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An initiative to improve oral and written skills of Engineering Students

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Abstract

In this paper, we describe some activities to develop to written and oral skills in students of Degree in Electrical and Electronics Engineering in the School of Industrial Engineering in Toledo. Among these activities, we have designed a workshop, included in welcome activities of the school, for first year students and two learning activities included in chemistry module. In the workshop, we explained the key points to consider when an oral or written presentation is prepared. Moreover, we tried to make conscious to our students of the importance of the development of written and oral skills. In addition, we have designed an assessment method for oral skills and other skills like critical thinking in the chemistry module, though an exercise that combines conventional evaluation with peer evaluation. As part of this work, an assessment rubric has been developed to mark oral presentations.

Keywords

Oral and written skills, workshop, oral presentation assessment, critical thinking, peer evaluation.

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1. Introduction

This work has been carried out during the last two academic years (2011-12 and 2013-13) in the School of Engineering in Toledo (University of Castilla la Mancha). This school has been teaching technical engineers for close to thirty years, until the academic year 2010-11, when the new bachelors´ degrees (ECTS credits) were introduced. Nowadays, we offer two bachelors´ degrees programmes: Electrical Engineering and Electronics and Automatic Engineering.

To study in our school the student do not require any minimum grade in their previous studies and moreover, we have a significant number of students who join us after taking the University Entry Exams ("PAU") in September, or after finishing his/her advanced vocational education. From the first moment, we detected important limitations in most of our students to express their ideas orally and in written form. For example, when marking exams or homework, it is evident that they have important difficulties to express in writing their knowledge, and these difficulties are even more important when they have to express something orally. In a vast majority of our students, we have detected that public speaking is something that they do not feel able to do. At the same time, and for different reasons that are not explained here, our students do not consider it important to express in a precise and correct form, when they are speaking or writing. It would be really ambitious to claim that with this initiative all the previously described problems would be solved completely, since we are dealing with a really complex problem. However, we want at least, to try to make students conscious that they have a problem that at some point they must face.

Taking into account these premises and being realistic, our main goal is to call attention to the huge importance of being able to express themselves correctly in writing and

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orally, and to show how improving these skills will help them attain their short and long term objectives. At present, the students will have to make exams and homework, prepare laboratory notebooks, make oral presentations, and defend their ideas in group debates, etc. In the long term, when they have to prepare and present their final year dissertation, or in their professional life they will have to present a project or report and defend it in public, not having good communication skills will be limiting.

The last figures available about the professional profile of our students are the ones published by Universidad de Castilla La Mancha in the year 2010 (UCLM, 2010). In this survey, it was shown that more than 85% of our students were working. The professional sectors more important were building with 10.35%, services (to other businesses, public services, administration, etc,) with a 62.07% and different branches of industrial sector with a 20%. Most of the questioned students claimed to have a job with an important level of responsibilities and be well adapted to their formative profile. A relevant piece of information obtained for this study highlighted in this survey is that 60% of surveyed students consider that public speaking and to defence their ideas is very important.

Our curriculum includes the development of written and oral skills. These two skills are included as transversal skills to develop in most of the modules of engineering curriculum (A4: To be able to transmit information, ideas, problems and solution for a public both specialized and not specialized). (UCLM, 2010b).

In the academic year 2011-12 we decided to teach a workshop about oral and written skills as part of Welcome Activities for students of first year (Romero, 2012). In this workshop we practiced writing scientific and technical documents and making oral presentation in public. Moreover, during this academic year, in the module of chemistry

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we included a component of assessment (laboratory classes) to assess oral skills. As it was the first try, the contribution of this assessment was minor, but it was useful to detect that this skill is not developed in general in our students, and even less when they have to explain technical or scientific concepts. This exercise was useful as starting point to develop a better method to introduce oral skills as part of the teaching and assessment methods in the module of chemistry for upcoming years.

2. A description of teaching tools used to develop oral and written skills

2.1. Oral and written skills Workshop

To organize this workshop we searched in the literature to try to find similar workshops. Most of the previous literature was about workshops for students in degrees like law, psychology, etc. (Universidad Nacional de la Loja, 2011; Gallardo, 2006). Additionally, we knew that there was, in our own university, an optional module for students in their last year of Civil Engineering called "Oral skills" (UCLM, 2011). All available resources were very general and lengthy. We tried to summarize some of main aspects and highlight in those related to write and speak correctly at scientific and technical level.

Our workshop was taught in sessions of three hours, and it was structured in three parts: (1) Introduction (30 min); (2) Written Skills (90 min) and (3) Oral skills (60 min). The contents of each part are related below.

In the first part of this workshop, we did an introduction and set the main objectives of this workshop, i.e.: to make our students conscious of the importance of expressing

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themselves correctly both orally and in writing, and to show how to structure an oral presentation or a written report, in an academic or professional environment.

