project Approval No.: CANQN250345); The Construction and Application of OMO+PBL Blended Teaching Model of College English Under Digitization and Intelligence Empowerment"(GH24434) Supported by Jilin Academy of Educational Sciences "the 14th-Five Year Plan"2024 General Project.

whether the learning outcomes can be measured and utilized, and on students' understanding and flexible application of knowledge, rather than mechanically memorizing it. The primary process is divided into three steps: determining the desired learning outcomes, focusing on the main competencies and knowledge points that students should master; determining the evidence of achieving the outcomes, and designing methods to examine students' learning outcomes. Designing learning experience and teaching activities should adopt the design philosophy that is centered on the evaluation evidence to plan appropriate teaching progress, which can effectively curb the blindness in teaching and ensure that teaching activities always revolve around the main objectives. It is particularly suitable for fields with specialized and applied dimensions, such as the International Construction Engineering English Micro-Credential Program. It can precisely align with industry demands and clearly define the professional English application competencies and cross-cultural communication competencies that students should possess, providing clear logical guidance for innovating teaching models.

### **2.2 Instructional Attributes of Generative AI**

Generative AI is an AI technology that relies on massive data and algorithm models to autonomously generate text, imagery, sound, etc. that meet certain scenario requirements. And large language models are the most commonly used form of generative AI in the education sector. Compared with traditional AI technologies, generative AI exhibits three defining characteristics: personalization, contextuality, and interactivity. It can align more accurately with the learning situations and cognition level of different students, transcending the traditional "one-size-fits-all" teaching model. In the teaching scenarios, generative AI can achieve personalized recommendations for learning resources, conduct precision design for learning tasks, simulate and build contextualized learning scenarios, and enable to dynamically assess learning outcomes and give feedback, thereby effectively compensating for the inherent deficiencies in traditional instruction—where teachers' capacity constraints prevent adequate personalized guidance. For the International Construction Engineering English Micro-Credential Program, generative AI can accurately align with the specific demands of architectural terminologies, engineering documentation and business negotiations, simulating the real-world communication contexts in the international construction engineering workplace, creating immersive learning environment for students, facilitating students to integrate their English knowledge with architectural operations, improving the flexibility and accuracy of language use.

### **2.3 Synergistic Compatibility of UbD-Generative AI Integration**

The integration of UbD and Generative AI essentially constitutes bidirectional empowerment—combining goal-oriented scaffolding with technology enablement—demonstrating robust synergistic compatibility. UbD empowers a clear direction for generative AI application, defining that the main purpose of AI technology application is to achieve the desired learning outcomes, to prevent purposeless and superficial technology application. Generative AI provides technical support for the implementation of backward design, addressing the challenges in backward design such as the difficulty in conducting personalized teaching, slow evaluation and feedback process, and high-cost scenario creation. Backward design clearly defines the core competency objectives that the International Construction Engineering English, Micro-Credential Program aims to achieve, including terminology mastery, engineering documentation writing, cross-cultural communication and business negotiations, etc. This provides basis for the scenario planning and task formulation of generative AI. Generative AI utilizes intelligent technologies to transform the teaching philosophy of backward design into implementable teaching operations, achieving the precision matching of teaching content, personalized improvement of teaching methods, and dynamic enhancement of teaching evaluation, enabling the effective and sufficient implementation of UbD. When integrating the two dimensions, they can jointly address the teaching challenges in Micro-Credential Program and drive the updating of teaching models.

