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Foreign Language Proficiency Training for Top-Notch Innovative Talents in Science and Engineering Universities

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The present paper discusses the definition of top-notch innovative talents, the current situation and problems in the cultivation of top-notch innovative talents in science and engineering universities, and the measures that should be taken to address the problems. It is argued that we need to develop a tailor-made curriculum system, strengthen the analysis of individual needs, combine online and offline teaching methods, and integrate students' professional development into foreign language teaching.

Keywords: foreign language training, top-notch innovative talents, science and engineering universities

Introduction

There is some preliminary consensus in the academic circles on the definition of top-notch innovative talents, which refers to "those who have a strong sense of professionalism and social responsibility, innovative spirit and ability, make significant contributions to the development of the country, and are leading leaders and outstanding talents in our country, especially in the world" (Hao, 2003, p. 7). They are "outstanding figures from all walks of life who try to lead development through change, so as to make outstanding contributions to the smooth transformation of the entire social economy" (Gao, 2011, p. 67), and represent "a combination of outstanding intellectual or professional talents, outstanding innovation consciousness and ability, and noble moral character and social responsibility" (Yu, Liu, & Li, 2024, p. 36). At present, the cultivation of top-notch innovative talents has become a key project in many universities, especially for science and engineering universities.

Current Situation and Problems

International vision is an important quality of top-notch innovative talents, so foreign language proficiency improvement is an important part. Many colleges and universities offer a large number of English lectures professional courses to create international exchange opportunities, so it is necessary to effectively improve students' English proficiency and meet the training needs of top-notch innovative talents. As colleges and universities pay more and more attention to the extensive participation of science and engineering students in international exchanges, foreign language learning has been given more and more emphasis and higher requirements (Liang, Tan, & Zhang, 2015; Ye, 2013; Liu & Luan, 2016). However, so far, it is still necessary to

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systematically clarify the following issues and aspects to explore how university foreign language courses can serve the cultivation of top-notch innovative talents in science and engineering institutions.

The first challenge is the integration of foreign language learning and professional learning needs. Most science and engineering students study college English during their freshman and sophomore years, when students only have a rough understanding of their own major, and it is difficult to closely link English learning with professional knowledge, resulting in students not being able to fully understand the practical application of foreign languages in their professional development. As a matter of fact, very few students in the second year of college have read academic papers, and the experience of doing scientific research is even more scarce. This kind of curriculum arrangement can easily make students not able to generate actual learning needs for professional English in the first and second years, leading them to think that English learning is mainly to obtain credits and certificates, thus reducing the importance of English learning. It is difficult to use English to solve scientific research problems because foreign language learning and professional learning cannot be improved at the same time.

The second challenge is the problem of the basic ability. Many students have a solid foundation in their major, but their foreign language levels are different. Or, their language test scores are not low, but their listening and speaking skills are obviously weak. This phenomenon is related to the insufficient cultivation of listening and speaking skills in traditional foreign language teaching. Traditional foreign language teaching often focuses on the grammar knowledge and reading and writing ability. Foreign language learning in the middle school is also often exam-oriented. Even if students obtain high scores in foreign language exams, their actual ability of use English, especially that of listening and speaking, is still weak. After entering the university, some students can cope with daily communication, but after entering the professional field, they are not good at using foreign languages, which is most obvious in the oral performance.

Third, from the perspective of curriculum design, the application of academic English in science and engineering usually includes reading and writing academic papers (literature), academic communication, academic presentation, etc., but most of the current academic English courses in science and engineering lack the content that directly reflects the research of science and engineering majors, and thus it is not possible to connect English learning to practical application in the professional field. This is not only reflected in the overall design of the curriculum, but also in other teaching materials. The more pressing problem is that traditional academic English teaching is often based on teachers' lectures and lacks close integration with students' professional practice. At present, the professional learning of science and engineering students is developing towards industrial practice, so students' academic English learning should also reflect more practicality and application. For example, teachers guide students to combine foreign language learning with professional research through case analysis, project-based learning, and simulated international academic conferences. However, existing teaching models often fail to do this, making it difficult for students to directly apply the language skills they have learned to professional fields. In addition, due to the lack of teaching resources, students from multiple majors often study foreign languages in the same classroom, making it difficult to meet the specific needs of students from different majors.

Fourth, as the majority of foreign language teachers have received training in linguistics, literature, translation, pedagogy, and other fields for many years, it is difficult to for them to effectively guide science and engineering students to carry out scientific research activities in English. The writing norms and logical structures

that science and engineering students need to follow are significantly different from those in the humanities and social sciences. If teachers can only provide guidance on writing papers in the field of humanities, then the academic training cannot achieve the expected results. Moreover, how to make a paper in the field of science and engineering published smoothly also involves research quality, journal selection, publisher preferences, and other aspects, which are not the areas that foreign language teachers are good at.

Fifth, due to the insufficiency of innovative teaching methods, such as group discussion, case analysis, and project-based learning, teachers do not pay enough attention to the cultivation of students' extracurricular practice and independent learning ability, so it is difficult to include academic papers in the test scope, and do not pay enough attention to output-oriented content, such as oral expressions, academic speeches, and project reports. This test design cannot fully reflect students' language use ability, and it cannot effectively motivate students to improve their oral expressions and academic communication skills.

