A New Exploration of Generative AI-Empowered Teaching of the English Micro-Major for International Construction Workplace Based on Backward Design Theory

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Abstract: This paper focuses on the application of generative AI in the teaching of micro major in workplace English for international construction engineering from the perspective of backward design theory, elaborates on the core of backward design theory and the advantages of generative AI, analyzes the current pedagogical dilemmas in content, methods, and assessment, and systematically constructs an integrated teaching model of the two, encompassing four critical phases: defining learning objectives, determining assessment evidence, designing learning experience and teaching activities, to explore new approaches and methods for truly promoting the improvement of teaching quality in this micro major and efficiently cultivating compound talents that meet the needs of international construction engineering sector.

Keywords: Backward Design Theory, Generative AI, International Construction Engineering, Workplace English

1.Introduction

With the deepening of globalization and the steady progress of the "the Belt and Road", international construction engineering sector is facing an increasingly urgent need for compound talents that have both specialized architecture knowledge and workplace English application capabilities. Against this backdrop, the micro major in workplace English for International construction engineering emerged as the times require, aiming to precisely cultivate workplace English talents for international construction engineering. However, there are still many challenges in the teaching process of this micro major at present, such as the disconnection between teaching content and job demands and the failure of teaching methods to stimulate students' interests and cultivate their practical ability. The backward design theory designs teaching philosophy from the perspective of expected results, which can make the teaching objectives more precisely achieved. Generative AI technology has made a spurt of progress, and has brought new opportunities for educational and teaching reform with its own language generation capabilities and support for personalized learning. Combining backward design theory with generative AI and applying it to the teaching of micro major in workplace English for international construction engineering can help break through the existing pedagogical dilemmas, innovate teaching models, improve teaching quality, and cultivate talents that can meet the job demands of international construction engineering better, which has significant practical significance and value.

2.Overview of Backward Design Theory and Generative AI

2.1 *Core of Backward Design Theory*

Backward design theory, proposed by Wiggins and McTeigue, disrupts the teaching sequence "where teachers first plan teaching content and teaching activities before considering assessment methods." This theory holds that teaching should be outcome-oriented and be divided into three stages: The first stage is to clarify the expected results, that is, accurately know the knowledge and skills that students need to master and what quality they need to have based on the curriculum standards, professional requirements, and the situation of students; The second stage is to find reasonable assessment evidence, that is, to think about how to accurately judge whether students have achieved

the expected learning results and be able to design multiple assessment methods that are highly matched with the expected learning results. The third stage is to design learning experience and teaching activities. According to the designs of the first two stages, teachers should arrange teaching content reasonably, select teaching methods carefully, and orchestrate teaching activities orderly, so that each teaching link helps students achieve their expected learning results and the entire teaching process proceeds orderly in the direction of achieving the expected results.

2.2 *Advantages of Generative AI Technology*

Based on deep learning algorithm, generative AI can generate text, images, audio and other content and has a significant advantage in the teaching of micro major in workplace English for international construction engineering. It can offer personalized learning support, and can provide each student with personalized learning content, exercises, and targeted feedback and suggestions based on each student's learning situation at every moment and their personalized learning needs, which fully conforms to the personal learning rhythm and style of different students. For example, for students with poor English proficiency, it can push more exercises on basic grammar and specialized vocabulary. For high-aptitude students, it can push extended professional English reading materials and more advanced practical tasks. On the other hand, it can provide a large amount of real learning resources, quickly generate situational dialogues on international construction engineering workplace, reports of international construction projects, contract texts, etc., and quickly create real learning situations, thereby enhancing students' practical ability. In addition, it can provide timely feedback and assessment on students' learning, accurately point out their mistakes and offer specific directions for correction, and is like an exclusive teacher who can give students the answers at any time, which greatly improves students' learning efficiency and quality [1].

3.Current Teaching Situation and Dilemmas of Micro Major in Workplace English for International Construction Engineering

3.1 *Disconnection Between Teaching Content and Job Demands*

At present, some teaching content of micro major in workplace English for international construction engineering still focuses more on imparting general English knowledge to students, and does not fully cover and deeply explore core specialized vocabulary, specific sentence patterns, workplace communication rules, and cross-cultural differences in international construction engineering sector. Most of the examples and exercises in the textbooks are fictional or outdated, and are quite different from the actual project scenarios, work processes and business requirements of current international construction projects, which are short on timeliness and practicality. This means that although students have mastered the basics of English, when they enter the real workplace environment, such as participating in business negotiations for international construction projects, writing project progress reports, and communicating with foreign colleagues on professional technical issues, they cannot use the English knowledge they have learned well for effective communication and cannot meet the job requirements, which in turn affects their working status in the early stage of their career development.

