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Communication skills and ESP courses: a Basque experience

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ABSTRACT

This paper analyzes those communication skills expected of engineers, as well as their current deficiencies. Subsequently, resources required to develop technical and professional communication maturity used in English for Specific Purposes (ESP) courses are specified. In particular, oral presentations and report writing, by means of role-play and simulations, are analyzed. Also considered are other aspects directly related to the improvement of communication skills, such as metacognition and interdisciplinary collaboration (communication). Finally, a practical case is presented: an ESP course for engineers at the Industrial Technical Engineering College from Bilbao (Spain). Several examples of tasks and activities to develop such skills are presented. Moreover, studies and data regarding their opinions about the importance of all these topics in their current learning process and in the long term are presented and analyzed. The main conclusions of the study could be summarized as follows: 1. Oral presentations and report writing are highly useful to improve engineering students' communication skills; 2. The information provided to them can be successfully applied outside academia.

Keywords: ESP, engineering, communication skills, role-play, interdisciplinary collaboration.

1. Introduction

Communication skills enable people to communicate effectively with one another. Good communication skills are demonstrated by choosing the best channels of communication for a specific purpose, the ability to speak in public, make presentations, write letters and reports, chair committees and meetings, and conduct negotiations.

Some of the professional tasks expected from an engineer are:

- To speak in public in front of a moderately sized group.
- To make oral presentations with the help of technical means.
- To write professional reports.
- To transition easily in multinational and/or multicultural projects.

It can be affirmed that communicative competence has become the cornerstone of an employee's curriculum (Brumfit & Johnson, 1989; Ravesteijn et al., 2006; Riemer, 2007). Accordingly, those individuals directly involved in their education will be responsible for helping them to maximize those skills.

Taking a global approach, items such as “communicative skills”, “team work capacity”, etc. constantly reoccur when engineers are demanded. Different sources state, year in year out, that the main deficiencies of recently graduated engineers are their limited communicative skills, lack of training for team work and decision making, and limited competence to work within international contexts (Epstein,

1999; Sageev & Romanowski, 2001). The American paradigm is worth mentioning to illustrate this statement: “Recent surveys of engineering program graduates in the workforce have suggested that American engineering students are finding themselves underprepared for the communication demands of the engineering workplace” (Kmiec, 2004, p. 179).

With a local viewpoint in mind, a study carried out in 2003 (“*Carencias de los Ingenieros –Deficiencies of Engineers*”) by the Polytechnic of Mataró (Catalonia) is worth referring to as case in point. The study was based upon the analysis of proficiency profiles of engineers graduated from Spanish universities compared with abilities expected by prospective employers. A multidisciplinary team, made up of external consultants, representatives from enterprises and teaching staff, was created to conduct the research. The abilities evaluated were grouped in four areas: Management, Communication, Business, and Marketing. The major discrepancies were found in communicative competences. Another study carried out by Mora (2003) shows a deficit of professional abilities of Spanish graduate engineers in social and participation aspects.

Knowledge and technical know-how are important for an engineer, but these must be presented with an aptitude for communication. In other words, apart from academic knowledge, an engineer needs social knowledge. It can be stated that a successful career for a young engineer is strongly founded on her/his communication skills (Esposito & Sigler, 2001).

This article reports the practical activities undertaken by 34 undergraduate engineering students from Bilbao (Spain) who were enrolled in a three-hours-per-week fifteen-week ESP course designed with the aim of improving technical and professional communication skills in English. To complement the study, the students were invited to complete a questionnaire at the end of the course.

The following two hypotheses were put forth:

1. Students will be well aware of the importance of developing teamwork and autonomy in their learning process, as well as communication skills for their career in engineering.
2. The pedagogic resources used in the ESP courses and the new experience will be accepted as valuable.

The main objective of the paper could be succinctly stated as follows: to show that ESP courses may help a great deal to improve basic communication skills for engineers.

2. Communication skills and engineers

The nature of the engineering profession is changing rapidly due to the fact that many engineering problems have to be “managed”, rather than “solved”, as a result of their increasing complexity and multifaceted nature (Maier, 2007).

Oral and written communicative skills expected by prospective employers cannot be taken for granted due to their degree in Engineering. In fact, technical and professional communication has been the deficiency most cited in a number of industrial and graduate surveys in recent years (Kmiec, 2004).