### **3.Current Teaching Status and Challenges in “English Micro-Major for International Construction Workplace”**

#### **3.1 Insufficient Disciplinary Integration: Disjointed Instructional Content and Industry Demands**

The most fundamental feature of “English Micro-Major for International Construction Workplace ” is the integration of “architecture discipline + English application”. However, in current teaching process of most higher education institutions, insufficient disciplinary integration remains very prominent. Teaching teams suffer from significant discipline barriers. English teachers do not have an academic background in architecture, failing to apprehend construction engineering terminologies, engineering processes, industry norms, etc. During teaching, they mostly focus on the teaching of English grammar and vocabulary, challenging to integrate English teaching with construction expertise. Architecture teachers lack English teaching experience, failing to effectively guide students in converting their specialized knowledge into English application competencies. As a result, the teaching content suffers from “disjointed English and architecture”. Furthermore, in the Micro-Credential curriculum design, insufficient synergy exists among the modules such as reading, translation, writing, speaking, and engineering design reading. Most of these are taught in isolation without forging a set of complete teaching content system centered around the demands in the international construction engineering workplace, resulting in fragmented knowledge of students, making it challenging to meet the comprehensive application requirements of “English + Architecture” in workplace. The teaching content is divorced from the industry realities.

#### **3.2 Ossified Teaching Models: Deficiencies in Personalization and Authentic Praxis**

Currently, the “English Micro-Major for International Construction Workplace” still adopts the traditional general English teaching model, which is ossified and lacks specificity and praxis embedment. The primary teaching method is “teacher explanation + student memorization”. Teachers take up the entire class, while students are passive recipients with no opportunities for proactive participation or practical application. In teaching, teachers often adopt a uniform teaching schedule, uniform teaching content and uniform evaluation standards, without considering the differences among students, failing to achieve precision-tailored education to meet the fundamental proficiency and diverse learning requirements of each student. Meanwhile, there is a lack of practical teaching components, lacking authentic international construction engineering workplace scenario simulation, which makes it difficult for students to link the English knowledge they have learned in class with architecture operations. As a result, students’ professional English application competencies enhance slowly, and they cannot quickly integrate into the communication and work of the international construction engineering workplace after graduation, revealing the inconsistency between the teaching models and the talent cultivation objectives <sup>[1]</sup>.

### **4.UbD-Anchored Generative AI-Driven Teaching Model Construction**

#### **4.1 UbD-Anchored Core Objective Establishment**

It is necessary to first establish the core learning objectives of the “International Construction Engineering English Micro-Credential Program” based on the core design frameworks of UbD “commencing with desired learning outcomes”, and establish trinity desired learning outcomes of “professional competence + English application + cross-cultural communication” from the perspectives of industry demands and students’ development needs. The main purpose is achieved from three aspects. The fundamental professional English proficiency enables students to become well-versed in important construction engineering terminologies, such as construction schemes, quality control, contract management, etc., equally capable of correctly apprehending some English articles, drawings and other materials related to construction engineering projects, possessing preliminary professional English reading and translation skills. Professional English application competencies mean to be capable of writing engineering reports, contract terms and other documents in English, and be able to conduct effective oral communication and business negotiations in international construction engineering occasions <sup>[2]</sup>.

## 4.2 Generative AI-Enabled Instructional Content and Methodology Design

It is necessary to leverage the advantages of generative AI to conduct backward design of teaching content and teaching methods based on the core objectives that are defined via backward design, achieving “objective-content-methodology” alignment. In the design of teaching content, it is essential to dismantle the barriers among modules, integrating reading, translation, writing, speaking, engineering design reading, and other modules centered on the core objectives to form systematic teaching content, combining construction expertise with English application. Generative AI can precisely feed personalized content to students based on learning objectives. For students with weak foundations, it provides introductory learning materials on architectural terminologies and rudimentary English reading materials. For students with good foundations, it delivers complex engineering documentation translation, business exchange cases, and other content.

