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The "English+Major" OBE Teaching Mode in the Context of New Engineering Education: A Case Study of Artificial Intelligence Majors

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Abstract: Guided by the construction of New Engineering Education and the concept of OBE (Outcome-Based Education), this paper constructs an integrated teaching mode of "English+major" based upon the teaching practice of artificial intelligence majors, aiming to cultivate compound talents with both English proficiency and professional expertise in artificial intelligence. The study first reviews the development characteristics of New Engineering Education in the context of the "Four New Education's", pointing out that cross-integration, industry-education collaboration, and international vision are future trends; then it sorts out the core principles and implementation steps of the OBE educational philosophy, emphasizing the reverse design of courses based on learning outcomes. The article proposes a five-layer structure for the "English+artificial intelligence" OBE teaching mode: the target layer sets the output of language and professional composite abilities; the method layer adopts constructivist teaching, project-based learning, and case teaching; the tool layer integrates online and offline resources and AI-assisted platforms; the output layer refines measurable indicators such as vocabulary, reading, writing, and translation; and the evaluation layer dynamically tracks learning outcomes through formative and summative assessments. Teaching practice shows that this mode can effectively enhance students' academic English application abilities for artificial intelligence majors and their interest in learning English, providing a replicable and scalable paradigm for universities to promote college English teaching reform in the context of New Engineering Education.

1. Introduction

With the rapid development of artificial intelligence technology and the deepening of New Engineering Education, the traditional single discipline talent training mode is no longer able to meet the industry's demand for composite innovative talents. In this context, how to organically combine

professional education with language proficiency development has become an important issue in higher education reform.

This study is based on the OBE (Outcome Based Education) philosophy and takes the artificial intelligence majors as an example to explore an innovative teaching mode of “English+major”. By integrating multiple methods such as constructivist teaching and project-based learning and case teaching, and combining online and offline teaching tools, a complete teaching system has been constructed that includes target setting, method implementation, tool application, outcome output, and dynamic evaluation. The research aims to enhance students’ dual literacy of “English+artificial intelligence”, including core abilities such as professional literature reading, academic communication, and technical report writing, so as to provide a practical path for interdisciplinary talent cultivation in the context of new engineering. This exploration not only responds to the advocacy of specialized English teaching in the *Guidelines for College English Teaching* (2020 Edition), but also provides a solution to the current teaching mode, evaluation methods and other practical problems in professional English teaching.

2. Education of “New Liberal Arts, New Engineering, New Medicine, and New Agriculture”

2.1 Main Contents

In recent years, in order to meet the needs of technological revolution and industrial transformation, China’s higher education has vigorously promoted the education of "new liberal arts, new engineering, new medicine, and new agriculture” (referred to as “Four New Education’s”), aiming to break down disciplinary barriers and cultivate compound innovative talents. The Ministry of Education launched the “Six Excellence’s and One Top” Plan 2.0 in 2018, which clearly stated that the “Four New Education’s” is the core direction of higher education reform.

The education of new liberal arts emphasizes the cross integration of humanities and social sciences with digital technology, promoting the transformation of traditional liberal arts towards intelligence and internationalization. It requires strengthening emerging fields such as big data analysis and digital humanities to respond to practical issues such as global governance and cultural dissemination[1]. Under the guidance of the education of new liberal arts, some universities in China have established interdisciplinary majors such as “Computational Law”, “Computational Social Sciences”, “Digital Economics”, “Digital Media Technology”, “Digital Protection of Cultural Heritage”, “Agricultural Resources and Environmental Economics” etc., to cultivate talents with both liberal arts and sciences.

The education of new engineering focuses on cutting-edge fields such as artificial intelligence and intelligent manufacturing, promoting the transformation of engineering education from traditional skill training to innovative ability cultivation. Under the guidance of the education of new engineering, many universities have successively opened majors such as “Intelligent Manufacturing”, “Intelligent Robotics”, “New Energy Science and Engineering”, emphasizing the “interdisciplinary+industry collaboration” training mode.

The education of new medicine is characterized by “Medicine+X”, integrating disciplines such as biotechnology and artificial intelligence to promote precision medicine and smart health. *The Lancet*’s 2023 report points out that China’s new medical construction has entered the world’s top tier in fields such as genomics and AI assisted diagnosis and treatment[2]. Practice has shown that composite medical students trained through the integration of medicine and engineering are better suited for emerging industries such as telemedicine and smart wearable devices.