A number of institutions offer engineering students communication instruction but in a rather peripheral way: the English or Communication department offers a technical writing class instructed by English and Communication faculty who often have no specific background working with technical documents.

The possibility of developing communication skills in most subjects at university level is quite often complicated. This is mainly due to the difficulty of teaching successfully to larger groups through traditional lecturing. It is not always easy for educators to give a more practical, realistic approach to their subjects. In fact, the peculiarities of engineering curricula show us that the development of communication skills is not regularly and/or globally included for a degree certificate.

The changes due to the Bologna process will affect the approach of university education in Western Europe in terms of teaching and learning habits (Goñi, 2005). Current teaching models, too often based exclusively on magisterial lessons in most subjects, do not offer our students a chance to develop communication skills relying on their professional vocabulary. Time availability is often cited as the reason that university students do not develop these skills (Hill & Storey, 2003).

According to the aforementioned precedents and focusing our attention upon the skills an engineering students should master, the following are, in our opinion, some of the skills in which an engineering student should be trained:

1. Oral presentations: Either regularly or sporadic, oral presentations are a significant part of an engineer's function. They are common within the academic, scientific, and professional world and some of their most relevant uses are: a) To make projects known to other people; b) To convey knowledge; c) To check projects; d) To compare results; e) To sell products or services... (Keane & Gibson, 1999).

A good oral presentation will be necessary if an engineer wants to convey a complex message in an efficient way, more specifically so that the audience comprehends easily. Moreover, this may also affect those who have to make decisions based on what has been presented (Sweeney, 1997; Wilder & Rotondo, 2002).

2. Report writing: Very often, Spanish students have a poor understanding of what report writing means. Usually, they need a thorough introduction to fully understand what the minimum professionally acceptable structure of a technical report is within the academic world, but also within the professional world. Then, obviously, they need to practice but they also need to know that: 1) the tasks on report writing they are asked to accomplish are not trivial but vital to complete their integral education, taking into account their specialization; 2) good reporting may be as important as good engineering.

On the other hand, for practicing oral presentations and report writing, tools such as role-play and/or simulations can be used. Real life situations are simulated in the latter, while in role-plays the participant represents and experiences a well known character of everyday life. In any case, these teaching-learning techniques are valid in situations with a certain amount of complexity such as those any engineer will have to face in her/his professional life (Hutchinson & Sawyer-Laucanno, 1990). These authors state that such techniques can be applied to the teaching of languages in several areas, such as ESP.

Among the most obvious benefits role-play and simulations could provide with engineering students, the following could be included:

- To satisfy the need of students to interact with the external reality beyond the walls of the classroom.
- To increase the motivation of students (and teacher).
- To modify the habitual teacher-student relationship in such a way that the student is more involved in her/his learning process during the simulation.
- To help students to be fully identified with the language they are acquiring.

Reports usually run parallel to problem solving, role-play (for example, to write a report for a client), opinion formation through personal research, logic and organization, objectivity and subjectivity implementation, use of tables, graphs and software, use of literature, use of abstracts, accuracy (Elbow, 1998).

When our students learn through doing, it can be observed that most of them have never been subjected to experiences where a demand for taking decisions in unknown contexts takes place. For this reason, in order to carry out role-play and/or simulations, it will be our duty to know which the level of knowledge, both technical and linguistic, the student brings with her/him is, so that students are not discouraged (Burns & Gentry, 1998).

The majority of students at university belong to the Net Generation, that is, students who have grown up with the Internet. These students prefer hands-on activities and to work in image-rich, rather than text-rich, environments. The Internet lets us accomplish a type of simulation in which there are no time-space restrictions. In these asynchronous exchanges, the students have enough time to reflect upon their own language use. Hypertexts allow teachers to select the most appropriate sources and incorporate them, through links, to the simulation activity.

The role of the teacher in both role-play and simulations is that of a moderator, someone who directs the debate in such a way that solutions and alternatives for solving the conflict presented, or facing the simulation created, are achieved. For the success of this teaching technique to be maximized, it will be important to reach conclusions and to measure the consequences of the decisions taken by the students. Moreover, the following three aspects that may also help to improve the communication skills of our students:

2.1. Knowledge and/or handling of ICT (Information and Communication Technology)

To show our students, or at least to let them know, what is used beyond the boundaries of our classroom is one of our many duties. This is not always easy since current technology moves at such vertiginous speed that either we are not prepared to assume the challenge, or the institution we work for cannot afford the socialization of the new, more-or-less-sophisticated device. Anyway, a minimum literacy of ICTs, that is, those in charge of studying, developing, implementing, storing and distributing information by means of software and hardware, will be necessary.

