

Teaching EFL for Engineering Students

Olav Talberg

Assistant Professor, Oslo University College, Faculty of Engineering,
P.O.Box 4, St. Olavs Plass, N-0130 Oslo, Norway, Olav.Talberg@iu.hio.no

Abstract - Oslo University College (OUC) has signed several exchange agreements with colleges abroad and the number of Norwegian exchange students visiting colleges abroad is increasing. However, the number of foreign students coming to OUC is still somewhat below expectations. This situation has triggered a discussion concerning measures to attract more foreign students. One such measure has been the feasibility of introducing lectures in English. However, there has been very little discussion about the English language skills of Norwegian engineering students. Recent research in Norway indicates that the current proficiency level of English of our students is far below what is expected when they enter higher education and engineering colleges. As there is no compulsory tuition of English, it is reasonable to assume that the language skills of future engineers will not have improved drastically by the time they leave engineering colleges. In view of the current general trends of increased internationalisation and number of student exchange programmes on the one hand, and the apparent need for improved English language skills on the other, this paper describes various didactic approaches that may improve the English language competence of engineering students. The approaches have been tried out on students and apprentices within engineering areas such as electrical engineering, mechanical engineering and building construction

Index Terms - EFL, Technical English, cultural knowledge, didactic approaches.

INTRODUCTION

"I thought my English language skills were good, but I had problems in understanding what the native English speakers said and also in expressing my main interests", an engineering student told me a few years ago. *"I have to increase my technical vocabulary; improve my technical English"*, another added. The statements came after a visit with my upper secondary class students to an exposition in London. The exposition consisted of some hundred companies from all over the world where their representatives were marketing the companies' state-of-the-art products. The students had participated in seminars and workshops of their own choice and had talked with visitors from various countries. Before going back to Norway, I had asked them to reflect on and evaluate their English language skills. The students' responses indicated that they had overestimated their language skills.

They admitted that in their future profession as engineers and representatives of their companies, their language skills would have to be improved.

My view is that we no longer need to ask if the English language skills of our future engineers must be improved. The question is rather how we should go about in improving these skills. This is primarily a question of didactics. As I am primarily a practitioner, the approach suggested in this paper is based on experiences from the teaching of English for students and apprentices in various engineering areas over a period of more than 20 years.

RATIONALE

In the introductory chapter to Technical Writing and Professional Communication For Nonnative Speakers of English [1] Thomas N. Huckin and Leslie A. Olsen, state:

"Scientists and engineers may be technically brilliant and creative, but unless they can convince co-workers, clients, and supervisors of their worth, their technical skills will be unnoticed, unappreciated, and unused. In a word, if technical people cannot communicate to others what they are doing and why it is important, it is they and their excellent technical skills that will be superfluous. From this perspective, communication skills are not just handy; they are critical tools for success, even survival, in "real world" environments".

The truth in this statement becomes even more pressing in view of the current increasing internationalisation of trade, commerce and industry. As English has become the lingua franca of international relations, tomorrow's engineers will need English language skills that are far above the skills that most engineering graduates have today.

Recent research in Norway [2] indicates that the current proficiency level of English is far below what is required of students entering higher education or engineering colleges. In Norway, English is taught as the first foreign language (EFL) in primary and secondary schools and is allocated altogether 741 lessons over 10 years. In engineering education, there is today no compulsory tuition of English. It is merely an elective (4 lessons/week in one semester, 5 ECTS) in all engineering colleges in Norway. It may therefore be assumed that the English language skills of future engineers in Norway will not improve drastically during their three year studies for the bachelor degree, even if many of the course books they read are in English.

WHAT ENGLISH – BR.ENG. OR AM.ENG?

In an enquiry of 23 EPS (European Project Semester) students at the Faculty of Engineering at Oslo University College (OUC), all of them considered their current English language skills to be 'satisfactory' in their future profession. It is difficult to find up to date information about the instruction of English in European engineering colleges with respect to whether it is a compulsory course or an elective, hours of instruction per year and curriculum. Information gathered from the 23 EPS students indicates that at 12 colleges, English was a compulsory subject with 2 - 3 lessons per week over 2 – 3 semesters, at an average. EFL was taught as 'General English', 'Business English' or 'Technical English'. The total number of EFL hours should indicate that there is a potential for developing the students' language skills. However, after having listened in on their use of English in class, it is my impression that the potential is not fully exploited and that the EPS students like their Norwegian peers overestimate their English language skills.

Improved English language skills will enable engineers to keep abreast with recent developments in engineering areas. This is important in a 'life-long-learning' perspective as it may enable engineers to develop competences needed in new areas of engineering and for job opportunities in an international environment. It is equally important for engineering companies to have an engineering staff with good English language skills. They not only make good representatives but may also become an important asset in meetings and negotiations with foreign companies.