The education of new agriculture focuses on rural revitalization and smart agriculture, promoting the deep integration of agricultural science, information technology, and ecology. Under the guidance of the new agricultural science construction, China Agricultural University and other universities have opened majors such as “Smart Agriculture” and “Food Big Data” to help modernize agriculture[3].

Currently, the “Four New Education’s” have shown three significant characteristics: firstly, they emphasize interdisciplinary integration, such new models as “liberal arts+big data” and “engineering+artificial intelligence”; secondly, focus should be paid on cultivating practical abilities and enhance students’ ability to solve complex problems through the integration of industry and education; thirdly, the educators should have an international perspective and actively draw on advanced educational experiences from around the world. In the future, it is necessary to continuously promote the “Four New Education’s” from the aspects of curriculum system reconstruction, faculty team construction, and evaluation mechanism innovation, to inject new momentum into the high-quality development of higher education.

2.2 New Engineering Education

New engineering education is a strategic educational reform direction proposed by Chinese higher education to cope with the new round of technological revolution and industrial transformation. In 2017, the Ministry of Education launched the “New Engineering Research and Practice Project” with the aim of promoting the transformation of engineering education from traditional discipline orientation to industry demand orientation, and cultivating innovative and versatile engineering talents that can adapt to future technological development. The education of new engineering disciplines not only involves the updating of disciplinary content, but also emphasizes the innovation of educational concepts, training modes, and industry-university research collaboration.

The core characteristics of new engineering education are cross integration and cutting-edge leadership. With the rapid development of emerging technologies such as artificial intelligence, big data, the Internet of Things, and new energy, traditional engineering majors are no longer able to meet industry demands. The key to new engineering education lies in breaking down disciplinary barriers and building an interdisciplinary training system of “engineering+”, such emerging directions as “artificial intelligence+manufacturing”, “artificial intelligence+materials”, “artificial intelligence+biotechnology”, and “biotechnology+materials”. According to statistics, as of 2023, more than 600 universities in China have opened new engineering majors such as artificial intelligence, robotics engineering, and intelligent science and technology. Some universities have also explored flexible training modes such as “micro majors” and “project-based learning”.

The deep integration of industry, academia and research is another important direction for new engineering education. Huawei, Tencent, DJI and other technology companies are deeply involved in university curriculum design, laboratory co-construction, and internship training, promoting seamless integration between the education chain and the industry chain. For example, South China University of Technology and Huawei jointly built the “Intelligent Base” project, which has trained a large number of high-end chip and operating system talents.

In the future, the new engineering education still needs to be further explored in terms of optimizing the curriculum system, building the teaching staff, and international cooperation. The 2023 review of *Nature* magazine pointed out that if China’s new engineering education can further advance in basic research innovation and global cooperation, it is expected to become a benchmark for global engineering education.

3. OBE Educational Philosophy

Outcome Based Education (OBE) is an educational philosophy centered around students' learning outcomes, emphasizing that the education system should be designed in reverse around the abilities that students ultimately acquire. This concept was first proposed by American scholar Spady in 1994 [4], and it has now become a core standard for global engineering education accreditation (such as the *Washington Accord*), gradually expanding to various fields of higher education. In recent years, China has widely introduced the OBE philosophy in the certification of engineering education majors and the education of new engineering, promoting the transformation of education modes from "teacher-centered" to "student-centered".

OBE emphasizes three key principles: (1) Reverse design the curriculum system based on students' final learning outcomes; (2) Provide flexible and diverse teaching paths; (3) Establish a continuous improvement quality assurance mechanism[5]. Research has shown that engineering graduates who adopt the OBE philosophy have significantly better problem-solving and engineering practice abilities than traditional teaching methods. The specific implementation of training engineering graduates based on the OBE philosophy includes four steps: defining graduation requirements (including knowledge, abilities, and qualities), constructing a curriculum system and ability matrix, designing teaching strategies, and establishing an evaluation feedback mechanism.

In the field of engineering education, the implementation of OBE has significantly improved the alignment between talent cultivation and industry demand. The "China Engineering Education Certification Report" (2022) shows that the employment matching rate of certified graduates has increased by an average of 15%, and employer satisfaction has reached 86.7%. The OBE curriculum reform case implemented by the National University of Singapore shows that modular curriculum design based on learning outcomes can improve students' learning efficiency by 30%[6].