2.2. Implication of students in their own learning process

It is not easy to provide a proper answer for the question “What does autonomy mean when referred to the learning of languages?” Any answer we may provide will be somewhat subjective. Nevertheless, there is an aspect in which different authors coincide: To assume a higher responsibility in the learning process both inside and outside the classroom. Autonomy (do not misunderstand with autonomous learning) refers to the skills and attitudes people possess so that they can be developed to different levels (van Esch & St. John, 2003).

A generally accepted principle is that autonomy is a basic condition for learning to be effective, that is, when our students develop autonomy, they become better English learners (Dam, 1995; Benson, 2001). Current reforms that are being carried out in Europe at university level try to put as much emphasis as possible on the idea of student’s autonomy, as well as in promoting innovation within the classroom (Trebbi 2003; Benson, 2003; Coll, 2003).

For a student to be actively involved in her/his learning process, certain prerequisites are necessary: 1) the lessons must be oriented to communication and learning; 2) learning must be relevant to both the student’s interests and needs; 3) the processes and the products generated in the classroom are important; 4) the students must involve themselves in playing active roles in the classroom (Littlewood, 1992).

As a last resort, we must try to transfer effectively those models, attitudes, aptitudes developed from the classroom to real scenarios beyond university. When a student knows how to learn better, the chances of using those skills in a conscious way –inside and outside the classroom– are bigger (Gardner, 1999).

2.3. Interdisciplinary collaboration

Interdisciplinary collaboration is basically interdisciplinary communication. An efficient interdisciplinary collaboration among experts in different areas of the network in the curricula of engineers is fundamental since this provides value added for the student (Castro et al., 1991).

The current globalizing trend means not only that engineers must communicate with colleagues from other latitudes but also that they must carry out communicating activities within the scope of management. In fact, middleman engineers who represent their employer must communicate ideas from concept, to development, implementation and use (Grünwald & Krause, 2007).

Interdisciplinary projects at university level foster the development of team work skills among the students. To accomplish those projects means to count on effective skills in oral and written communication. Methodologies based upon projects carried out in teams facilitate the reinforcement and expansion of key skills in engineers, communication included (Tedford et al., 2007). That is, to include this type of tasks and assess them appropriately are vital components of engineering curricula all over the world. The teaching body involved in the learning process of engineers should: 1) Identify opportunities among engineering and other disciplines, as well as among different university departments; 2) Conceive projects for teams, once potential collaborations have been identified; 3) Get feedback from students; 4) Analyze how to reinforce already learnt skills; 5) Favor opportunities for personnel from other disciplines for communicating to each other (Riemer, 2007).

To sum up, oral presentations and report writing are fundamental skills for current engineers. The tools ESP instructors can use to develop those skills are wide and varied. Role-play and simulations (with or without using the internet) can be useful resources, but a sound knowledge of ICTs, a deep implication of

students in their own learning process and sufficient interdisciplinary collaboration will play a vital role not only in helping our engineers to –technically and professionally– communicate better but also to develop other basic skills for an engineer’s future: critical thinking, problem solving, decision taking, team work, and social skills.

3. Workshop on oral presentations: a Basque experience

The Spanish educational system in engineering is comparable to those in the rest of Continental Europe, where the following two different profiles of engineering degrees are offered: one with a short curriculum (three to four years long) based on an applied approach, and one with a long curriculum (five to six years long) based on a theoretical and conceptual approach. The Industrial Technical Engineering College (ITEC) from Bilbao (Spain) is founded on the short curriculum.

This section of the paper documents an initiative aimed to improve the success of our engineers with respect to their communication skills. Thus, it can be considered the modest contribution of ESP to the development of those skills at our College.

It must be observed that, for several reasons, the introduction of ICTs in the Basque secondary school system within the 1999-2004 period (at this time, many of our engineering students were at secondary school) has not been as satisfactory as it could have been expected (Monge, 2008).

