

Research on teaching methods for the course *English for Petroleum Engineering*

Jiju Xu & Houbin Liu

Southwest Petroleum University
Chengdu City, Sichuan, People's Republic of China

ABSTRACT: *English for Petroleum Engineering* is one of the basic courses for college students majoring in petroleum engineering. The authors selected, as research subjects, 58 students from one class of this major, enrolled in 2012 at Southwest Petroleum University. In the process of teaching and learning, the course, English for Petroleum Engineering, multiple methods were adopted, such as integrating the macro-class lecturing with micro-class drilling, in-class teaching with open self-directed learning by means of CDs, multi-media and the Internet. First-class study (lectures) was combined with second-class activities (e.g. debates) to cultivate the students' initiative and motivation for learning. This has proven to be effective in helping the students to acquire the fundamental principles, basic concepts and approaches, and skills in English related to petroleum engineering. The analysis of students' performance in and out of class, in examinations and their final results suggests that this multi-method teaching meets the requirements of the syllabus and is effective in providing a better basis for the construction of courses in English for science subjects.

INTRODUCTION

English for Petroleum Engineering is one of the basic courses for college students majoring in Petroleum Engineering. It aims to integrate the knowledge of general English that students have learned as freshmen and sophomores, with English for Petroleum Engineering that they should learn in the third year in college [1].

In this course, students put into an English language context the major, petroleum engineering. While practising, listening and speaking in English, students acquire a large English vocabulary related to petroleum engineering, and gradually master the thinking and expressing of academic ideas in English. Hence, the students subconsciously understand and grasp the rules of English as used in petroleum engineering. This sets a foundation for them to access frontier knowledge and technologies internationally. It also helps students to compose scientific research papers in English and, thus, to communicate with other academic researchers [2].

Prior to the English for Petroleum Engineering course, students finished their studies on courses, such as general English, petroleum physics, oil-gas field development geology, drilling engineering, production engineering, and oil and gas reservoir engineering. Thus, they have grasped the basic concepts and principles of petroleum engineering. Through the course English for Petroleum Engineering, students are required to establish a clear and complete comprehension of the interrelated processes in oil and gas exploration and development in the English language.

With a good command of English for petroleum engineering, students are able to read and understand English scientific research papers or books published by the SPE (Society of Petroleum Engineers) and JPT (Journal of Petroleum Technology) covering related specialties. This helps students to know and master the trends in the oil and gas industry. Also, it is helpful to students in determining the direction of their future study.

TEACHING METHODS

Macro-class Lecturing with Micro-class Drilling

Macro-class lecturing involves using multimedia CDs that cover textbook material, which in class is projected on to a screen, and augmented by the blackboard/whiteboard. Multimedia CDs display content vividly and directly to students [3][4].

Students watch and read the material on screen, and listen to the teachers; the upper limit on the number of students is not defined. For classes needing more participation and interaction between instructors and students, such as oral discussions or debates, micro-class drilling is adopted [5-7].

In-class Teaching with Open, Self-directed Learning

In-class teaching is organised and guided by the teachers. Having made sure the requirements of the general syllabus and the needs of students are considered, teachers design a flexible teaching plan featuring demonstrations, lectures, tutorials and assessments, to guide and help students in accomplishing their assignments. In class, teachers supervise students' performance, answer their questions and monitor their learning. However, time for in-class teaching is limited. Some projects and assignments need repeated drilling or are time-consuming, and should be completed out of class.

Based on the study requirements, as well as level and interest, students can choose suitable software to conduct their open, self-directed learning. Open, self-directed learning may be achieved at indeterminate times and in multiple locations. This can meet students' differing cognitive predispositions, learning goals and study habits; it also supports individualised learning.

Teaching and Learning by Means of Multimedia and the Internet

Multimedia CDs make teaching more vivid and lively by combining sounds, pictures, scripts and animation. This promotes the students' interest and improves their recall of material, as well as the overall teaching effect [8]. Computer-assisted assignment drilling and checking enables students to do and redo as necessary the required tasks, guided by informative feedback. Hence, students can identify their own problems and adjust the degree of difficulty of the learning, and still have a sense of achievement.

