Design of English teaching in engineering majors: oriented toward speciality

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ABSTRACT: Research and observations indicate that close and successful international cooperation between companies requires people with overall talent who demonstrate both technical expertise and a good command of English. However, the majority of current graduates in China cannot meet those requirements. To cultivate highly skilled people able to effectively communicate in English is a major challenge and a strategic goal for universities. This article reports on a progressive specialty-oriented English teaching system deployed throughout the whole university study course that aims to help students convert their broad knowledge of English into specialised English. Practice has shown that this teaching mode can deliver the expected outcomes and it brings positive results for students.

INTRODUCTION

The debate on whether the aim of college English education should be about comprehensive English learning or learning English for special purposes (ESP) has lasted for decades in China. According to several authors, English teaching at universities in China or abroad shows that ESP courses abroad are a constituent part of the subject curriculum for non-native English speakers in English teaching [1-3].

The curriculum development abroad tends to be richer and more solid, and emphasises ability training for international exchanges in the major speciality field, academic standards, academic conferences and seminars, and research in that field. But in China, ESP appears to have been marginalised.

The author has investigated training plans, course setting and the employment situation of some engineering major students in China, and found the following phenomena in English teaching: firstly, the comprehensive English teaching takes up a great portion of time, while academic English and English for special purposes are ignored with the 8:1 ratio of the former to the latter. Secondly, specialty-oriented English is not included as part of the core curriculum and ESP is only taught eventually to students in the final two years of the undergraduate years. Thirdly, the teaching of ESP is centred on the teacher who mainly translates the textbook. The last point explains why the majority of graduates cannot use English in technical communications. The English education in China lags seriously behind in the study undertaken by students in engineering majors, and cannot fulfil the requirements for internationalised talent.

ORIENTATION OF ENGLISH TEACHING IN ENGINEERING UNIVERSITIES

One needs to investigate the demand for students, as well as the enterprise or industry, to accurately orient the English teaching in engineering majors. Table 1 presents investigation results of the English learning situation of 105 junior or senior students in engineering majors who undertook CET4 at Inner Mongolia University of Finance and Economics, in 2012.

The questionnaire results in Table 1 indicate the following problems: firstly, students generally agreed that their level of English proficiency decreased and they were not content with college English teaching because they deemed it as cliché-ridden compared with their high school English. Secondly, students wanted to learn specialty-oriented English or English, which could be helpful for the development of their major skills. Thirdly, students wanted to develop their English capabilities, but did not receive appropriate guidance.

The investigation made in the same year for 153 freshmen and sophomores who did not take the CET4 showed similar results.

Table 1: Survey of English learning perceptions of 105 senior and junior students in engineering majors.

Survey question \ Number and percentage		Yes		No	
		No	%	No	%
1	Do you think your English listening has been improved?	19	18.1%	86	81.9%
2	Do you think your oral English has been improved?	12	11.4%	93	88.6%
3	Do you think your English reading has been improved?	28	26.7%	77	73.3%
4	Do you think your English writing has been improved?	23	21.9%	82	78.1%
5	Do you think your translation between Chinese and English has been improved?	34	32.4%	71	67.6%
6	Does passing CET4 and CET6 most motivate you to learn English?	72	68.6%	33	31.4%
7	Do you think your English is good enough to communicate in daily life after graduating from high school?	45	42.9%	60	57.1%
8	Is there a big difference between high school English and *College English*?	18	17.1%	87	82.9%
9	Will you continue to learn English if there is no link between passing CET4 and graduation?	17	16.2%	88	83.8%
10	Are you content with what you have been taught in *College English*?	16	15.2%	89	84.8%
11	Are you willing to learn specialty-oriented English?	98	93.3%	7	6.7%
12	Have you ever attended international academic lectures?	18	17.1%	87	82.9%
13	Could you understand the international academic lectures delivered in English?	0	0.05	105	100.0%
14	Are you willing to learn English for the *ability of academic exchanges*?	77	73.3%	28	26.7%
15	Are you willing to learn *business English*?	36	34.3%	69	65.7%
16	Are you willing to learn English for the ability of translating specialty-oriented documents?	81	77.1%	24	22.9%
17	Are you willing to learn English as a *basic mechanism*?	96	91.4%	9	8.6%
18	Would you like to be employed by multinational corporations?	68	64.8%	37	35.2%
19	Do you find it difficult to develop your English ability?	77	73.3%	28	26.7%

