

Teaching Design for Foreign Languages in Polymer Materials and Engineering

Yujing Zuo and Mei Yan*

School of Chemistry and Chemical Engineering, University of Jinan, Shandong 250022, P.R. China

* Corresponding author

Abstract

With the acceleration of the globalization process, academic exchanges and international cooperation are becoming more frequent. Foreign languages, especially English, have become a basic skill that students majoring in polymer materials and engineering must master. This article aims to explore how to design a foreign language teaching program suitable for students majoring in polymer materials and engineering, helping them improve their English reading, writing, listening, and speaking skills while studying professional knowledge. By combining teaching content, learning objectives, and student needs, specific teaching strategies and implementation methods are proposed, aiming to provide theoretical basis and practical reference for foreign language teaching in the field of polymer materials and engineering.

Keywords

Polymer Materials and Engineering, Foreign Language Teaching, Teaching Design, English Proficiency, Teaching Strategies.

1. Introduction

The major of polymer materials and engineering is a technical and interdisciplinary discipline, involving multiple subjects such as chemistry, physics, and mechanics. In this field, foreign languages, especially English, have become the main tools for academic communication, scientific research cooperation, technology introduction, and academic publishing. With the acceleration of internationalization, mastering professional English has become an essential skill for students majoring in polymer materials and engineering. Traditional foreign language teaching focuses more on basic language application, however, for foreign language teaching in this major, it is necessary to not only improve students' language abilities, but also help them better understand professional knowledge. The teaching objectives, content, methods, assessment content, and assessment methods of this course are strictly implemented according to the course outline. The correspondence between the teaching objectives, teaching content, and the supporting graduation requirement indicators is based on the 2022 version of the "English for Polymer Materials and Engineering" course outline. The evaluation of the achievement of the teaching objectives of this course includes the course assessment results, student self-assessment results, and the evaluation from the school and college level supervisors (third party). By combining qualitative and quantitative evaluations, the course instructor assesses the learning outcomes of students from the perspective of course teaching, evaluates the achievement of course objectives, provides a basis for the evaluation of graduation requirements, discovers teaching deficiencies, improves course teaching methods, enhances teaching quality, ensures that students acquire relevant knowledge and abilities, and initially possess the ability to solve complex engineering problems in the field of polymer materials. This article will start from the objectives of foreign language teaching in polymer

materials and engineering, analyze the basic ideas of teaching design, and propose specific teaching strategies and methods, aiming to provide reference for teaching practice.

2. Teaching Design Objectives

"The Specialty English for Polymer Materials and Engineering" is a fundamental course for the specialty of Polymer Materials and Engineering. The course introduces students to commonly used professional vocabulary and phrases in this field, teaches the types of professional English, the characteristics of its content composition, especially the writing characteristics of English literature, and uses the latest scientific and technological literature as examples to help students understand the characteristics of professional literature and how to describe relevant knowledge in professional English. Through studying this course, students can master the word formation of professional vocabulary, improve their reading comprehension, translation, and writing abilities, thereby laying a solid foundation for students to read English materials, write professional English papers, and engage in international academic exchanges. By studying this course, students can master the common professional vocabulary and phrases required for the specialty of Polymer Materials and Engineering, read English materials in this field, smoothly translate various genres of English literature in this field, and possess preliminary English literature writing abilities, thus establishing the necessary foundation for the smooth progress, completion of graduation design, and engagement in professional work after graduation. Integrating classroom teaching, self-study, class discussions, exercise questions, and major projects, along with using multimedia courseware, video electronic teaching, and blackboard teaching methods as auxiliary teaching means, continuously enhance the teaching effectiveness to achieve the goal of learning this course.