In our educational institution, taking advantage of the new situation (no more large groups), a workshop for producing oral presentations in English has been created. The students learn techniques and develop skills to improve their oral expression in English. The methodology applied covers the aspects included in figure 1:

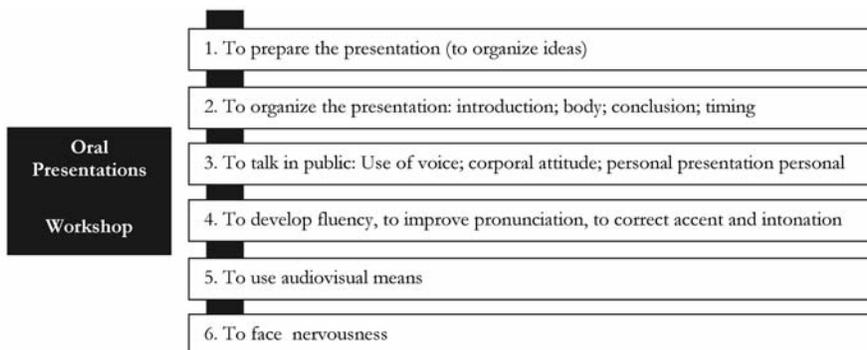


Fig. 1. Aspects improved in the workshop

Role-play (active learning) is used with our students as a tool (even for teaching engineering ethics and deontology). This approach develops new perspectives when it is used within a classroom with a certain degree of cultural diversity (Prince, 2006). This could be our case, not only because our students have different mother tongues, Basque and/or Spanish, but also because as time goes by and due to interchange programs, or just immigration, the number of students from other continents and cultures is steadily increasing (Europe, South America, Northern Africa, etc.).

The tasks put into action both mind and hands (learning through doing) in order to stimulate active learning, critical thinking and concept comprehension. These force the students to work in teams so that the so-called collaborative learning reinforces interpersonal skills, thus helping students to develop self-esteem, to be more motivated, and to improve their educational yield. Collaboration also prepares students to write better, a fundamental aspect when they become part of the work market, since a high percentage of writing means collaboration.

At the ITEC of Bilbao, this philosophy and good intentions can be stated explicitly as follows: the students must conclude two oral presentations as part of their course. The organization and characteristics of such presentations are summarized in this way:

1. Groups of approximately six students are formed. This division can be carried out at random or, more conveniently, considering technical affinity.
2. Each member from each group chooses a topic (mainly technical) and a hypothetical context in which the oral presentation will be made.
3. Each student is assigned another topic to be presented (for example, an engineer from a company has visited the firm's headquarters in order to learn a new technique, and now s/he makes an oral presentation to her/his colleague engineers).
4. The student develops in front of her/his group and the teacher, outside school schedule, the topic s/he chose, approximately at midterm and for about 12 minutes. In this first oral presentation the student receives an important feedback since s/he is in front of an audience and a thorough use of the workshop is made.
5. The student develops for 8 effective minutes and in front of all the students, prior to the end of the course, the topic chosen by the teacher.

Most of our engineering students are *a priori* reluctant to make oral presentations in front of an audience due to a lack of perception of their importance for their career, but also because they are not accustomed to them. A significant part of responsibility as teachers involved in the learning process of engineers includes fostering that perception, thus, facilitating our students their presentations. Appendix 1 includes an example of role-play activity put into practice at the ITEC of Bilbao.

It can be observed that in this role-play (see Appendix 1) the student pretends to be an individual in a complex situation that could be part of her/his tasks when in the labor market. The aim of this role-play is to imagine the way an engineer would act in such a situation and also the decisions s/he would make. Ideally, role-playing is more effective when it is practiced in a group, so that each member of the group plays the role of a member of the organization. For this approach to be fully effective, the students are immersed in environments that include both technical and non-technical communication.

The environments commonly created for developing communication skills include meeting pseudo customers and/or suppliers, personnel of the same rank and/or superior and inferior, external auditors, civil servants, etc.

In the simulations, the student makes use of the language to accomplish authentic and relevant tasks in a highly communicative context. The conditions and contexts in which communication takes place are similar to those the student would use in English when working. An active learning takes place and, moreover, the students witness the results of their actions. For simulations to be carried out our students are provided with a hypothetical scenario and a guide about what is expected from them. Appendix 2 includes a practical example.

