HISTORY AND POSTERS: DYNAMIZING ELEMENTS IN THE LEARNING PROCESS AT TELECOMMUNICATION ENGINEERING

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Abstract

The educational innovation project PIE15-63 funded by the Universidad de Málaga is focused on the reinforcement of basic and general competences of the graduate and master students of the School of Telecommunications Engineering (ETSIT). Some of the main activities of this project are: the design of posters, written in English, on evolution and history about the main topics of each subject, the oral presentation of these posters and the exhibition of the best ones on each of the topics.

After two years, this paper describes the results, the interests and the strengthening of the competences of those students involved in this experience. The results show that the students have improved the selected competences and they have improved competences and their abilities to communicate ideas through posters as well as through oral presentations. Generally, students are very satisfied with these innovation activities because their novelty and practical relevance.

Keywords: Telecommunication engineering, Posters, History, Competences, Dynamizing elements.

1 INTRODUCTION

Currently, all the degrees are involved in accreditation processes. These accreditation processes take along the revision of the verification reports of all degrees, which include all the competences that the students must have when they obtain the degree. An important part of the accreditation process is the review of how each competency is obtained and how it is evaluated. The evaluation of specific competences involves some difficulties; however, it is a task well focused on the knowledge of each subject and all teachers have experience in carrying out such assessment [1], [2], [3]. However, the assessment of basic and general competences is often unclear. These competencies are included in all the grades’ subjects, but it is not determined how they should be worked and evaluated.

In this context, the presented educational innovation project (PIE15-63) founded by the Universidad de Málaga is focused on the strengthening of basic and general competences of the undergraduate and master students of the School of Telecommunications Engineering (ETSIT). More specifically, the students involved belong to the following degrees: Graduado en Ingeniería de Sonido e Imagen (GISI), which is a four-year degree and Master en Ingeniería de Telecomunicación (MIT), which is a two-year Master. Both are included in the framework of Signal Theory and Communications and taught by the Department of Communication Engineering of the University of Malaga [4].

The basic and general competences of the undergraduate and master students of the School of Telecommunications Engineering at the Universidad de Málaga, to be reinforced are:

- CB-3: Students have to get the ability to gather and interpret data (usually related to the field of study) to make judgments that include a reflection on social, scientific and/or ethical aspects.
- CB-4: Students have to get the ability of transmitting information, ideas, problems and solutions to both expert and non-expert audiences.
- G-01: Ability to assume a respectful attitude towards fundamental rights and gender equality.
- G-12: Ability to solve problems, decision-making, creativity and to communicate knowledge and skills understanding ethical and professional responsibility of the Telecommunication Engineer.
- G-17: Ability to work in a multidisciplinary group and in a multilingual environment as well as communicate, both in writing and orally, knowledge, procedures, results and ideas related to telecommunications and electronics.
In order to work these competences, the concrete activities that will be carried out in all the subjects involved in this project are:

- The design of posters, written in English on evolution and history about the main topics of each subject. Students will be encouraged to work on issues that include, in some way, fundamental rights and gender equality. With this activity, the competences to be worked are CB3, CB4, G01 y G17.

Specifically, this activity is intended to enhance the capacity to:

- Collect and interpret relevant data to make judgments (CB3 and G12).
- Transmit information to both expert and non-expert audiences (CB4).
- Respect fundamental rights and gender equality (G01).
- Work in a multilingual environment as well as communicate, both in writing and orally, knowledge, procedures, results and ideas related to telecommunications and electronics (G17).

In addition, the activity proposed aims to reinforce a part of the subjects to which students usually pay less attention, which is history and evolution; although the importance of these pieces of knowledge is sometimes diminished, they are often the basis for understanding current technologies and developments.

Also, the organization of an exhibition with the best posters open to the entire university community, encourages the students to achieve better results and more strongly reinforces the development of the competencies CB3, CB4, G01 and G17.

1.1 Objectives
The objectives to be achieved by this project are

- Strengthening the basic and general competences of the undergraduate and master students of the School of Telecommunications Engineering at the Universidad de Málaga.
- Carry out an activity of design of posters, written in English, on topics of evolution and history, related to the subjects of the degree. With this activity, the competences to be worked are CB3, CB4, G01, G12 y G17.
- Organize exhibitions with the best posters of each subject. This is intended to disseminate the activity carried out and to make the entire university community learn new concepts in a simple graphical way. With this activity, the competences to be worked are CB3, CB4, G01 y G17.

1.2 Overview
The paper is structured as follows: section 2 explains the context in which the research is carried out. Section 3 describes the experience, covering all the general aspects our experience is based on, showing how the research is being organized and the tools used to collect the data. Section 4 presents some results obtained. Finally, section 5 outlines the main conclusions.

2 CONTEXT
Students involved in this research, are enrolled in the lectures of the Superior Technical School of Telecommunication Engineering (ETSIT). The students belong to Graduado en Ingeniería de Sonido e Imagen (GISI), which is a four-year degree and Master en Ingeniería de Telecomunicación (MIT), which is a two-year Master. Both are included in the framework of Signal Theory and Communications and taught by the Department of Communication Engineering of the University of Malaga [3], [4].