We started with a simple exercise. We proposed to our students to write an email to their mathematics lecturer asking for an extension and after that, we selected some of these emails and we commented on them.

We mentioned orthographic and syntactic mistakes, confusing or incorrect sentences, and problems of "laismo" (a grammatical mistake where "la" is used when it should not be used) that are very common in Toledo. Usually, we heard justifications such as that they had written in a rush, that for formal homework they would have taken more care, etc. Nevertheless, we tried to make them understand that this is not true, that when someone knows how to use the language correctly, he/she will do it in a natural and unconscious way in any situation. After that, we showed them a couple of written exams of the same module, one really well presented, and another one with a very bad presentation, but both similar from technical point of view. We highlighted the aspects that we considered when we marked both exams (clarity, tidiness, correction in the exposition of ideas, etc.). Our students need to understand that a clear, tidy and correct exposition of arguments is an important factor to consider when they are marked in a written exam.

In the second part of the workshop, we dealt with aspects related to written skills and we started talking about plagiarism. This is a criminal offence, but in our country, it is fair to admit that there is almost a complete absence of social consciousness about it. To assure that they know what plagiarism is, we did a group activity where we described a series of situations that students in groups need to classify as plagiarism, absence of plagiarism or bad academic practice. After that, we proposed an activity where they had

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to paraphrase, and we showed them different styles for references and citations. Then, we explained to them, the basic rules of a written presentation, focusing in how to write a good laboratory notebook, essay, etc. We commented on the structure and format for this kind of homework, and explained in detail how they have to make graphs and tables in these written documents. We concluded this part of the workshop by making reference to their most common mistakes (they can use this list as "check list"): (1) inappropriate use of capital letters; (2) use of acronyms without defining them; (3) grammar mistakes in concordance; (4) lack or inappropriate use of punctuation; (5) orthographic mistakes; (6) inappropriate use of inverted commas; (7) not using paragraphs to separate text; (8) mistakes or absence of citation and plagiarism; (9) lack of use of scientific language, using slang, etc.

In the third part, we dealt with aspects related to oral skills. We began by showing them some videos where we wanted to mark clearly the difference between a good and bad speaker. Just after that, we invited them to do a test to try to measure their skills as a speaker. This test is based in the one developed by B. Gallardo Pauls (Gallardo, 2006). The objective of this part of the workshop is that students understand the keys to make a good oral presentation. From our point of view such keys are the following: (1) to know properly the topic you are going to talk about; (2) to structure the presentation in an appropriate way; (3) to know the audience you are going to make the presentation, and to make an entertaining presentation; (4) to speak in fluid way, trying to vocalize, using voice intensity to call attention of the public when necessary and using a rich vocabulary; (5) using paralinguistic complements like body language and humour but always in an intelligent and moderate way; (6) to use resources such as power point presentation with graphs, figures, photos, etc.; (7) to repeat the presentation alone or

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preferable with someone before to overcome stage fright and to be sure the presentation sticks to time limit. Moreover, we noted them that the oral presentation can change depending on the type, although scientific oral presentations are normally structure in the following parts: introduction, experimental procedure or method, results, discussion, conclusions and future work. Acknowledgements can be made at the beginning or the end of the presentation.

Finally, we proposed that they individually prepare at home an oral presentation to be recorded with a webcam and to send it via "Moodle" (UCLM virtual learning platform) for us to give them feedback. The topic for this presentation was "Why do I want to be an engineer?"

2.2. Activities in the module "chemistry"

Chemistry is a basic module of 6 ECTS credits that is taught in the semester of the first year of Degree in Electrical and Electronics Engineering (UCLM, 2010b). In the academic year 2011-12, the assessment method with the weight of each component was the following: written exam (70%), homework that included solving chemistry problems (20%) and laboratory work (10%). In this academic year, 2012-13, the assessment component where students have to submit their homework has been eliminated and we have introduced a compulsory new evaluation method to promote development of oral skills between our students, and additionally we have modified the weight of each assessment component. Now the written exam contributes 80% to the final mark, 10% comes from laboratory work and another 10% from an oral presentation. This new assessment component has been developed as described below.

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2.2.1. Laboratory classes

The students attended laboratory classes for two hours every two weeks. Before starting laboratory work, they had to make an oral exam, where they have to answer, in couples, a series of questions that the lecturer asked related to the practical work that they have to do in this session. In the academic year 2012-2013, it was highlighted by the lecturer that students would be assessed not only by their chemical knowledge, but as well for their ability to express their knowledge in a correct, exact and scientific way. This activity took about five-ten minutes per couple at the start of the session but the contact between students and lecturer continued during the rest of the session where the lecturer continues asking questions related to what exactly the students were doing in this moment in the laboratory. The objective of continuing with this exercise during the whole length of the session was to make the students avoid using slang for the entire session. They knew they were assessed continuously, so they had to be careful with the kind of language they were using.