The need for improved English language skills among engineering students calls for strategies that develop adequate language skills that are related to their profession. It has been argued that introducing bilingual instruction or lectures in English are feasible alternatives to EFL for developing English language skills. Supporters of bilingual education have come up with numerous arguments in favour of using this method of instruction. However, the scepticism against bilingual education is also growing. Those in favour of using English as the language of instruction in higher education argue that the students' language competence will indirectly be improved. Their main reason for introducing lectures in English is, however, financially motivated; an increased number of exchange students from other countries will have a positive effect on the budget of the faculty or the institution.

The two approaches are not designed for language learning in particular; they are primarily 'subject-oriented' and not 'language-oriented'. They may to some extent help develop the students' language skills and increase their vocabulary. However, as the language competence needed by our future engineers should be related to their profession, a language learning approach should be based on the activities that are relevant and typical of their profession in an international context. A language learning programme for engineering students will therefore have to improve not only the language skills as such, but will also have to enhance their cultural awareness so as to enable them to communicate adequately with colleagues from other nations.

Teachers of English sometimes ask themselves if they should teach American English or British English. Although the question may be of academic interest, it is in the context of this paper of less importance. Moreover, there are many other varieties of English than the two above. As language skills are developed for communicative purposes, teachers of EFL should focus on teaching an English that may be understood and used world-wide, a 'World Standard English' (or 'International Standard English') which in Tom McArthur's words [3] is an "*ad-hoc balancing-out of a variety of practices. It is 'a fuzzy-edged subset drawn from all the Englishes... It will be the norm and level to which millions will aspire...'*".

The abbreviation EFL is commonly used in a broad sense referring to the teaching of English as a foreign language. It does not say if this 'English' is American English, British English or something else. Nor does it distinguish between what is commonly called 'General English', 'Technical English' or 'English for Specific Purposes'.

Many English language teachers argue that correct English can best be taught and learned in a 'General English' context, also with respect to the teaching of English for engineering students. My experience is different. The fact that the purpose, the lay out, the discourse and the vocabulary of texts that deal with technically oriented subject matters are different from literary or newspaper texts, for example, these features justify the need for didactic approaches that are different from those applied to texts on general, social or literary topics. The term 'Technical English' is commonly used to refer to texts that deal with 'technical subjects' and to denote texts in which the discourse is different from that used in literary texts or texts on various social subjects. The term 'vocationally-oriented English' can also be used to denote English language instruction that aims at developing language skills that are relevant for a particular profession or group of professions.

SYLLABUS AND LEARNING MATERIAL

Basically, the overall aim of an English language course for engineering students should be twofold: to develop the students' overall communicative competence, and to lay the foundation for further learning and refinement of language skills. In this respect, the syllabus, the learning targets, choice of learning material and didactic approaches should be relevant for the students' area of engineering. The teaching of English should be implemented in situations and contexts that are authentic; that mirror 'real-life' as closely as possible to enhance the importance and relevance of the classroom activities so as to ease the transfer of knowledge and skills to future real life situations.

Learning targets commonly describe knowledge and skills areas of a subject. Assessment and grades express the level of the knowledge and skills that the students have achieved. Tests are used to offer the students an opportunity to

demonstrate the level of knowledge and skills they have acquired. Tests and learning targets are closely linked. It goes without saying that the more precise the description of learning targets is, the easier it is to develop tests. Descriptions of learning targets should be precise with respect to skills and knowledge areas. Often it may be necessary to break down main learning targets into more detailed sub-targets and also to add examples to describe the targets accurately. My experience is that precise descriptions of learning targets and accurate linking between learning targets, assignments and assessment criteria will help students in their language learning and it will also make it easier for teachers when they design assignments.

In EFL the learning targets may consist of two main areas; the knowledge areas and the skills areas. Within EFL, the knowledge area has commonly included knowledge about countries such as the UK, the USA, Australia and the like where English is the national language. The learning targets have traditionally required the students to acquire knowledge about these countries, their history, people(s) and customs, for example. However, due to increased globalisation, cultural knowledge as a learning target should be included and related to other countries, particularly countries that it is reasonable to assume that the engineering students will visit in the future as engineers. Cultural knowledge is important, and perhaps equally important as language skills, but need not be taught as a separate subject. It can be acquired when necessary and relevant. Information related to culture can be found on the Internet or in books and students should be asked to apply such information in various exercises. The overall aim of including cultural knowledge in a language course for engineering students should be to raise their awareness of the fact that people from different countries express themselves differently due to their cultural background. Language mistakes can be corrected or compensated for on the spot. Lack of cultural knowledge and awareness cannot.