Despite significant achievements, the implementation of OBE still faces challenges such as the transformation of teacher concepts and the reconstruction of evaluation systems, as many teachers still have a habitual thinking of "emphasizing content transmission over ability cultivation". Future development trends include: (1) Establish an intelligent learning outcome tracking system; (2) Deepen the integration mode of "OBE+ideological education"; (3) Expand international substantive equivalent professional certification. The experience of ABET certification in the United States shows that continuous 8-10 years of OBE practice can lead to a stable improvement in the quality of professional construction[7].

OBE represents a fundamental shift in educational paradigm from input-oriented to output-oriented. With the inclusion of OBE as an evaluation indicator in China's Implementation Plan for Undergraduate Education Teaching Review and Evaluation in Ordinary Higher Education Institutions (2021-2025), this philosophy will play a more important role in improving the quality of higher education in China.

4. College English "English+Major" Teaching Mode

The "English+major" teaching mode for college English is an important direction for the current reform of English teaching in universities. This mode breaks through the limitations of traditional general English teaching and organically combines language skills training with professional knowledge learning. The Ministry of Education has clearly stated in the *Guidelines for College English Teaching* (2020 Edition) that the relationship between General English and English for Specific

Purposes (ESP) teaching should be handled well, emphasizing that English teaching should serve the professional development needs of students and offer corresponding English courses at different stages of undergraduate studies.

The "English+major" teaching mode mainly includes three implementation paths: Content and Language Integrated Learning (CLIL), English for Specific Purposes (ESP) courses, and Project Based Learning (PBL). Research has shown that the CLIL model can significantly improve students' professional English application ability, enhance their academic English proficiency and literacy, and make their learning attitude more positive, resulting in more prominent teaching effects[8]. ESP courses are designed with teaching content tailored to different professional needs, such as medical English, legal English, etc.

Of course, the implementation of the "English+major" teaching mode also faces many challenges, with the primary issue being a shortage of teaching staff. Many universities lack English teachers with professional backgrounds, which poses difficulties for "English+major" teaching[9]. Secondly, the construction of teaching materials is relatively lagging behind, especially academic ESP textbooks that cannot meet teaching needs[10]. In addition, the teaching evaluation system also needs to be further improved. Currently, most universities still focus on language proficiency testing and lack effective evaluation of professional English application ability.

Future development trends include establishing interdisciplinary teaching teams, developing intelligent teaching platforms, and improving diverse evaluation systems. The experience of the CLIL project in the European Union shows that after 3-5 years of system construction, the proportion of students whose English application ability in their professional field can reach CEFR C1 level can be increased to over 70%[11].

5. Research on the "English+major" OBE Teaching Mode for Artificial Intelligence Majors

Under the guidance of the new engineering education and OBE educational philosophy, the research team of this project has gradually summarized the "English+major" teaching mode through the implementation of classroom teaching practice for the artificial intelligence majors.

5.1 Development Status of Artificial Intelligence Majors

As an emerging interdisciplinary field, artificial intelligence has shown a thriving development trend globally in recent years. According to the latest data from the Ministry of Education, as of 2023, 498 universities in China have established undergraduate programs in artificial intelligence, an increase of more than 13 times compared to the first 35 universities in 2018. According to a study in the journal *Nature*, the number of research papers published in the field of artificial intelligence worldwide has surged from 12,000 in 2010 to 156,000 in 2022, with Chinese scholars contributing 27.3%.

The education of artificial intelligence majors presents obvious interdisciplinary characteristics. The research conducted by Academician Zhang Bo's team at Qinghua University's Institute of Artificial Intelligence shows that modern artificial intelligence education needs to integrate multiple disciplines such as computer science, mathematics, and cognitive science. According to a survey by the journal *Science*, core courses such as machine learning and deep learning account for about 40% of the artificial intelligence majors in top universities, while math foundation courses account for 30%, domain application courses account for 20%, and ethics and safety courses account for 10%[12].

Innovation in talent cultivation mode is driven by industrial demand. According to the report of

China Artificial Intelligence Industry Development Alliance, the scale of China's AI core industry will reach 508 billion yuan in 2022, and the related talent gap will reach 5 million. For this reason, many colleges and universities have explored the "school-enterprise alliance" training mode. For example, Beijing University and Baidu have cooperated to open the "Paddle" artificial intelligence class, and 85% of students have obtained enterprise certification before graduation[13].