In terms of report writing, a good report must pay attention to its composition process. The students must learn that writing is a step-by-step process. There is a high degree of agreement with respect to those steps: 1) To identify the purpose of the report (a key factor for the success of the process); 2) To identify who is/are the recipient/s (the audience and its characteristics, as well as its needs); 3) To research into the topic intensively (to understand the nature of the problem, to use adequate terminology, and to understand the data and its argumentation); 4) To draw a diagram (to review and to synthesize the information previously gathered); 5) To write a first draft (to pay more attention to ideas, evidences, backing documents and cohesion, than to punctuation and to typing mistakes); 6) To edit the first draft (to concentrate on clarity of ideas and how they are expressed, their logic and their consistency); 7) To connect the elements that provide the final shape of the report in paper (to choose a professional appearance, visually attractive, and with a unified structure).

When producing a report, even if there is economic or financial data (which, by the way, is often a key element of the report), it is the narrative element the one that most frequently causes problems to engineers and subsequently, problems to those who read them. At the ITEC of Bilbao, the students are helped to identify a purpose, to design a structure, to organize the material in a logical way, and to present the information in a clear and readable way either on a sheet of paper or on a screen. Moreover, the students are oriented to help them to highlight relevant information preserving the author's data and arguments, to share the same space both the writer's objectives and the reader's interests, to identify which innovative strategies are more suitable for solving different technical writing situations, etc. and even to let them know which commercial software is available (for example, StyleWriter from StyleWriter Development Group, Inc.). Some of the advantages of this software are that our word processor becomes a professional editor. In this way, the document is more

effective but our students are told to leave some room for personal style, rhetoric and imagination.

As far as the main elements of a technical report are concerned, our engineering students are presented six different areas:

1. The aim(s): It identifies exactly what information it contains, for whom it has been written, why it is necessary to produce it.
2. The format: The students are told that written information should be classified into three categories: a) Obviously important information because it is relevant for our aims; b) Borderline information that can be useful for certain readers or can extend other more important pieces of writing; c) Interesting information for those who write but irrelevant for the aims of the technical report.
3. The writing: The message sent to the students focuses on achieving accuracy (orthography, punctuation, word choice, sentences and paragraphs) and brevity.
4. The illustrations: The type of hint given to the students refers to diagram location. They are told that in many parts of the world there are conventions about how to present them and about the most convenient type of table or graph for each occasion.
5. The ending: In this section, summaries, abstracts, and tables of contents are analyzed, but the appearance of the report is also checked.
6. The conclusion: This section summarizes the main points of the report, thus, it should not include surprises or new information, although it may include conditions for future actions to be taken.

From a practical point of view, our students must produce a 5-6 page long technical report. Appendix 3 includes some examples.

Finally, on the one hand, in reference to reinforcing the autonomy level of our students in their learning process, it can be stated that they are equipped with tools and strategies that try to qualify them for a world in which the teacher is just one of the many suppliers of information and practical communication.

On the other hand, in terms of interdisciplinary communication, the students are given opportunities of transversally approached activities. As an example, the

following Project Work was carried out by students from the ITEC of Bilbao –two teachers from the Chemical Engineering department collaborated with us–. The students developed a new environmentally friendly procedure for treating lignocellulosic residues and minimizing the environmental impact created by burning cereal straw, as well as making possible its use as cattle food, fertilizers, stationery, etc. (González, 2002).

In summary, this section has tried to succinctly explain the types of activities carried out at the ITEC of Bilbao, as well as the strategies developed in order to achieve our purpose: to improve communication skills in our engineering students.

In order to obtain additional feedback on our work, our students were invited to complete a questionnaire at the end of the ESP course. The main results of its analysis are presented in the following section.

4. The questionnaire: analysis and results

4.1. The sample

The participants in the ESP course were 34 students (18 men and 16 women) in the age range of 20 to 24, the mean age being 21.39.

4.2. The instruments

The questionnaire is original, that is to say, it is neither a replica, nor an adaptation of someone else's questionnaire. It includes 20 items and the main aim was to use the same questions concerning the skills and topics included, in order to avoid any possible bias (which could have been the case if different questions about each particular skill or topic had been asked). The minimum score for each item is 1 (very little) and the maximum 5 (very much). It must be underlined, although it is obvious, that the expected scores were within the range 4-5, that is “very much” or close to it.