3.2 *Conventional and Undiversified Teaching Method*

In terms of teaching methods, most courses still follow the model of "teachers give lectures and students listen to without much active involvement", where students receive knowledge passively and are short on the opportunities for active thinking and hands-on operation. The form of classroom interaction is only simple Q and A, and lack of language practice activities or in-depth interaction in actual situations. When explaining specialized English vocabulary, teachers merely paraphrase the words and read example sentences. Students are short on the opportunities to apply the vocabulary in actual work, which leads to their shallow memory and incomplete understanding of the words, and that they are unable to apply them flexibly in real situations. In listening and spoken language teaching, teachers often employ the audio and simple dialogues that come with the textbooks, making it difficult to simulate the complex and ever-changing scenarios in the international construction engineering workplace, such as, the communication in a noisy on-site environment and conversations among foreigners with

different accents. This results in a slow improvement in students' listening comprehension and oral expression ability. Moreover, the conventional and undiversified teaching model cannot stimulate students' interest and initiative in learning, is not conducive to cultivating students' problem-solving ability and innovative thinking, and does not conform to the objectives of micro-majors to cultivate practical talents.

3.3 *One-Sided Assessment Methods*

Teaching assessment is an important part of teaching process. Currently, the methods of teaching assessment are overly one-sided, and the assessment dimensions are relatively single. Most courses are overly reliant on final exam results with minimal weighting for usual performance. And usual performance is mainly determined by students' attendance and completion of simple assignments, which cannot comprehensively track and assess students' daily learning. The final exams mainly focus on students' memory of knowledge, such as word spelling, grammar, and recitation of texts, and rarely examine students' ability to communicate and solve problems in English in actual working scenarios, and thus fails to comprehensively assess students' English proficiency and comprehensive ability. This leads to that the final exams cannot truly reflect students' learning process and learning ability, and the assessments fail to fully actualize the feedback and facilitation functions of assessment in teaching process. It is not conducive for teachers to promptly adjust their teaching strategies and improve teaching methods based on students' actual problems, nor is it beneficial for students to promptly find their own learning problems and improve their learning effect in a targeted manner. This has led to a vicious circle where teaching is disconnected with assessment [4].

4. Construction of Generative AI-Empowered Teaching Models Under the Theory of Backward Design

4.1 *Defining Expected Learning Objectives*

Accurate, specific, and measurable learning objectives are defined based on the core job demands of international construction engineering and the latest industry standards, by combining with the results of entrance exams for English proficiency and using generative AI technology to deeply analyze a mass of real international construction engineering workplace English corpora. In terms of knowledge objectives, students need to master core terminologies, such as architectural structure, construction technology, and engineering contract proficiently, and various common sentence patterns and professional expressions in construction returns, letters, contracts, etc. In terms of skill objectives, students are required to accurately understand the key information in international architectural engineering professional literature and project materials, be able to communicate with others fluently in various working scenarios, including speeches at the project meetings, customer communication, team collaboration and exchanges, and technical guidance on construction sites, etc., and be proficient in writing various professional English documents, such as project progress reports, engineering change notices, and bidding documents. In terms of quality objectives, the focus is on cultivating students' awareness and ability of cross-cultural communication, enabling them to have a deep understanding of the differences in business etiquette, communication styles and cultural taboos in construction engineering sector among different countries. This will enable them to effectively avoid cultural conflicts in international cooperation, carry out work in a professional and appropriate manner, and demonstrate good professional quality.

4.2 *Determining the Assessment Evidence*

In terms of classroom performance assessment, generative AI is used to collect and analyze students' classroom speech content in real time, and assess them comprehensively form multiple dimensions, such as their language accuracy, fluency of expression, and appropriateness of specialized knowledge application. For instance, when discussing "Risk Response Strategies for International Construction Projects" in groups, AI not only analyzes whether the specialized words used in students' speeches are appropriate and the grammar is accurate, but also assesses whether the students' viewpoints are clear and well-organized and the logic is rigorous. At the same time, it

records the number and quality of each student's speeches, and based on this, comprehensively assesses their classroom performance to provide objective basis for their usual performance.