Measures

We believe that to improve the foreign language level of top-notch innovative talents in science and engineering, it is necessary to closely focus on the innovation of teaching models and to strengthen the overall planning. Specifically, under the guidance of the *College English Teaching Guide (2020 Edition)*, the blended teaching mode should be fully applied on the basis of flipped classroom, "AI + language" curriculum design, customized and practical language improvement plan. In addition to consolidating students' English foundation, we should focus on improving students' listening and speaking skills and academic English use, prepare for their second and third years of major courses, increase the international competitiveness and social influence, and extend the experience to foreign language courses in other universities.

Develop a Tailor-made Curriculum System

Following the principle of "from general English to professional English", we should strengthen their language ability in stages, and gradually introduce professional texts to improve their academic English use. The curriculum is based on two core principles. One is "professional orientation" and the other is "ability integration", which is to develop special materials and teaching strategies according to the characteristics and needs of students' majors to ensure that the materials are highly relevant and practical. Specifically, in the first semester, English for General Academic Purposes (EGAP) courses are offered to build a solid foundation. At this stage, students focus on cultivating basic skills, such as reading academic literature, writing paper abstracts, and participating in research discussions. By analyzing popular science articles or academic papers in the field of science and engineering, students are guided to master the standardized expressions of academic English, and establish academic awareness. Subsequently, in the second semester, professional English can be embedded into the teaching. At this stage, a certain number of professional case studies can be used to help students establish a connection between language learning and professional needs. In the third and fourth semesters, we focus on the core needs of students in the professional field of learning, and design advanced academic English courses, such as academic writing and publication of international journal papers, etc. At this stage, special attention needs to be paid to strengthening students' international communication skills and collaboration skills in interdisciplinary projects. Students are required to participate in real or simulated international academic seminars, school-enterprise cooperation research projects, and complete the technical design, report and summary of the project in English.

Strengthen the Analysis of Individual Needs

Traditional final assessments (such as final exams) and ongoing assessments (such as classroom performance and quizzes) cannot fully reflect the development of language proficiency in the cultivation of top-notch innovative talents. We should, first of all, use the advantages of the smart teaching platform to establish an effective learning analysis mechanism, collecting data on learning duration, preferences, and habits, so as to more accurately understand the individual needs and characteristics of each student. It can be combined with certain natural language processing techniques to observe grammatical accuracy, vocabulary complexity, and other characteristics, so as to accurately analyze students' performance in conducting speaking and writing tasks. We can also use tools to perform visual-aided analysis, such as the analysis of students with strong writing skills but weak speaking skills, and then customize teaching resources for students.

The second is to conduct interviews and evaluations, collect feedback, and suggestions from teachers and students through questionnaire surveys and group discussions, and adjust teaching strategies in a timely manner. The training of top-notch innovative talents often focuses on a limited number of students. Therefore, it is useful to collect information from short-term feedback, mid-term evaluation, and long-term tracking, and to analyze the typical problems and transform them into teaching cases.

The third is to establish a real-time, dynamic, and diversified formative assessment system, strengthen the monitoring of the learning process, accurately grasp the learning progress, give personalized learning feedback in a timely manner, and improve the learning effect. The system would include whether the language is accurate, whether the oral expression is fluent, whether the professional context can be explained in English, and whether students can carry out innovative international exchanges. The system regularly records the learning progress, and introduces the linking mechanism of self-evaluation, peer evaluation, and teacher evaluation, so that the evaluation model is more in line with the natural development of top-notch innovative talents.

Combine Online and Offline Teaching Methods

The training process of top-notch innovative talents should make full use of online and offline resources. First, it is important to provide rich learning resources of massive open online courses (MOOCs), reconstruct the classroom-teaching process, and integrate basic knowledge modules (such as the use of basic academic English vocabulary, professional terminology analysis, etc.). The role of teachers is to monitor the learning progress, record students' learning data, and propose solutions to weak points.

The second is to greatly increase the practice of academic listening and speaking. Classroom-teaching transformation is the most important way to cultivate top-notch innovative talents. Since students have to take a certain number of bilingual and all-English courses in the upper grades, teachers should actively create immersive tasks for students to cultivate their smooth role switching between different scenarios, such as international academic conferences, United Nations conferences, debates, seminars, and daily communication, and to get used to expressing themselves.

The third is to make good use of various learning platforms and artificial intelligence technologies and tools represented by ChatGPT, DeepSeek, etc., to improve students' high-level digital literacy, such as critical thinking, interpersonal communication, collaboration, and independent learning. Students should be encouraged to use artificial intelligence tools to generate abstracts, introductions, and other texts, and critically analyze the text from the dimensions of language quality and content credibility, while comparing it with human-written texts. Generative AI also plays the role of a virtual debater in debates, the audience role in

international academic conferences, a judge role in speech competitions, etc., which can effectively carry out students' thinking training.

Integrate Students' Professional Development Into Foreign Language Teaching

First, based on the output-oriented principle, the course introduces terms, cases, papers, industry reports in the engineering field directly related to students' majors, so that students can study, analyze, and explain the literature, and deepen their understanding of professional knowledge while learning foreign languages. They not only learn the accurate use of professional terms, but also gain a deep understanding of research methods and logical frameworks in their area of expertise.

The second is to use real materials from international academic scenarios to transform English listening, speaking, reading, and writing into comprehensive English literacy, and enable students to directly participate in and understand engineering practices and technological innovation in different cultural backgrounds in a pure English environment. It is also important to provide students with international conference videos, technical papers, patent documents, and other corpora to help students familiarize themselves with academic communications. Science and engineering students should learn how to clearly express complex technical concepts in academic speeches through repeated practices.

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