4.3. Method

The questionnaires were completed in class and the time allotted was 15 minutes. However, in order to let the students fully understand the process and the questions, a thorough explanation was provided. Moreover, the students asked questions about the items before starting. Their answers were anonymously recorded on answer sheets and, later on, after codifying them, statistically evaluated. The statistical analyses were carried out by means of the SPSS (Statistical Package for Social Sciences).

4.4. Results and discussion

Table 1 shows mean and variance scores of the items the questionnaire contains.

ITEMS	mean	var
1. To what extent have "Oral Presentations" helped you to improve your command of General English?	3.91	0.84
2. To what extent have "Oral Presentations" helped you to improve your command of ESP?	4.03	0.69
3. How important do you think "Oral Presentations" could be if you start working for an engineering company in the near future?	4.21	0.70
4. To what extent has "Report Writing" helped you to improve your command of General English?	4.08	1.01
5. To what extent has "Report Writing" helped you to improve your command of ESP?	4.19	0.73
6. How important do you think "Report Writing" could be if you start working for an engineering firm in the near future?	4.41	0.59
7. To what extent do you think this ESP course has helped you to improve your knowledge and/or command of ICT?	3.88	1.18
8. How important do you think a good command of ICT could be for you if you join an engineering company in the near future?	3.97	0.98

ITEMS	mean	var
9. How much do you think this ESP course has helped you to increase your personal implication in your own learning process?	3.24	0.69
10. How important do you think developing autonomy in your own learning process could be if you are hired by an engineering company in the near future?	4.43	0.52
11. How much have you "felt" the interdisciplinarity of this ESP course with other subjects from your curriculum?	4.08	0.89
12. To what extent do you think you will "feel" interdisciplinarity if you start working for an engineering company in the near future?	4.41	0.39
13. How much have the tasks and assignments given in this ESP course helped you to improve "good" teamwork?	3.04	0.83
14. How much do you think this improvement will help you if you start working for an engineering company in the near future?	3.22	0.98
15. To what degree have your "Oral Communication Skills" improved with this ESP course?	3.92	1.21
16. How much importance do you think "Oral Communication Skills" will be given in the event that you start working for an engineering firm in the near future?	4.30	0.60
17. To what degree have your "Written Communication Skills" improved with this ESP course?	3.67	1.34
18. How much importance do you think "Written Communication Skills" will be given in the event that you start working for an engineering firm in the near future?	3.77	1.14
19. How important do you think good "Communication Skills" in English will be for your engineering career?	4.21	0.56
20. How important do you think good "Teamwork in English" will be for your engineering career?	2.81	0.73

Table. 1. Mean scores and variances of the items from the questionnaire

Figures 2 and 3 below show graphically the mean scores and variance scores respectively of the 20 questions the questionnaire contains.

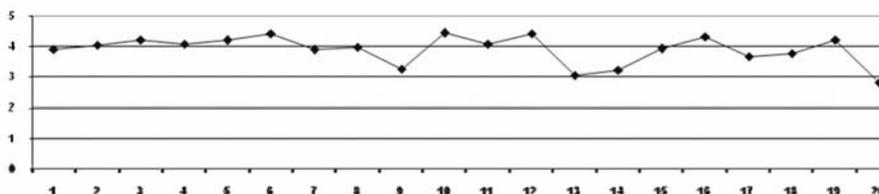


Fig. 2. Graphic representation of mean scores (items from the questionnaire)

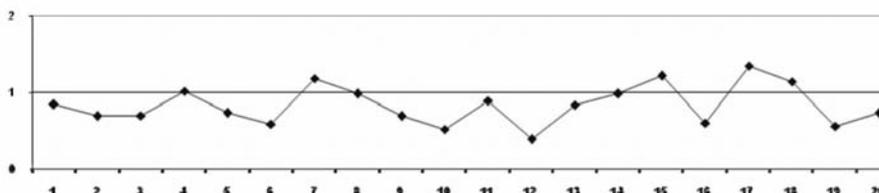


Fig. 3. Graphic representation of variance scores (items from the questionnaire)