This course is an exam course, which is conducted in a closed book format according to the teaching outline. The exam consists of five major questions, including fill-in-the-blank, translation from English to Chinese, vocabulary explanation, translation from English to Chinese with drawing of structural formulas, and comprehensive analysis. The exam content corresponds to and covers 100% of the graduation requirements indicators supported by the course. The final grade is determined by the regular grade (30%) and the final exam grade (70%). The regular grade includes class attendance (discussion), regular assignments, and material literature reports, all closely related to the course objectives and the graduation requirements indicators. The specific teaching objectives of this course include the following aspects:

1. Master language tools Master language tools; have computer application capabilities, able to collect, analyze, judge, and select domestic and international technical information materials through modern information technology tools for solving complex engineering problems.
2. Have at least one foreign language proficiency, with basic abilities in listening, speaking, reading, writing, and translating, as well as professional foreign language application skills; understand the differences in different cultural backgrounds, and possess a certain international perspective and cross-cultural communication abilities.
3. Be able to learn for a lifetime, track the development trends of polymer materials field and related technologies, and continuously update professional knowledge.

3. Teaching Content and Structure

The content setting of foreign language teaching in the field of Polymer Materials and Engineering should focus on the following key areas:

3.1. Basic knowledge of polymers

The basic knowledge of polymer materials includes the definition, classification, properties, applications, and other fundamental concepts. Students need to understand professional terms and be able to express them in English.

3.2. Polymer synthesis and processing technology

Polymer synthesis and processing technologies include methods of polymer synthesis, synthesis reaction mechanisms, types of polymerization reactions, processing techniques, etc. This part of content is more technical and requires students to grasp relevant professional terms and expressions.

3.3. Mechanical properties of polymers and methods of analysis

Mechanical properties and analysis methods of polymer materials include the mechanical properties, testing methods, and performance analysis of polymers. The key focus of teaching is to cultivate students' academic expression ability through the use of relevant analysis tools in English learning.

3.4. Writing academic papers and reading literature

Academic paper writing and literature reading help students master how to express research content related to polymer materials and engineering in academic papers, how to conduct literature reviews, and train students' ability to critically read academic articles.

3.5. Technical English Listening and Speaking Training

English: Technology English listening and speaking training enhances students' listening and oral communication skills by listening to international academic reports, participating in discussions, and so on.

4. Teaching Strategies and Methods

4.1. Situational approach

Traditional text translation is also mainly teacher-oriented, with the teacher translating every sentence and paragraph, while the students only passively memorize and comprehend, which is not effective and the students may not be able to understand effectively. According to the actual situation, we also adopted the mode of "teaching and learning", allowing students to translate, sentence by sentence, paragraph by paragraph, and then the teacher corrected the students' mistakes. First, for each paragraph of the text, randomly select a number of students, each translate a sentence and let the students correct each other's mistakes, mainly to test whether the students really understand the meaning of each word, each phrase, and whether the grammar and structure of the whole sentence is skillfully mastered, which also improves the students' classroom motivation and participation; Subsequently, the teacher corrects the problems of the students and translates the whole paragraph sentence by sentence to explain the meaning of the whole paragraph, so that the students can translate the text according to the specialized knowledge they have learned. The teacher then corrects the students' questions, translates the passage sentence by sentence and explains the meaning of the passage, so that the students can translate the text according to their specialized knowledge. After this habit is formed, the students' ability to translate the text skillfully in the classroom can be improved, and the teaching effect is good.

4.2. Task-based pedagogy

Design tasks with practical application, such as writing lab reports, conducting project presentations, translating specialized literature, etc., so that students can consolidate their professional knowledge and language skills by completing the tasks.

4.3. Typical case studies

Traditional text reading teaching is usually teacher-driven and adopts a “teaching-oriented” model, i.e., the teacher reads aloud sentence by sentence and paragraph by paragraph, while the students mechanically and passively listen to the lecture and record the words or phrases they do not know. The effect of this approach is limited, and not only is it difficult for students to read the text fluently, but their participation in the classroom is also low. In order to address this situation, we adopted a “learning-oriented, teaching and learning” model, guiding students to actively participate in reading aloud, while the teacher followed up with guidance and correction. The specific methods are as follows: First, we randomly selected a number of students to read aloud a part of each passage and let them correct each other's mistakes. This process was mainly used to check whether there were any non-specialized vocabulary or phrases that the students did not know and whether they were able to read aloud more smoothly. This approach was also effective in increasing students' classroom tension, attention and motivation. Then, the teacher read aloud once more and corrected students' problems in reading aloud in detail, and asked students to record in their textbooks any non-specialized vocabulary that they did not know and that was not marked in their textbooks. Through this model, students gradually develop the habit of actively reading aloud in class and recording in time, which can significantly improve the fluency of reading aloud the text and expand their non-specialized vocabulary, and achieve better teaching results.