Studies and observations indicate that close and successful international cooperation between companies requires talented people who demonstrate both technical expertise and a good command of English. However, the majority of current graduates in China cannot meet those requirements. For example, a company complained that *…the interpreter we employ has passed TEM-8, but he knows nothing about the basic words used here, such as bogie and brake valve.*

When a company introduced a kind of diesel engine, they could not find the required number of people among thousands of employees who would understand the corresponding English terms for materials, and the company had to rely on a translation agency. Further, it is not a rare case that companies do not have people equipped with specialised English and have to seek help from translation agencies. But, some current technical materials from the railway industry translated by translation agencies are sometimes inaccurate in relation to the actual meaning, which hinders understanding and communication. Imported equipment in some companies is idle due to the lack of talented staff with ESP abilities. Table 2 demonstrates company expectations of English capabilities for engineering university graduates.

Table 2: Companies' expectations of the English abilities of graduates.

Basic expectations	Higher expectations
Able to understand what foreigners are talking about; Qualified to hold simple oral communication; Able to use English to write non-technical documents and make PPT presentations; Able to write mails for international recipients.	Knowledge of extensive speciality-related vocabulary; Able to understand foreign drawings; Able to translate technical material between Chinese and English; Able to understand instructions for imported equipment Able to communicate in terms of technology.

In workshops with teachers who taught comprehensive English and specialised courses, the teachers also demonstrate the above-listed problems, but reforming the situation faces great difficulties. Firstly, teachers who teach a comprehensive English major in English linguistics or other similar courses do not have enough knowledge of any engineering specialty, which explains their difficulty in engineering-related English teaching. Secondly, there is a shortage in teachers who are both good at English and have specialised knowledge. Thirdly, there is a great difference in the reward for teaching comprehensive English and specialty-oriented English because of their different orientation

and teaching hours. So, almost all the teachers who teach comprehensive English are unwilling to teach specialised …*English for the tiny salary and demanding task*. Comprehensive English requires the completion of 16 credits in four semesters, while the specialty-oriented English requires only two credits in one semester. In a year, the salary of teachers who teach the former is four times of that of teachers who teach specialty-oriented English.

The redesign and reorientation of engineering English teaching should be conducted according to the above-mentioned demand. The design of a specialty-oriented curriculum and teaching should help graduates to achieve the higher expectations that companies have of students' English abilities, as displayed in Table 2.

This curriculum would ensure that students are prepared for international work in industry, develop communication skills to deal with international partners and have research capability in their major. To achieve this goal, one needs to change the existing English curriculum, teaching content, teaching and examination mode and prevent students from only concentrating on English study in their first undergraduate years, and from focusing entirely on interest-oriented learning (aiming at passing CET4 and CET6) and cramming for the final examination. Teachers also need to avoid negative factors, such as determining students' academic performance according to a test only, lack of proper transition and connection in the curriculum (no buffer between comprehensive English and specialised English), and use of a teacher-centred teaching mode.

THE DESIGN AND PRACTICE OF THE TEACHING MODE OF SPECIALTY-ORIENTED ENGLISH: RAILWAY VEHICLE MAJOR AS EXAMPLE

Taking the railway vehicle major as an example, Table 3 presents the curriculum design for this engineering specialty incorporating English for special purposes. With the core content of ESP, it is designed according to *authenticity*, *need* and the *student-centred principle*. It is a progressive curriculum, focused on the student, teaching in the class, *combining field work with the classroom* and adopting formative assessment methods.

Earlier, teachers were mainly responsible for creating an environment for specialty-oriented English and, as much as possible, they nurtured the students' speciality-oriented thinking mode in that environment.