Networking and collaborating with colleagues and between students at other colleges may be a feasible means to acquire knowledge about other countries. I have tried it a few times, but not with the result I had hoped for due to various constraints. There is first of all the time difference between the colleges. This constraint may be overcome if students collaborate asynchronously. The greatest obstacle is the difference between the subjects the students are doing and the overall workload they have. Collaboration requires synchronisation with respect to choice of subjects and didactic approaches, and should be planned between the teachers before the students are involved.

The skills areas consist of four skills: understanding written and oral communication, being able to communicate orally and in writing, in formal as well as in informal social settings or contexts. However, in most communicative situations and contexts, students will have to use their cultural knowledge. Language expressions are cultural expressions; they will contain and render implications that are culturally conditioned. They will indicate something about the culture you come from and the cultural knowledge you have about

those you are talking to. The two areas - language skills and cultural knowledge – cannot and should not be separated. Moreover, awareness of culture may often ‘make or break’ communication and the success of negotiations.

The learning material should cover the learning targets listed in the syllabus. Learning material for engineering students should primarily consist of authentic texts (i.e. texts written by engineers, for engineers, on engineering subjects but for other purposes than language instruction), and preferably written by native English speakers. As the students in their future profession will meet these types of text, the texts should be relevant for the particular area of engineering that the students are studying. The learning material should include documents, illustrations and graphic presentations used in contexts and situations that are typical of the students’ area of engineering. They should also include symbols, formulae and equations used in mathematics, physics and chemistry. As such, the texts will serve as resources and examples of language usage for particular purposes and in particular situations.

Depending on the level of the students’ language skills, authentic texts written in a national language and or in English by non-native English speakers can also be used for learning purposes. However, some of them may have to be edited or adapted. The extent of editing and adaptation will have to be related to the students’ level of skills as well as to the purpose and the context the texts will be used in.

LANGUAGE SKILLS AND DIDACTIC APPROACHES

Didactics is very much a question of what we want to do in class, when, why and how we want to do it. It is a question of planning, structuring and integrating various activities for the purpose of enhancing the students’ learning.

The English language skills areas comprise the abilities of understanding oral and written English and being able to use English orally and in writing adequately in different contexts and for various purposes. In my teaching I have focussed on developing the students’ written language skills within genres such as memos and formal letters, reports (of varying length), writing documentation (as in brochures, manuals, procedure and process descriptions), and writing brief articles for journals, magazines and newspapers. Although there are many varieties of how these documents are set up, conventions and various standards indicate a common lay-out that is widely accepted internationally. Oral presentations and discussions in meetings and negotiations are adequate activities for developing the students’ oral skills.

General didactic considerations

Learning a foreign language is a matter of language acquisition; students will incrementally acquire, practise and refine their language skills in accordance with their individual needs. Developing language skills is a matter of how to activate the students optimally in their work with adequate material, exercises and assignments in the classroom. Organising the students in groups (in pairs or in groups of 3 or

4 students) is probably the most efficient method to activate all students as much as possible during class.

It is my experience that an English language course that is vocationally and contextually relevant for the students will inevitably cover the same formal aspects of English as we may find in a 'General English' course. Moreover, working with relevant authentic texts is highly motivating for the students. In my classes I do not teach grammar 'for grammar's sake'. The students lack the 'meta-knowledge' of grammar and are in general mainly concerned with getting their language 'correct' without having to learn about grammar as such. Teaching grammar for grammar's sake will have no effect on developing their oral or written skills: "*The study of traditional school grammar has no effect on raising the quality of student writing. ... it will ... do them a gross disservice...*". [4]. Instead, the teacher should encourage students to use 'interactive grammar exercises' available on the Internet individually to improve their formal language skills. If teachers want to support their language instruction on grammar, a 'comparative or contrastive grammar' method may be used to highlight and create awareness of differences between national language and English.

Response

Teacher response and guidance during the students' language acquisition process – formative assessment - is an efficient means to inform them of the level of their skills and the quality of their work. Teachers should respond frequently to the students' work and their response should be implemented pedagogically. Responses should focus on a selection of aspects of the students' work and preferably make students reflect on their own work. Moreover, teachers' response should be based on and in line with requirements and assessment criteria. Involving students in setting up the requirements and criteria will enhance their awareness of the learning targets and the expected quality of their work. Student involvement in this respect may have a direct effect on their learning.