**Table 1.** Reference subjects of educational innovation project PIE15-63 of Graduado en Ingeniería de Sonido e Imagen.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Audio Basics</th>
</tr>
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<tbody>
<tr>
<td>Year / Semester</td>
<td>3º Year / 1º Semester</td>
</tr>
<tr>
<td>Type / Amount of credits</td>
<td>Compulsory / 6</td>
</tr>
<tr>
<td>Enrolled</td>
<td>23</td>
</tr>
</tbody>
</table>
This paper presents the results of applying the strategies above mentioned on 5 subjects corresponding to 5 different groups of students. Thus, we cover all the academic courses (2) of Master en Ingeniería de Telecomunicación and the two last years of the Graduado en Ingeniería de Sonido e Imagen. The total number of students considered in this study rises to 85 enrolled.

Table 1 details the characteristics of the subjects under study in Graduado en Ingeniería de Sonido e Imagen. In Table 2, the characteristics of subjects of Master en Ingeniería de Telecomunicación are presented.

### EXPERIENCE DESCRIPTION

#### 3.1 General aspects of the experience

The aspects involved in this study are focused on the strengthening of the following competences:

- Collect and interpret relevant data to make judgments (CB3 and G12).
- Transmit information to both expert and non-expert audiences (CB4).
- Respect fundamental rights and gender equality (G01).
- Work in a multilingual environment as well as communicate, both in writing and orally, knowledge, procedures, results and ideas related to telecommunications and electronics (G17).

The activities developed to strengthening the selected competences are:

- The design of posters, written in English on evolution and history about the main topics of each subject.
- Oral presentation of these posters in each subject.
- Exhibition with the posters that can be visited by the university community.
3.2 Experience organization

Each teacher, according to the characteristics of the corresponding lecture, has planned the kind and number of posters considered suitable.

During the semester, several meetings have been planned to discuss about thematic and design of the posters and the oral presentation. At the end of the semester, the oral presentation of the posters in each subject is performed. As well as, at the end of the second semester an exhibition of the best posters of each subject are organized.

Also, data for every subject are collected by means of a survey of the participant students (section 3.3) as well as by means of interviews with the teacher that participate in the experience.

3.3 Collecting data tool

The main results presented in this paper are based mainly on the analysis of data obtained from a survey of students from the School of Telecommunications Engineering, enrolled in the subjects shown in Tables 1 and 2.

The survey is developed by means of a questionnaire of 3 items. It is designed to get information about the strengthening of the basic and general competences by means of the main activities of this project: design of posters and its oral presentation.

They anonymous questionnaire begins with the following general data:

- Degree, in which the students are enrolled.
- Subject, in which the questionnaire is passed.
- Year, in which the subject is coursed.
- Age.
- Gender.
- Time (in years) enrolled in ETSIT.

The 3 items are described in table 3.

### Table 3. Questionnaire used as collecting data tool.

Rate the compliance of the following questions from 1 to 5, with 1 not having fulfilled anything and 5 having totally fulfilled.

1. The design of posters, written in English, have strengthening the capacity of:

<table>
<thead>
<tr>
<th>Items</th>
<th>Assessment (1 to 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) To gather and interpret data (usually related to the field of study) to make judgments that include a reflection on social, scientific and/or ethical aspects.</td>
<td></td>
</tr>
<tr>
<td>b) To transmitting information, ideas, problems and solutions to both expert and non-expert audiences.</td>
<td></td>
</tr>
<tr>
<td>c) To assume a respectful attitude towards fundamental rights and gender equality.</td>
<td></td>
</tr>
<tr>
<td>d) To work in a multilingual environment as well as communicate, both in writing and orally, knowledge, procedures, results and ideas related to telecommunications and electronics.</td>
<td></td>
</tr>
<tr>
<td>e) To strengthen the knowledge and evolution of current technologies and developments.</td>
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What would you do to strengthen the previous capacities from the design the posters in English?

What other activities could be done in class to enhance theses capacities, related to the writing of posters or documents?
2. The oral presentation of theses posters, have strengthening the capacity of:

<table>
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</thead>
<tbody>
<tr>
<td>a) To gather and interpret data (usually related to the field of study) to make judgments that include a reflection on social, scientific and/or ethical aspects.</td>
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<td></td>
</tr>
<tr>
<td>e) To strengthen the knowledge and evolution of current technologies and developments.</td>
<td></td>
</tr>
</tbody>
</table>

What would you do to strengthen the previous capacities from the oral presentation of the posters?
What other activities could be done in class to enhance theses capacities, related to oral presentation of posters or documents?

3. Comments about the questionnaire.

4 RESULTS

The results discussed in this section are collected by the data forms and by the conclusions stated in the meetings of this educational project.

The average age of the student participants in this study are 21 years and a man-woman distribution 90%-10%, which corresponds to the usual distribution of students in the School of Telecommunications. The average years enrolled in ETSIT are 4 years.