4.4. Integration of multimedia and web-based resources

Multimedia resources such as online courses, professional journals and online lectures are utilized to introduce the latest academic developments and cutting-edge technologies into the classroom to stimulate students' interest in learning. Meanwhile, use English learning software and online platforms for independent learning and assessment.

4.5. Cooperative learning

Discussion and collaboration among students is promoted through group work. Students can work together in groups to solve difficult problems in language learning and specialized knowledge learning, which helps to improve students' teamwork and language communication skills.

4.6. Encourage undergraduate students to observe and learn from faculty research laboratories

In order to improve students' professional English, learning can be strengthened through scientific research training. In addition to classroom teaching, based on the author's many years of scientific research experience, early participation in laboratory work is an effective way to improve professional English proficiency. Therefore, students should be encouraged to take the initiative to communicate with the teachers of their specialized courses and strive to join the laboratory for scientific research work as early as possible. This not only enables students to be exposed to the latest progress in their specialized fields, but also requires them to read a large number of English documents during the experiment, thus significantly improving their reading and application of professional English. In teaching practice, the author found that students who enter the laboratory early usually have a stronger interest in learning and a more solid grasp of professional English.

5. Comprehensive Evaluation and Analysis of Course Teaching, With Suggestions for Improvement

Based on the above results of student self-assessment, course assessment results and the evaluation results of the supervisors at the university and college levels, this course has achieved its teaching objectives, and there is a better achievement of the graduation requirement index points supported by the course. However, there are also some problems to be emphasized and continuously improved. Taking the 2021 undergraduates of Jinan University majoring in polymer materials and engineering as an example, the content of the final examination meets the requirements of the teaching syllabus, the content of the test paper covers a wide range of questions, the question types are varied, and the number of questions is moderate, and the students are able to complete the questions in the stipulated time. The average grade of the students is 81.16, and the grade is in line with the normal distribution, which indicates that most students have mastered the content required by the course well, and individual students have poorer grades, which is consistent with the students' usual performance. From the students' scores in the examination, they mastered basic vocabulary and basic sentence patterns well, and lost more points in reading comprehension and Chinese-to-English writing questions. In the future teaching process should further strengthen students' mastery of basic professional vocabulary, focusing on improving students' ability to practically apply professional English; in view of the characteristics of this course, emphasize the two main lines as the basis for learning this course, and further strengthen the oral training. Fully mobilize students' enthusiasm for learning, so that students can actually understand the importance and significance of this course and study it more actively.

6. Conclusion

The teaching of foreign languages in the field of polymer materials and engineering is not only a training of language skills, but also a cultivation of professional and cross-cultural capabilities. By integrating the characteristics of the discipline and the needs of students, designing reasonable teaching objectives and content, and using appropriate teaching strategies, students can significantly improve their language skills and lay a solid foundation for their future communication and cooperation in the international academic field. This teaching design paper comprehensively considers the specificity of the polymer materials and engineering major, integrates teaching strategies of language learning and discipline knowledge, and provides a more practical foreign language education program for students in this major. If there is a need for further details or modifications, it can be discussed further. With the continuous updating and optimization of foreign language teaching methods, the future foreign language education in the field of polymer materials and engineering will better meet the learning needs of students and the trends in industry development.

Acknowledgements

This work was financially supported by Natural Science Foundation of China (22274064, 22007037), Natural Science Foundation of Shandong Province (ZR2024YQ021), the Foundation of Key Laboratory of Special Functional Aggregated Materials, and the startup fund of University of Jinan (1009428), Supported by Science and Technology Program of University of Jinan (XKY2204).

References

- [1] J.Li, L. Wang: Exploration of English Teaching Modes in Polymer Materials and Engineering Major (Educational Research, China 2020), p. 112-118.
- [2] W. Zhang, L.Chen: Current Situation and Countermeasures of Polymer Professional English Teaching (Higher Education Research, China 2019), p. 54-60.
- [3] X.M. Liu: Research on the combination of university English teaching reform and professional English teaching mode (Foreign Language World, China 2018), p. 78-83.