Similarly, students may be asked to respond or comment on their peers' work. It is my experience that using peer-response groups will involve all the students actively and is much more effective with respect to learning than using 'one-on-one' response. As with teacher response, students should have a clear and precise knowledge about the requirements for peer responses. The requirements will vary from one assignment to another but should be in line with some of the learning targets.

The authenticity of classroom activities

The ideal authentic setting and context for learning activities within engineering would be to allocate students to a workplace that is relevant with respect to engineering area and to ask students to participate in some of the normal activities of the workplace. This is suggested by Anne Blakeslee [5]. Still, for most engineering colleges the classroom is where learning activities are organised. It is for this reason important to create an optimal level of 'authenticity' in classroom

activities so that students experience the activities as authentic and relevant for their future profession. The activities should give students an understanding of workplace realities, and motivate their language acquisition. Visits to companies and talking to representatives may give students relevant knowledge of workplace writing practices

Developing text comprehension skills

At work engineers will read a variety of documents on technical subjects. Authentic documents written by native English speakers can be obtained upon request from local, national or international companies or from the Internet. Authentic documents as those mentioned previously will illustrate the use of vocabulary, sentence construction and lay out, and will give the students the opportunity to study how these elements are used in various types of documents. They may serve as 'models', but should rather – to my mind - serve as resources and examples that illustrate how English can be used in certain contexts and for certain purposes. Text comprehension will require knowledge of lay-out, vocabulary and sentence construction. But comprehension can also be extended by asking students about the context of the documents and their purpose.

Authentic texts in national language or written in English by non-native English speakers can be used for language learning purposes. By comparing these texts with texts written by native English speakers, students may become aware of differences between the national language and English. Such a strategy will not merely extend their vocabulary, but may also enhance their awareness of the 'cultural' aspects and differences between the two languages. Moreover, if authentic texts written by native English speakers are used as examples, the students may acquire vocabulary and sentences construction that they may apply when they are writing their own texts on similar subjects and in similar contexts or situations. Thus, learning English becomes an active acquisition of language skills, and the differences between 'classroom' and 'workplace' activities may be reduced considerably which again may enhance the transfer of language skills from the classroom to the workplace.

Developing writing skills

The engineering profession – as with most other professional activities – is becoming increasingly 'writing-oriented'. It is for this reason important to focus on developing the students' writing skills. Engineers will have to proofread, correct or edit documents written by others, and they will have to be able to write these types of documents themselves. As indicated above, authentic documents can be used as 'model' documents. To my mind, however, they should be looked upon and used as learning resources which the students should study and use as examples.

This paper addresses the question of how to improve English language skills of non-native English speaking engineering students; it does not propose strategies for the teaching of technical writing skills or how to teach writing professional documents as in 'technical communication

courses'. The focus is on teaching English as a foreign language, but an EFL course will to some extent have to touch upon writing conventions with respect to genres. Good writing – and also technical writing – is situational and contextual. This also applies to various types of text or genres – literary as well as technical genres.

Genres establish the conventions that students must learn and practise in order to communicate professionally, and are commonly defined in terms of formal features. Thus user manuals or academic papers have different features, but texts within one genre may also be different due to the context, situation and purpose when they were written. Knowledge about genres and the conventions that characterise or shape them is important because these conventions in many ways set the standards and the features that readers expect to find. Breaking these conventions may disrupt communication.

As communication is a social act involving two parties, language activities which ask students to address someone should contain information with respect to a receiver or an audience. Different audiences – and different intentions or purpose – will demand different communication styles. When doing their written assignments, students should apply their knowledge of text types and be asked to adhere to the conventions that are typical of different texts.

It is not unreasonable to spend more time on developing writing skills than on the other three skills. The advantage with writing activities is that they give the students time to reflect and check what they are writing so as to be able to correct it. Writing is also an activity that supports the development of oral skills. Writing exercises – and preferably short one – should be given frequently and should be on relevant technological subjects (e.g. brief summaries of research article, newspaper articles, technical reports, minutes of meetings, product presentations). Process-oriented collaborative writing where students work in groups of 3 – 4 students will activate students as much as possible and allow them to learn from each other. In groups larger than this, some students may become passive. During the writing process, the groups write, revise and edit the documents several times in line with responses from teacher, peers or peer-response groups. Avoid giving long lectures or talks in class. Instead, allow the students to explore material and inquire or seek information with respect to the problems they have.

If the students are working with documents (e.g. a user manual) written in their native language, they may be asked to render – not to translate – the contents of documents in English. This activity gives the students a bit more freedom to paraphrase than a 'word-by-word' translation. As a follow-up, they may be asked to use the rendered text to write a similar document as the original one in the national language using the appropriate writing conventions. The final stage may be to study, collect and apply relevant vocabulary from similar documents written by native English speakers in their own document. This series of activities will make the students focus on the language used by native English speakers and the context and purpose of their own document.