## 5. Implementation Impediments and Strategic Countermeasures in Teaching Model Innovation

### 5.1 Implementation Impediments

The application of the UbD-anchored Generative AI-driven teaching model in the “International Construction Engineering English Micro-Credential Program” still faces two main challenges. Insufficient integration of faculty capabilities and technologies constitute the biggest obstacle in the application of the generative AI-driven teaching model. When backward design is integrated with generative AI, the requirements become higher for faculty professional qualities. Teachers need to have stronger English teaching capabilities and construction expertise, and be well-versed in the operating principles and application methods of generative AI, capable of fully applying AI technology and UbD to teaching ecosystems. However, currently, the majority of teachers lack relevant technical skills and teaching capabilities. They have limited knowledge of the application scenarios and operation methods of generative AI, failing to fully leverage the enablement efficacy of the technologies. There are even cases where technology application is disconnected from the learning objectives. It is challenging for learners to balance their learning autonomy and technical compatibility. Generative AI can provide personalized learning support for students. However, the quality of students’ learning outcomes still depends on their prior knowledge, cognition competence, and metacognition level. Some students fail to develop good self-directed learning awareness and overly rely on AI assistance, thereby hindering the development of self-directed critical thinking and language application competencies [3].

### 5.2 Strategic Countermeasures

Higher education institutions must conduct backward design of teaching evaluation systems based on UbD, oriented by core objective attainment to design an “evaluation-instruction-objective” closed-loop ecosystem, and leverage generative AI to upgrade assessment systems with intelligent automation and dynamic adaptability. Teaching evaluation should transcend the traditional summative evaluation approach and establish a multi-dimensional evaluation system featuring “process-oriented evaluation + summative evaluation + practice-oriented evaluation”, emphasizing the cultivation of students’ professional English application and cross-cultural communication competencies. During the process-oriented evaluation, generative AI continuously monitors students’ actions and task completion, and provides dynamic scoring and feedback on students’ reading, translation, oral expression, and other competencies, enabling students to quickly identify their shortcomings. In the summative evaluation, generative AI is used to plan evaluation tasks that meet workplace requirements, such as engineering documentation writing and business negotiation simulation, to comprehensively assess students’ key competencies. When conducting the practice-oriented evaluation, it is necessary to integrate with the international construction engineering workplace scenarios to enable students to carry out authentic engineering English application tasks, and then AI works together with teachers to conduct evaluations, ensuring fair and pragmatic evaluation results. Generative AI can conduct precision analysis of evaluation data, provide teachers with advice on teaching improvement, offer personalized learning guidance to students, and achieve evaluation diagnosis, feedback

and improvement functions, thereby promoting continuous improvement of teaching quality [4].

## 6. Conclusion

In the macro-context of the globalized construction engineering industrial advancement and the digital transformation of education, the “English Micro-Major for International Construction Workplace” has become a key vessel for cultivating interdisciplinary talents. Therefore, it is imperative to reform teaching models for the “English Micro-Major for International Construction Workplace”. The UbD-anchored generative AI-driven teaching model is guided by the desired learning outcomes, leveraging the advantages of generative AI to address current challenges in Micro-major education, such as insufficient disciplinary integration, ossified teaching models, and superficial application of AI technologies. It establishes a “objective-instruction-assessment” closed-loop unified teaching system to achieve a deep integration of construction expertise and English application competencies. This model can effectively advance students’ professional English application and cross-cultural communication competencies by defining the core objectives, optimizing the teaching content and methods, and refining the evaluation systems, to solidify foundations for their future work.

## References:

- [1] Yinxiao Zhang.(2025)*Teaching Theory and Practice of Architectural Engineering English:Review of “Architectural Engineering English”*[J].*Building Structure*,55(19),107.
- [2] Linlin Li,Yiyang Li.(2024)*Characteristics of Architectural Engineering English Terminology and English-Chinese Translation Strategies*[J].*Chinese Science&Technology Translators Journal*,37(02),9-12.
- [3] Xiangqin Du,Zhilong Liu,Huashan Yang,et al.(2023)*Problems and Countermeasures in the Teaching of “Constructional Engineering English”*[J].*The Theory and Practice of Innovation and Entrepreneurship*,6(15),35-37.
- [4] Xiangqin Du,Zhilong Liu,Zhenhua Zhao,et al.(2024)*Integrating Ideological and Political Elements into the Teaching of“Constructional Engineering English”*[J].*Education Teaching Forum*,3,21-24.