Network instruction provides students with virtual classes. Teachers' lecturing and students' learning can be carried out in any place with efficient communication infrastructure. Interaction may be between teachers and students or between students. In designing the network courseware, both teaching and learning are taken into consideration. Students are provided with learning assignments and teachers with the technological tools for assignment checking. This teaching method makes students acquire knowledge openly, interactively, co-operatively and independently, and is the necessary complement for in-class teaching of English for petroleum engineering.

First-class Study with Second-class Activities

The atmosphere of learning English in the course, English for Petroleum Engineering, is established by integrating *first-class study* i.e. classroom learning, with *second-class activities*. The second-class activities include broadcasts in English on campus, organising international conferences and launch of debates in English on related subjects. Exploiting various language-learning contexts on campus stimulates students' enthusiasm and passion to learn English.

ANALYSIS OF THE EFFECT ON TEACHING

Research Subjects

The authors selected as research subjects one class of 58 students enrolled in 2012 in petroleum engineering at Southwest Petroleum University. The teaching and learning was carried out from week one to week 18 in the autumn academic semester of 2014.

Assessment Measure

Academic achievement for this course is graded by learning performance, an oral test and final examination. Learning performance accounts for 30 percent of the total score and includes class attendance, completion of tasks, response and interaction to teachers' questions. The oral test is 10 percent of the total score, and is graded based upon a five-minute dialogue between the teacher and student.

The final examination is 60 percent of the total score and is closed book. It is composed of three parts, viz. reading comprehension of native English specialised literature (50 points out of 100 for the examination), specialised vocabulary (15 points) and specialised research article writing (35 points). The test conforms to the requirements of the general syllabus of English for petroleum engineering, from both the design perspective and the proportion of objective and subjective questions. Specifically speaking, the test paper examines the students from multiple perspectives and covers the main content they have learned from the course.

Analysis of Results

Analysis of Students' Learning Performance

In Figure 1, it can be seen that 18 students are in the interval 90-100 points, occupying 31% of the total number of students. There are 40 students in the interval 85-89 points, occupying 69%. There are no students in lower intervals. It seems that, as students are majoring in the state key specialty, petroleum engineering, they show great interest and work diligently on the course. This is indicated by their initiative in answering questions and completing assignments on time.

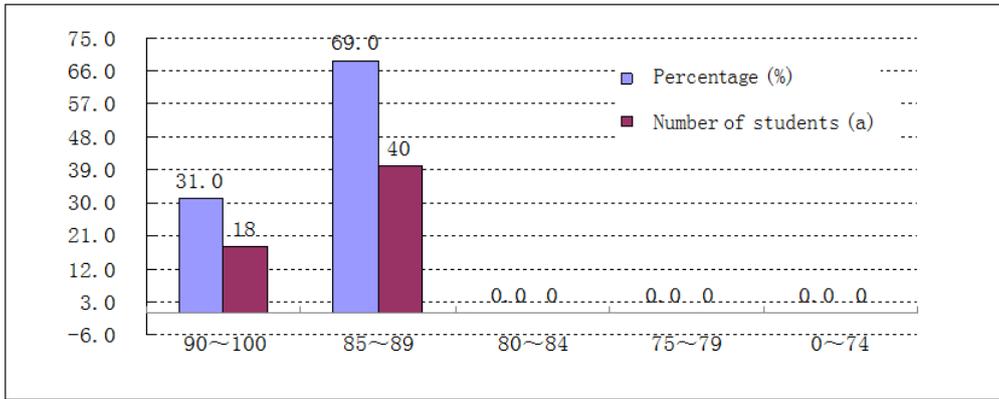


Figure 1: Students' learning performance.

Analysis of Students' Oral Test Results

From Figure 2, it can be seen that six students or 10.3% of the total number scored over 90 points; 12 or 20.7% of the total scored between 85 and 89 points; and 21 or 36.2% of the total scored between 80 and 84 points. Thus, 67.2% of the students scored over 80 points. Combining the learning and oral test results reveals that students who score high in the oral test usually have a better performance in class learning and in the final examination. Those who score lower are unwilling to speak or communicate in English with others.