The current development of artificial intelligence profession faces three major challenges: insufficient teaching staff (teacher-student ratio generally below 1:20), homogenization of curriculum system, and weak ethical education[14]. *The Harvard Business Review* suggests that in the future, artificial intelligence education should strengthen basic theoretical research, focus on ethical norms cultivation, and promote deep integration of industry, academia, and research[15].

5.2 "English+Major" OBE Teaching Mode for Artificial Intelligence Majors

Under the guidance of the new engineering education, this study focuses on the cultivation of students' "English+major" composite abilities. At the specific teaching implementation level, guided by the OBE education philosophy, the output of students' "English+major" composite abilities is taken as the educational output result, and based on this, a corresponding "English+major" OBE teaching mode is designed.

The research team takes the artificial intelligence majors as the example and uses the "English+major" OBE teaching mode as the research content. The project divides the "English+Major" OBE teaching mode into five interrelated and progressive hierarchical structures: target layer, method layer, tool layer, output layer, and evaluation layer. Guided by the target layer, combined with the fundamental teaching goals and improvement goals in the 2020 version of the *Guidelines for College English Teaching*, the output of "English+AI" composite ability is taken as the teaching target; in teaching practice, the method layer and tool layer is implemented, and the output layer is therefore achieved; finally, the implementation effect of the "English+major" OBE teaching mode will be verified through the evaluation layer.

5.2.1 Target Layer

At the layer of the "English+major" teaching target, this study focuses closely on the artificial intelligence majors and formulates interrelated, gradual, and reasonably classified teaching targets. Guided by the OBE philosophy and guided by the output of teaching targets, the "English+major" teaching for the artificial intelligence majors is carried out.

The target layer includes: (1) master comprehensive English language abilities: listening, speaking, reading, writing, and translation. (2) Basically understand artificial intelligence courses taught in English. (3) Be able to have conversations or discussions in English about common topics in the field of artificial intelligence. (4) Be able to read comprehensive literature related to the field of artificial intelligence. (5) Be capable of writing English abstracts, short reports, or small papers in the field of artificial intelligence. (6) Be capable of using dictionaries and other tools to translate literature related to the field of artificial intelligence.

5.2.2 Method Layer

The importance of teaching methods is self-evident, as it serves as a bridge between teacher knowledge and student understanding, directly affecting teaching effectiveness and learning quality.

Scientific and reasonable teaching methods can stimulate students' interest in learning, turning passivity into initiative. On the contrary, rigid "cramming" teaching can easily lead to students" mechanical memory and weaken their innovation ability. In the information age, teachers need to constantly innovate teaching methods in order to truly achieve educational goals and cultivate well-rounded talents with both knowledge reserves and practical abilities.

In the teaching practice process of this research project, the project team has used the following three teaching methods.

First is the constructivist teaching method which emphasizes that learning is a process in which students actively construct knowledge. Teachers are no longer one-way transmitters of knowledge, but guides, helping students construct new cognition based on existing experience through creating problem scenarios, collaborative exploration, and other methods.

Second is the project-based teaching method, also called task-driven teaching method. In teaching, students of the artificial intelligence major are divided into several small groups, each responsible for different projects or tasks, such as AI English-Chinese terminology collection, AI-assisted English writing, AI-assisted English translation, AI-assisted English academic exchange, AI-assisted English speech, etc. Each group independently completes project tasks in terms of data preparation, data sorting, project reporting, project summary, etc. This will greatly enhance students' interest in "English+AI" learning, greatly improve their self-learning ability, and give them a strong sense of learning achievement.

Third is the case teaching method, in which teachers use real "English+AI" teaching cases to provide students with practical learning situations. For example, when teaching the English writing standards for technical reports in the field of artificial intelligence, teachers can provide a brief English technical report sample as a case study to analyze its language characteristics, including technical terms and academic sentence structures, and simulate the review of international journals on artificial intelligence. They can write "revision suggestions" in English, thereby transforming English learning into the real professional needs of the artificial intelligence profession and enhancing their learning motivation.