Developing oral comprehension skills

Developing comprehension skills with respect to oral discourse is an important part of foreign language learning. Oral communication is fast and will require not only a rich vocabulary and knowledge of sentence construction, but also some cultural knowledge about the people you are listening to. As spoken statements are very dependent on culture, situation and context, they should be understood or interpreted within the context they are spoken. Using videos (e.g. TV programmes on technical subjects, companies or product presentations) or sequences from films may give the students knowledge and examples of how language usage is culturally and contextually conditioned. TV-programmes and films in English with no translations or dubbing of what is spoken may be challenging, but is rewarding. The sequences may need to be played several times during which students should be asked to take notes in English and present briefs either in pairs or in front of class. Cultural aspects may be subject for discussions in class.

Developing oral skills

Developing good oral skills is a complex activity and probably the most difficult part of foreign language learning. It involves not merely being able to pronounce words correctly, using appropriate vocabulary, and developing a good fluency and sentence construction. It is also a matter of using cultural knowledge and adapting statements to the context, the situation and intention. In meetings and negotiations, applying appropriate language skills as well as cultural knowledge to keep up a conversation is essential. Failure to do so may make or break the communication. Far too often students use inappropriate language or the 'language of films' uncritically and indiscriminately when communicating with foreigners with no awareness of context or the cultural background of the people they are communicating with.

The simplest activity for developing oral skills is to ask students to practise reading out loud in pairs focussing on fluency. This activity can be applied to texts, but should also be applied to reading symbols, equations and formulae used in mathematics, physics and chemistry, for example. It is my impression that teachers of English do not always give students time to practise this skill, and lack of fluency in this respect may cause misunderstanding.

Activities that aim at developing oral skills can be based on written material at an early stage in the language course, and later combined with comprehension of oral communication. Alternating between developing written and oral skills is efficient for language learning purposes as the two skills areas mutually affect each other. Students may be given an authentic text to study, but instead of asking the teacher for information with regard to vocabulary, sentence construction, use of paragraphs and general lay out, they may first ask their classmates for information in English before they address the teacher for help. They may then be asked to talk about the text (e.g. its background or purpose). This oral activity may be followed up with various types of writing

activity (e.g. write a summary or a similar text based on background information given by the teacher).

Videos in the national language can also be used and can be obtained from local or national companies. The sequences shown in class should not be longer than 5 – 10 minutes; 15 minutes at the most. The oral activities may comprise asking students to do oral summaries of the video (or parts of it) in English, or discussing the subject or product presented in the video or asking them to render in English the contents of the video sequence.

Students like doing oral presentations (individually or in groups) of technical subjects. Oral presentations will involve various activities such as writing, reflection and structuring (e.g. setting up notes). This activity gives the students time to prepare their oral presentation which again has a positive impact on developing their oral fluency. Oral presentations may also cover a wide range of other engineering related subjects (e.g. company presentations, staff and their company positions and responsibilities, product ranges, manufacturing processes, exports and trade relations).

Role play is another activity that students love to do and may be applied to many different situations and settings (e.g. working in pairs like ‘guide’-‘tourist’, ‘instructor-apprentice’, ‘visitor-information officer’). Role play requires role cards; information that the students will need to act out a particular character. Role cards may contain information about the characters (e.g. age, educational background, job position, situation, context), but students may also be asked to add more information or invent their own characters. Using role play as an activity may give teachers a means to create different ‘cultural contexts’ in which students may practise their language skills and cultural competence. As most other ‘classroom’ activities, role play cannot replace a ‘real life’ situation, but it may give students an opportunity to prepare for such situations.

CONCLUSION

Offering our engineering students the opportunity to develop adequate and comprehensive English language skills is increasingly becoming a necessity. Failure to do so is doing

our students a disservice as they will need these skills in their studies as well as in their future profession. Various strategies have been launched in this respect. Although bilingual instruction or lectures in English are feasible alternatives to EFL for developing English language skills, the two methods are primarily ‘subject-oriented’. In order to develop the language skills of our engineering students, a compulsory English language learning programme be incorporated in their studies. The language programme should have as its overall aim and focus the development of the language skills that engineering students will need in their future profession as engineers. As engineers will communicate – orally and in writing – for different purposes and in different contexts and situations, the language programme should allow for activities that are as close to authentic, real life situations as possible. Similarly, the use of authentic learning material may enhance their language acquisition and offer the students an opportunity to develop a language competence that they may further refine in their professional life.

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