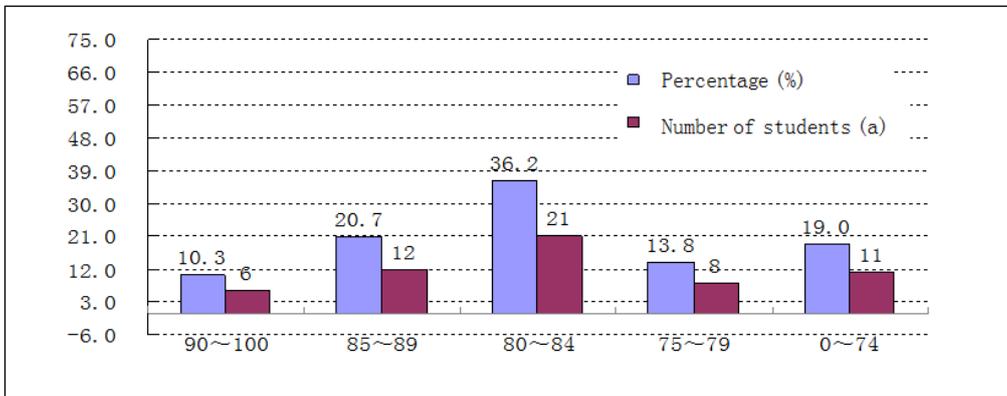


Figure 2: Analysis of students' oral test achievement.

Analysis of Students' Results in the Final Examination

Figure 3 shows the students' performance by score interval - the scores are out of 100 points. There were 58 students attending the final examination, of which 54 students passed, with a passing rate of 93.1%. To be specific, among students who passed the examination, 31% scored between 60 and 69 points; 59% scored between 70 and 79 points; and 9% scored over 80 points. Students' performance in the final examination suggests that most made a great effort in their study and had a satisfactory achievement.

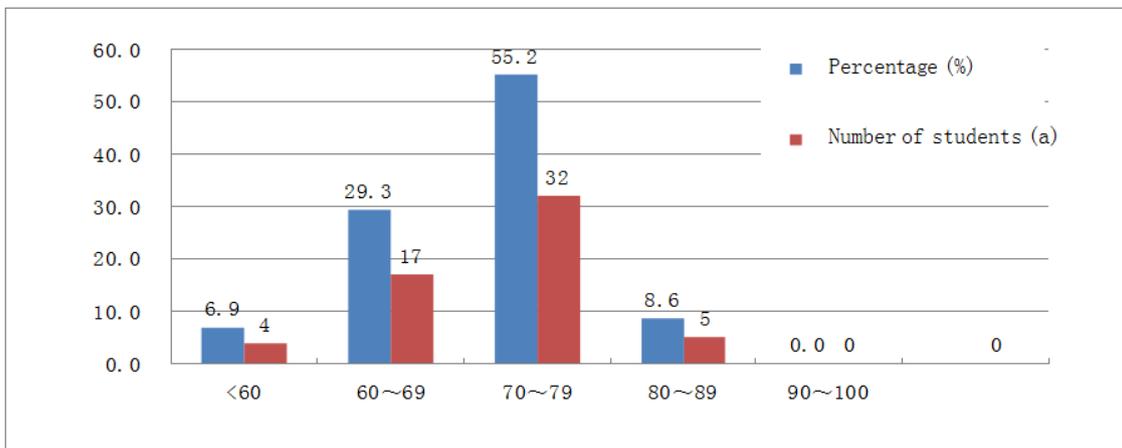


Figure 3: Students' performance in the final examination.

Analysis of Students' Total Score Results

Although the evaluation of students' performance by the final examination is an important way to appraise their command of the course content, that is far from being sufficient. To have a fair judgment of a student's final overall performance, an analysis of the student's learning performance, oral test and final examination is necessary. Figure 4 shows students' final results through combining the three sets of result.