As far as the first hypothesis is concerned (“The students will be well aware of the importance of developing teamwork, autonomy in their learning process, and communication skills for their career in engineering?”), the results reflected in Table 1 for items 1, 2, 3, 4, 5, 6, 16, 18 and 19 suggest that the students are aware of the importance of communication skills with reference to both their current language needs and their professional future. In fact, the scores obtained show us that some of the mean values reach remarkably high scores with relatively low

variances [items 6 (4.41 / var 0.59), 16 (4.30 / var 0.60) and 19 (4.21 / var 0.56)], when the results of the whole questionnaire are considered. Moreover, the students consider that “Oral Communication Skills” are more important than “Written Communication Skills” [4.30 / var 0.60 vs. 3.77 / var 1.14]. T-tests analyses were carried out, which demonstrated that those skills developed in the ESP course [$t(29) = 4.036$, $p < 0.001$] and their connection with the students’ future careers [$t(32) = -1.084$, $p < 0.05$] were significantly positive.

On the other hand, and as far as “Autonomy” is concerned, items 9 and 10 show us that students believe that developing autonomy in their own learning process is essential for their future, and these ESP courses have helped them increase somewhat their personal implication in their learning process.

Finally, with respect to teamwork, the opinions of our students keep being steadily favorable [items 11 (4.08 / var 0.89), 12 (4.41 / var 0.39), 14 (3.22 / var 0.98) and 20 (2.81 / var 0.73)]. However, rather surprisingly, item 20 achieves the lowest score of all the items in the questionnaire. In fact, it could be stated that our students consider “Teamwork in English” only relatively important for their career.

For the second hypothesis (“The pedagogic resources used in the ESP courses and the new experience will be accepted as valuable”), the dispersion of scores is higher and some observations should be made:

- 1) The students consider that the educational resources used in the classroom have been adequate and the effort has been worthwhile (items 7, 8, 11, 12, 13, 15 and 17), since the scores range from 3.04 (var 0.83) to 4.41 (var 0.39). Nevertheless, the tasks and assignments given in this ESP course (item 13) seem to be only relatively valid for improving teamwork.
- 2) In terms of ICT (items 7 and 8), the students have not been specially impressed by the equipment used [scores 3.88 (var 1.18) and 3.97 (var 0.98)], probably because they are accustomed to it in other subjects and/or because they belong to the Net Generation (image-rich environments).
- 3) Their autonomy level (item 9) in the acquisition process of the language has not improved extraordinarily [score 3.24 (var 0.69)], probably because it is not common with other subjects at our College.

5. Conclusions

This study was undertaken in the belief that it might help to reach a better understanding of the relevance of ESP courses in connection with communication skills.

Communication skills are recognized as important elements in current engineering education (Davies, 2001; Kniec, 2004). Providing engineers an integral education for a changing world means to create and integrate knowledge beyond the confines of traditional academic disciplines.

During their studies, the students have to present different types of projects, proposals, etc. (common tasks in a company) with the express purpose of obtaining utility goals under a more practical and realistic approach. Then, synergies will be necessary in the usually overloaded curricula of engineers, by integrating those communication skills not as a new subject, but as a necessary element for reinforcing subjects, ESP included, in different contexts.

The first conclusion to be drawn from this study is that oral presentations and report writing help our students to enhance their language learning experiences and to improve their communication skills in general and, particularly, in English. Role-play and simulations let them become accustomed to situations in which they will have to apply their knowledge of English to a labor context where people work and communicate across cultures. Moreover, they will have to develop digital media skills and to be creative and productive users of technologies, particularly to be as literate as possible in ICT.

Another conclusion could be that by making clear our students the professional need of writing well, teaching them the steps to be followed when writing technical reports, and giving them the opportunity of exploring topics with a certain complexity, we will be preparing them for their future and providing them with information they can apply outside academia. In addition, our duties will be more rewarding.

The synergy produced by team work and interdisciplinary collaboration may collaterally improve significantly the communication skills of most students, simply because this approach is based on the needs, preferences, and interests of the students.

Our last conclusion could be that more autonomy and teamwork, and a higher development of their specialization have been achieved at the ITEC of Bilbao. The results of the questionnaire can be described as very promising and show us that we are on the right track. More research work is necessary and if these results are confirmed by other researchers and with larger groups of students, the approach should be adopted in a more structured way together with other techniques currently used in ESP. No doubt, this will help our students become more competent communicators and, subsequently, better engineers.