For example, English was used in textbooks, handouts, PPT in the class, homework, final papers, research reports, laboratory reports, and so on, for four years. Also, English would be used as the only medium of instruction in the first undergraduate year. In the sophomore year, English was used as the main medium of instruction (students have formed the English thinking mode after one-year of strengthening studies). *Task motivation* was used in teaching from the beginning to the end. Teachers instructed students in some themes or topics and arranged relevant tasks that extended beyond class teaching. After class, students learned, prepared PPTs in English, wrote a task report individually or in a group, and later debated or discussed issues during classes in English. Several opportunities were provided for students to report and act as the character they discussed. Each student also had more than ten chances to answer or raise questions in class. The learning time after class was four times more than that in class.

Table 3: Curriculum arrangement of specialty-oriented English.

Semester	Course	Duration	Aim	Content
1	Introduction to Mechanical Engineering	32	Transit thought, lead thinking of students, transit from basic English to English of mechanical industry, train abilities such as speaking, listening, presentation, document indexing, group working and putting theory into practice.	Literature review, presentation skills, engineers or scientists investigating, speech from engineers or scientists in a mechanical field, content of textbooks, laboratory visit, report writing, etc.
2	Applied Mechanical Engineering	32		Seven modules, such as automobile, railway bogie, CAM, NC, man-machine engineering, electric supply for train, robots and their laboratory applications.
3	Basic Mechanical English (I)	48	Mechanical foundation; master a large number of machinery-related vocabulary and written characteristics, able to understand, communicate, read and translate basic English mechanical documents, familiar with international academic communication skills.	Mechanical knowledge, such as mechanical processing, metal materials, engineering drawing, modern design method, heat treatment and so on; expression characteristics of mechanical terminology in English, academic discussion and communication skills; relevant applications of laboratory learning.
4	Basic Mechanical English (II)	48		
5	Specialised English for Railway Industry	32	Industrial foundation; master specialised vocabulary and written characteristics, able to understand, communicate, read	Industrial content as subway, light rail, monorail, maglev, high-speed railway, train stations, train monitoring, operation organisation and so on; skills and norms

			and translate English outline of technical documents, familiar with skills and norms of article writing.	of thesis writing; relevant applications of laboratory learning.
6	Specialty-oriented English	48	Specialty-oriented foundation; master specialised vocabulary and written characteristics, able to understand, communicate, read and translate specialty-oriented English documents and retrieve relevant literature, familiar with skills and norms of article writing.	Important foreign periodical literature, papers from foreign conferences, academic exchanges, reports of experimental study, investigation reports of rain accident investigation, reports of project planning, special technical contracts, specifications and so on, model academic conferences, laboratory study.
7	Practice of English Major (I)	32	Specialty-oriented progress; able to communicate internationally, qualified to internationalised work and study, able to write thesis in English, familiar with skills of academic research.	Common methods and skills in railway research at home and abroad, areas of research focus, direction of specialty-oriented research, model academic conferences.
8	Practice of English Major (II)	16		

The progressive curriculum design helps students transition from comprehensive English learning to English for special purposes. For instance, in junior grades attention should be paid to forming habits, such as practicing academic speaking and listening, presentation skills, document indexing and referring to relevant sources. However, in senior grades, emphasis should be put on the application of special-purpose English in terms of internationalised work, international academic exchanges, specialty-oriented research, developing academic frontiers, and so on.

Table 4: Curriculum evaluation methods.

Semester	Course	Method of formative evaluation
1	Introduction to Mechanical Engineering	Attendance, speech, defence of individual and group's learning task, report from laboratory visits, in-class quiz, discussion and final paper.
2	Applied Mechanical Engineering	
3/4	Basic Mechanical English	Use laboratory reports to replace the reports from laboratory visits. The rest is the same as above.
5	English for Railway Industry	Use laboratory survey reports to replace the laboratory reports. The rest is the same as in Semester 3 and Semester 4.
6	Specialty-oriented English	Add reports from field investigations, research reports, discussions, translations, model academic conferences. The rest is the same as that of Semester 5.
7/8	Practice of Specialty-oriented English	Add the paper writing part. The rest is the same as for Semester 6.