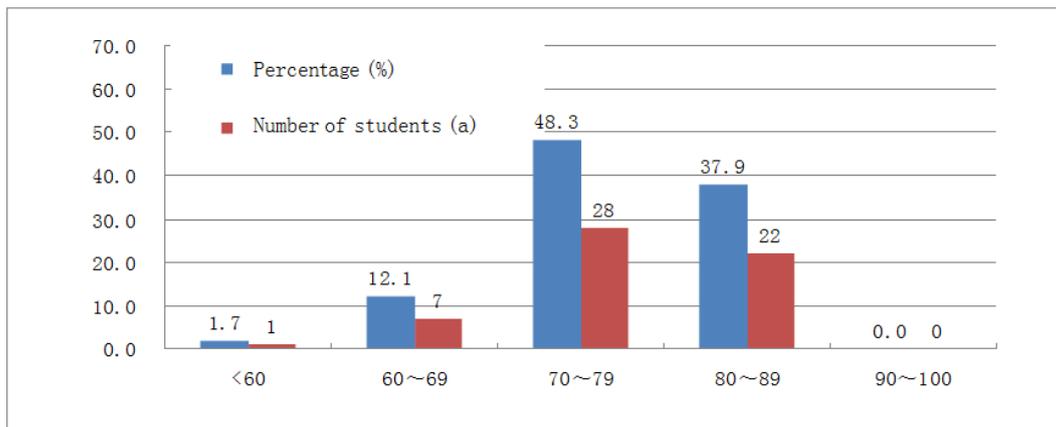


Figure 4: Analysis of students' final results.

Figure 4 describes the students' final overall results. The results are calculated thus: Final result = (Learning performance x 0.3) + (Oral test x 0.1) + (Final examination x 0.6). This formula reflects a weighting of 30% for the learning performance, 10% for the oral test and 60% for the final examination. The statistics in Figure 4 indicate there were 22 students, whose final score was between 80 and 89 points or 37.9% of the total. The percentage passing was 98.3% and the average score was 77 points. Students' final results were quite satisfactory compared with students who had not had the same teaching method. The result suggests: first, students are greatly interested in the methods the authors have adopted for the learning process, and they have made a great effort in learning and drilling, both in and out of class; second, the teaching methods are effective in instructing students on acquiring knowledge in English for petroleum engineering.

CONCLUSIONS AND SUGGESTIONS

In the teaching and learning for the course, English for petroleum engineering, students should be asked to preview the taught material in advance. Namely, the new vocabularies, texts and related background information should be previewed or researched by students before lectures. Students' preparation for lectures should be checked, evaluated and graded by the teacher, as part of the assessment of learning performance. Academic writing and translating tasks should be assigned to students, helping them to master academic knowledge, as well as English, after class.

Assessment of students is an effective way to check the teaching effect and encourage students to learn proactively. To promote students' initiative in learning, the authors could adjust the weightings of component contribution to the final score. A diversity of assessments might be employed, such as student attendance and participation in class, assignment after class, drills on listening, as well as writing and translating.

At present, most teachers who teach English for petroleum engineering are petroleum engineering academics, who have not received a professional education in English. The lack of professional practices in the English language makes them unfamiliar and inexperienced in specialised English teaching, and this results in poor teaching. Much more attention should be paid to the teaching of English, with teachers trained to improve the quality of it. The School should make full use of all possible resources and channels, to provide teachers with the opportunities to improve their teaching in English, such as giving professional training or sending them abroad to study; thus, enhancing their capability in lecturing in English.

The ability to solve a problem in learning often makes the individual gain a sense of achievement and satisfaction. To achieve this, the practical cases in routine study or work, as illustrated in the lecturing process, can arouse the students' interest in, and enthusiasm for, learning. For example, instructors can make use of the instructions in English that are on some equipment in laboratories, or the mathematical formulae in books, or the operating procedures in experiments. To promote students' initiative, enthusiasm and interest is of great importance while learning the course English for Petroleum Engineering.

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