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Appendix 1

Example of role-play activity put into practice at the ITEC (Bilbao):

“You have been chosen by your firm to technically support its commercial team in an International Exhibition Centre. Your company develops and markets worldwide CNC Turning Centers. The members of the commercial team are experts in commercial aspects (INCOTERMS and the like) and they also have quite a good command of how their machines function. Some representatives (engineers) of prospective customers from Hungary, Bahrain, and South Korea ask for certain technical details your commercial team is unable to fully and successfully provide, despite the fact that excellent manuals accompany each model. You play your role and provide them with the following information in a way that you help them tailor their new machine (a CNC lathe) to their specific needs: 1) Number of tools the lathe can handle simultaneously and their mechanical characteristics; 2) Vibration damping; 3) Rigidity; 4) Surface finishes and accuracy; 5) Index time from a tool to the next; 6) Functional range: manual vs. semi-automatic vs. full automatic vs. full CNC; 7) Travel range; 8) Supporting programs; 9) Workpiece capacities; 10) Horsepower drive systems and rpm range; 11) Possibility of carrying out secondary operations without re-fixtures; 12) Menu of options; 13) Maximum torque capacity; 14) Peak performance; 15) Availability of digital product brochure (view vs. PDF)”

Appendix 2

The following is a summary of an example of simulation for mechanical engineering students from a branch called Industrial Structures:

“You will participate in ‘BEST European Engineering Competition’. The venue will be Warsaw (Poland) and you are expected to: 1) Work in an international team; 2) Compete with other teams; 3) Try to come up with the most ingenious design or idea, the most convincing arguments, or the best negotiation proposal; 4) Find out what your engineering limits are; 5) Test out if you are ready to face the real technical world with its challenges.

Your proposal will consist of the following: *A reinforced concrete hangar design* with these characteristics: 1) To hold up to two planes; 2) Minimum dimensions: 100m x 40m; 3) The planes access the building via two symmetrically positioned doorways (one at the front and one at the back); 4) Engineering and service areas run along the internal side of the hangar; 5) Door openings must be wide enough (double-cantilevered arches built in situ are suggested); 6) Centrally-positioned V-shaped beams are also suggested; 7) Location: Helsinki airport (Finland).

The proposal will include different sections:

- 1) Research work: Do some research about the places where the competition will be held and where the project will be developed. Quote your sources of information. (Emphasis in this section: reading skills).
- 2) Essay writing: Explain your project and justify it (10 pages per team). Focus on grammar issues. (Emphasis in this section: writing skills).
- 3) Drawings and calculations: Any engineering project will include a graphic part so that explaining your proposal to your audience will be easier (Adapted former projects are welcome). Moreover, it will include a budget (with maximum and minimum expected costs), a schedule, a justification for the design chosen (dimensions, materials used, prospective factors affecting the schedule...), and the composition of the design team (each member of the group should participate equally). (Emphasis in this section: speaking skills).
- 4) Résumé: A brief résumé (real or made-up) must be included so that the jury can handle more elements for choosing the best option.

On the other hand, when you listen to members of other groups, you will have to take notes, write comments, ask questions, etc. The emphasis in this case is on listening skills.”

Appendix 3

The following are two examples of report-writing tasks for electronic and mechanical engineering students respectively.

Produce a 5-6 page long technical report:

“Select three thyristor modules from different manufacturers but similar applications, and produce a report for workshop technicians. It must include: 1) Trademarks and models; 2) Mechanical dimensions; 3) Part number identification; 4) Electrical specifications; 5) Mechanical specifications; 6) Advantages and disadvantages of each unit; 7) Danger, if any (specify); 8) Warning (specify, for example –risk of material damage and hot enclosure–); 9) Environmental information; 10) Any other piece of information you consider relevant.”

“Select two welding rods for brazing, two for stainless steel, and two for special alloys, from three different manufacturers, and produce a report for workshop technicians. It must include: 1) Trademarks and references; 2) Tensile strength; 3) Hardness; 4) Types of current; 5) Welding processes; 6) Applications; 7) Positions; 8) Amperages and sizes; 9) Temperature ranges; 10) Any other piece of information you consider relevant.”