Fig. 1 shows the average assessment of the capacities developed in the design of posters, written in English. In Fig. 2, the average assessment of the capacities developed in the oral presentation of the posters are presented. Fig. 3 and Fig. 4, show, respectively, new actions and new activities proposed by the student to improve the capacities worked in the proposed activities.

Figure 1. Design of posters, written in English, average assessment of the capacities:

   a) To gather and interpret data to make judgments that include a reflection on social, scientific and/or ethical aspects.
   b) To transmit information, ideas, problems and solutions to both expert and non-expert audiences.
   c) To assume a respectful attitude towards fundamental rights and gender equality.
   d) To work in a multilingual environment as well as communicate, both in writing and orally, knowledge, procedures, results and ideas related to telecommunications and electronics.
   e) To strengthen the knowledge and evolution of current technologies and developments.

Comparing results in Fig. 1 and Fig. 2, it can be observed that the design of posters has better assessment in all the capacities that the oral presentation of posters. However, several of the new actions and new activities, presented in Fig. 3 and Fig. 4, are related to improve and practice more oral presentations. This assertion coincides with the fact that the students recognize they are afraid to look ridiculous.
The most valued capacity is the strengthening the knowledge and evolution of current technologies and developments in the design of posters (Fig. 1). It can be related to the fact that the main objective of the design a poster is the study of a technology, and the students usually perform this task in several subject.

The worst rated capacity is the assuming a respectful attitude towards fundaments rights and gender equality. This is because thematic of posters and oral presentations as well as the subject are not related at all with this capacity. However, new actions and activities proposed by students include (Fig. 3 and Fig. 4) ideas to improve it.

Attention must be paid on the best value capacity in design of posters in comparison with the best value capacity in oral presentation. In the design of posters, the best value capacity is c) to work in multilingual environment while, in the oral presentation is b) to transmit information. This is because the design of posters is made in English (multilingual environment) and the students perceive an oral presentation as system to transmit information to other students.

In general, after evaluate the question 3 of the collecting data tool (comments about the questionnaire) and the interviews with students and teachers, the valuation of the activities proposed in this innovation project are positive and the student participation is high. Also, it can be said that the students have improved the selected competences (the average assessment of all the capacities is above 3).

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**Figure 2. Oral presentation of the posters, average assessment of the capacities:**

a) To gather and interpret data to make judgments that include a reflection on social, scientific and/or ethical aspects.

b) To transmit information, ideas, problems and solutions to both expert and non-expert audiences.

c) To assume a respectful attitude towards fundamental rights and gender equality.

d) To work in a multilingual environment as well as communicate, both in writing and orally, knowledge, procedures, results and ideas related to telecommunications and electronics.

e) To strengthen the knowledge and evolution of current technologies and developments.
a) Design of posters, written in English.

- More open theme not only history evolution.
- Work in groups of ten people.
- Select a different theme for each poster.
- Design posters about women in science.
- Make the working groups of men and women.

b) Oral presentation of posters.

- Invite to the oral presentation of posters students of other courses.
- Select a poster of each topic to present.
- Present the poster in English.
- Improve attendee participation.

Figure 3. Actions proposed by the students to improve the capacities worked in these activities related a) Design of posters, written in English, b) Oral presentation of the posters.

c) Design of posters, written in English.

- Analysis of commercial equipment and market studies.
- Posters on research in topics of general culture related to engineering.
- Organize oral communication techniques course.
- Attend lectures in English of subjects on which to realize the poster.
- Expositions with real elements of each technology.
- Discuss specific topics in the classroom.
- Reading articles in English.
- Writing exercises in English.

d) Oral presentation of posters.

- Excursions to sites related to the degree.
- Perform the oral presentation in English.
- Make more oral presentation.
- Make student expose part of the subject.
- Resolution and explanation of problems on the board by students.

Figure 4. Activities proposed by the students to enhance these capacities related a) Design of posters, written in English, b) Oral presentation of the posters.

5 CONCLUSIONS

In this paper, the educational innovation project PIE16-63 funded by the “Universidad de Málaga” and the results obtained, are presented. This project is focused on the strengthening of basic and general competences of the undergraduate and master students of the School of Telecommunications Engineering (ETSIT). Some of the main activities of this project are: the design of posters, written in English on evolution and history about the main topics of each subject and oral presentation of these posters in each subject and exhibition of the best posters of each subject.

The main conclusions of this study are:

- The design of posters has better assessment in all the capacities that the oral presentation of posters. The students feel more comfortable preparing a document that performing an oral presentation.
• The most valued capacity is the strengthening the knowledge and evolution of current technologies and developments in the design of posters. It can be related to the fact that the main objective of the design a poster is the study of a technology, and the students usually perform this task in several subject.

• The worst rated capacity is the assuming a respectful attitude towards fundaments rights and gender equality. This is because thematic of posters and oral presentations as well as the subject are not related at all with this capacity. However, new actions and activities proposed by student include ideas to improve it.

• The results show that the students have improved the selected competences. Also, they have improved their abilities to communicate ideas through posters as well as through oral presentations.

• Generally, students are very satisfied with the innovation project because the proposed activities are novel and with practical relevance.

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