In terms of assignment assessment, generative AI is used to intelligently grade students' written assignments (such as, translation of professional literature and project document writing). AI cannot only accurately identify spelling and grammatical mistakes, but also provide specific suggestions and grade them from content completeness, logical coherence, accuracy of expression, format compliance, and other aspects. Taking the writing of construction project tender documents as an example, AI can determine whether the technical solution description accurately uses terminologies, whether the commerce clauses conform to industry standards, whether the integral structure is reasonable and clear, and whether the language expression is professional and appropriate in the documents to help students clarify the direction for improvement [2].

In terms of project practice assessment, highly realistic international construction projects are set up to allow students to complete the entire process of project planning, implementation and presentation in groups. Generative AI simulates the roles of the project stakeholder, partner, supervisor, etc., to communicate and interact with students in real time, and dynamically assess their integrated English proficiency, problem-solving ability, teamwork skills and project management ability in project practice. Taking the project presentation session as an example, AI will score from the specialization of content, the fluency of language expression, the effect of PPT presentation, the accuracy and timeliness of answers and other dimensions to ensure that the assessment results are objective and comprehensive.

4.3 *Designing Learning Experience and Teaching Activities*

In terms of virtual working scenario setting, generative AI in conjunction with virtual reality (VR) or augmented reality (AR) is adopted to create immersive international construction engineering virtual workplace environment. Students can easily enter construction sites, project offices, meeting rooms, international tendering and bidding sites and other virtual scenes through VR devices or online platforms to make real-time interaction with simulated foreign colleagues, clients, partners, supervisors, etc., fulfil practical tasks, such as on-site safety patrol and communication, project progress reporting, business negotiation, and project demonstration, and rapidly enhance their English skills and professional operational capabilities through realistic practical training.

In terms of personalized learning assistance, generative AI employs algorithms to precisely analyze students' strengths and weaknesses in learning and make personalized learning paths and exclusive learning plans for each student based on their learning data (such as, classroom performance, homework completion and test scores). For students with difficulties in listening comprehension, it will push specialized listening training materials (including audio from international constructional engineering conference, dialogue recordings in noisy construction sites, technical instructional videos with different accents, etc.), and provide targeted listening skill guidance and practice feedback. For students with insufficient development in writing skills, it will offer progressive writing training courses, gradually transitioning from basic sentence construction to complex technical document authoring, and at the same time, provide one-on-one composition correction services and detailed revision suggestions to help students make up for their shortcomings in a timely manner.

In terms of group collaborative learning, generative AI is used to assign challenging group project tasks (such as jointly planning international construction projects and presenting them in full English). After students form teams freely, they can conduct in-depth research and discussions by relying on project background materials, case analysis, relevant laws and regulations and other resources generated by AI. During the collaborative process, students constantly train their teamwork skills and English communication skills by completing the tasks, such as, task allocation, project design, data collection, report writing, and result presentation, in English. AI will monitor the group discussion in real time, promptly provide suggestions for optimizing their language expression, and extended information of specialized knowledge, and reminders of the project progress, help solve problems encountered in the

discussions, promote the efficient development of group collaborative learning, and ensure the smooth achievement of learning objectives [3].

5.Conclusion

This study shows that closely integrating backward design theory with generative AI technology and comprehensively applying it to the teaching of micro major in workplace English for international construction engineering can effectively solve many problems existing in current teaching, such as disconnected content disconnection, undiversified methods, and one-sided assessment, create a systematic teaching model guided by clear expected learning outcomes, guaranteed by multiple assessment evidence, and based on innovative learning experience and teaching activities to provide strong theoretical and methodological support for the teaching reform of this micro major, thereby effectively improving teaching quality, enhancing students' integrated English proficiency and practical ability, and enabling them to better adapt to the job demands of international construction engineering. However, in the actual operation process, this teaching model still encounters practical problems, such as the stability of generative AI technology, the security and privacy protection of teaching data, as well as the update of teachers' technology application level and teaching concepts. In the future, it is necessary to increase input in optimizing and perfecting the generative AI educational technology, enhance the security guarantee of teaching data and relevant legal regulations, continuously train teachers to improve their ability to integrate information technology and teaching, and constantly explore the approaches and pathways of integrating backward design and generative AI, constantly innovate and enrich the models and methods of teaching to cultivate more compound talents that meet the development needs of international construction engineering sector, and promote the sustainable and healthy development and high-quality progress of the teaching of this micro major.

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