5.2.3 Tool Layer

In the information age, the project team adopts a combination of offline and online teaching tools. Offline teaching is mainly based on classroom teaching, supplemented by multimedia courseware, teaching aids, case libraries and other tools. Through teachers' classroom lectures, students master learning methods, supplemented by discussion, guidance, practice, homework and other means, so that students can comprehensively master English learning methods. Online teaching mainly uses various English learning platforms as tools, including Rain Class, WE Learn, Ucampus, iSmart and other English learning platforms. At the same time, MOOC, micro classes, open source materials, live broadcast tools, search engines and other tools provided by the Internet are employed to assist teaching. Finally, AI tools such as DeepSeek, Kimi, ERNIE Bot, Doubao, Tongyi Qianwen are used to assist teaching and learning. Online teaching mainly cultivates students' self-learning ability, especially the ability to use artificial intelligence tools to assist English learning.

5.2.4 Output Layer

The output layer includes two aspects of content, one is the output of comprehensive English language ability, and the other is the output of "English+AI" composite ability.

The output of English language comprehensive ability is the foundation of the output of "English+AI" composite ability. Only when students have a solid foundation in English language can the effectiveness of "English+AI" output be ensured. The output of comprehensive English language proficiency includes several aspects such as listening, speaking, reading, writing, and translation, as well as the ability to coordinate, complement, and integrate these aspects. For non-English major students like those majoring in artificial intelligence, their English listening and speaking abilities are generally not strong, so improving their English listening and speaking abilities is the focus of their overall English language proficiency.

The output of the composite ability of "English+AI" includes the following aspects: (1) Mastering about 500 professional English vocabulary in artificial intelligence. (2) Artificial intelligence English short video production: about 5 minutes. (3) Artificial intelligence English text reading ability: around 130 words per minute. (4) Writing a short paper on artificial intelligence in English: about 200 words. (5) Artificial intelligence short article translation: about 250 words per hour. By combining OBE teaching with the above output targets, most students in the class are able to complete and achieve the composite ability output of "English+AI". For students who do not meet the output requirements, the research team adjusts the output targets according to their learning situation, teaches according to their aptitude, until all students can achieve their expected output goals, thus achieving the ultimate goal of OBE teaching.

5.2.5 Evaluation Layer

Under the guidance of the OBE framework, the research team evaluates students based on their ultimate ability goals. During the research process, diverse evaluation methods are used, and a combination of formative and summative evaluations is employed.

The research team pays far more attention to formative evaluation in the evaluation layer, and adjusts teaching methods and means in a timely manner based on students' evaluation results during the teaching process. The formative evaluation methods adopted by the research team include classroom performance, group discussion and speech, group tasks and their completion, classroom reporting performance, project summary report writing, case analysis report writing, homework and practice completion, and many other aspects. The project team analyzes and organizes the data of the formative evaluation results to obtain the formative evaluation results of each student, and pays attention to each student's learning situation at any time according to the evaluation results, achieving personalized teaching.

In terms of summative assessment, the project team mainly evaluates students' learning outcomes in two aspects. One is the evaluation of students' comprehensive English language ability, which is determined by observing the students' grades of final exams, CET-4, CET-6, etc. The other is to test students' composite ability of "English+AI", mainly assessing students through AI professional English tests and writing AI English term papers.

By closely combining formative and summative evaluations, the project team can understand the output results of OBE teaching and track students' learning progress based on the output results, achieving continuous improvement.

6. Conclusion

Under the dual drive of the new engineering education and the OBE educational philosophy, this paper takes the artificial intelligence majors as the example to construct the "English+major" OBE

teaching mode. Through the systematic design of the target layer, method layer, tool layer, output layer, and evaluation layer, the deep integration of language ability and professional knowledge is achieved. Practice has shown that this mode significantly enhances students' "English+AI" composite abilities, such as professional literature reading, technical report writing, and cross-cultural academic communication skills, while ensuring continuous improvement in teaching quality through a diversified evaluation system.

In the future, it is necessary to further optimize the construction of interdisciplinary teaching staff, develop intelligent teaching resources, and deepen school-enterprise cooperation to meet industry needs. In addition, exploring the direct integration of AI technology (such as big language models) into English teaching scenarios can enhance personalized and efficient learning. This mode not only provides a new path for the cultivation of artificial intelligence majors, but also provides a model for the language teaching reform of other new engineering majors, helping higher education to cultivate more compound and innovative talents in the globalization and digital wave.

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