As Table 4 shows, the evaluation process was applied in relation to the students' study to comprehensively investigate their whole learning.

The original cultivation plan requires students to finish *College English* from Book 1 to Book 4 and pass CET4. Students in the Department of Mechanical Engineering cannot obtain credits from specialty-oriented English. Therefore, the Department adjusts the controllable courses (basic courses, specialty-oriented basic courses and specialty-oriented courses offered by the Department) in the cultivation plan and stipulates policy to support the adjustment. Adjustment measures can be seen in Table 5. In addition, students who finish *College English* from Book 1 to Book 2 in the Department can take CET4. The students that pass this can choose the course *Basic Mechanical English* and *Special-purpose English of Railway Industry* instead of *College English* from Book 3 and Book 4.

Table 5: Adjustment measures for new specialty-oriented English courses.

Semester	Course	Measure
1	Introduction to Mechanical Engineering	Take the place of the Chinese course with the same name
2	Applied Mechanical Engineering	Elective course
3/4	Basic Mechanical English	Distributed elective course
5	Special-purpose English for Railway Industry	Elective course
7/8	Practice of Special-purpose English	Distributed elective course

The teaching mode described above has been applied for nearly four years and has proved to be successful. It emphasises the development of academic exchange ability in the freshman year, pays attention to mechanical foundations in the sophomore year, and attaches importance to the beginning and advance of a major in junior and senior years. Bachelor graduates who have benefited from this teaching mode successfully embrace special-purpose English, acquire comprehensive qualities, and are qualified to compete and obtain *internationalised* positions.

EXISTING PROBLEMS

First, shortage of teachers. Although some specialty-oriented English courses can be offered over several years with considerable effort, it is far from satisfactory because of insufficiency in the coverage of knowledge and well qualified teachers.

Second, the divergence in the idea of evaluation. Final examinations are cancelled for these courses. The Administrative Department considers that there are no unified scientific criteria for these courses, which makes the Department unable to supervise the teaching quality.

Third, unstable learning psychology of students. Over 90% of students still choose to learn comprehensive English and take passing CET4 as the aim of *College English* learning, which makes students who choose specialty-oriented English worry that they cannot pass CET4 and cannot graduate smoothly.

The fourth problem is that the passive learning habit of students impacts negatively on teaching quality. Some students cannot adapt to the teaching mode, which gives priority to independent learning, presentation and discussion because they are accustomed to be forced by others to learn in basic education. And, in the new teaching mode, it is basically useless to be good only at answering questions in the paper-based examination.

CONCLUSIONS

The progressive arrangement of English teaching creates opportunities for students to develop their comprehensive ability of English in terms of academic listening, speaking, presentation skills, group working, discussion, technical translations, which will help them to conduct international professional exchanges and research. It will be of great benefit for them to be recognised for their skills and develop in the long term. With companies' increasing demand for technical staff with special-purpose English ability, ESP education in China still has a long way to go. The experience of our University is the basis for the following suggestions for strengthening ESP education:

Firstly, try to train a large number of young teachers. Preferential policy and targeted training should be provided for young teachers to support those teachers who teach comprehensive English in specialty-oriented courses and actively take part in the teaching of these courses.

Secondly, adequate attention should be paid to such specialty-oriented English courses through establishing its key position in the cultivation plan. What is more, students should be allowed to take CET4 after finishing the study of *College English* Book 1 and Book 2 and those students who pass this, should be able to start the learning of specialty-oriented English.

Thirdly, there should be a reform of the policy that requires students to complete CET4 before they graduate. In the first stage, specialty-oriented English could be regarded as an optional condition of graduation to adjust the presently significant role of CET4. In the future, CET4 could be cancelled.

The last suggestion is that universities should employ the student-centred teaching mode and pay more attention to students fulfilling their learning potential.

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