We need to clarify that the final mark in the laboratory classes, although conditioned by the oral skills, in a large extent was determined by the theoretical-practical knowledge of the student about the laboratory work they had to carry out. However, we propitiated the environment for students to realize their limitations when they have to use technical/scientific language: lecturers observed a consistent improvement in the use of this kind of language during the semester for some students, but not for all of them. It was detected that students coming from vocational training had more limitations in using technical/scientific language.

In the last laboratory session (6 sessions in total) the students worked in groups of ten. A project learning approach was used (Galeana, 2006) where, instead of providing in

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advance a detail descriptive protocol for the laboratory work, as it has happened in previous sessions, we only gave them a description of the objective to achieve (to demonstrate Faraday law). We gave to them a series of laboratory material that they would need to demonstrate this law, and additionally we gave them some advice on how to organize their work. We told them that they had to assume that the team was a small business (with sub-teams) and they have to try to divide the tasks to be sure they can achieve the general objective. After that, we asked them to start working independently from the teacher (they could not ask questions). The teacher only helped them, once they have arranged themselves to carry on the practical work.

This experience was described by the participants as fun and didactic, except by one team (from the five formed teams) that could not work together and consequently, could not achieve the objective.

From an oral skills point of view, this last activity allowed teacher to establish definitely the level that students had reached using technical/scientific language, especially in those students that worked in the team as leaders. However, it was just a formative assessment since this exercise did not count for the laboratory mark.

In the surveys carried out by the students of this module, we observed that although some students think that this type of exercises are stressful, most of them think that these types of teaching techniques are more effective for improving their learning experience.

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2.2.2. Oral presentation in small groups

Taking advantage of the fact that the last two units in chemistry module are very descriptive ("Module 12. Basics of Inorganic Chemistry" and "Module 13. Introduction to carbon chemistry"), we thought that it would be interesting to ask students to prepare an oral presentation about these topics, and make this part of the module more entertaining. In the academic year 2011-12, it was not compulsory to make such an oral presentation, as the students could choose between making it or handing in homework. Most of the students chose the second option. Probably, they thought it was easier, and they were used to that. However, six students decided to be assessed by an oral presentation.

Having such a low number of students making the oral presentation, was really positive, since it allowed us to learn from this experience to prepare this exercise to make it compulsory in the following academic year. Moreover, it allowed us to check how good our assessment rubric was. We made a unique group, and each student worked individually. We invited the rest of students to come to listen their classmates and give them feedback. The experience was especially interesting due to the reduced number of speakers, it was possible to provide them a detailed "feedback" by students and the lecturer, and they thought it was especially useful to improve their future oral presentations. After this first experience, in the following academic year 2012-13, it was decided that oral presentations are the only option to assess the last two units. Moreover, we promoted group work by allowing oral presentations to be done in groups of four students instead of individually. In this way, tutorial groups of eight students were formed (two groups) and each group had to expose one of the two units. It was highlighted to the students to avoid content overlapping in each group and to show that

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they had worked in a coordinate group. To ensure that, the mark of each student was individual, but 20% of it was determined by group work (see assessment rubric in Figure 1).

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ORAL PRESENTATION FEEDBACK								
Name of speaker:								
Title of presentation:								
Group of speaker:								
Reviewer name:								
Group of reviewer:								
	"10-9"	"8-7"	7-5,5	5,5-4,5	4,5-3	3-0		
(Write the mark in figures)								
Delivery (25%):								COMMENTS
Correct pace							Pace too slow/fast	
Audible							Unloud	
Held atention/interesting							Boring	
Enthusiastic							Bored	
Appropiate body language							Absence of body language and not appropiate body language	
Content (40%):								
Structure well organized							Structure uncleared organized	
Appropiated use of examples/ilustrations							No use of examples/illustration	
Creative and original							Unimaginative	
Completely relevant							Wandered off the point	
Factually accurate							Generally inaccurate information	
Visual aids(5%):								
Very clear and well structured							Unclear and withouth a clear structure	
Well handled							Poorly handled	
Answering questions (10%):								
Very clear							Answer difficult to understand	
Student has used dialectic to answer question in a way that public thinks he has done right							Student has said "I don´t know"	
Right answer							Wrong answer	
Teamwork (20%):								
Welll co-ordinated							Badly co-ordinated	
No content overlapping							There are clear overlappping	
General comments								
Final mark								

Figure 1. Oral presentation assestment rubric used in the academic year 2012-13

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The objectives of this activity were the following: (1) to develop skill of speaking in public, (2) to develop research skills and be able to summarize and explain their findings to their classmates; (3) to develop critical thinking skills; (4) to develop the skills to work as part of a team; (5) to learn about industrial applications and natural resources of organic and inorganic chemical compounds; and (6) to learn how to teach classmates.

The bibliography to use in this activity could be any general chemistry book or reliable sources of information on the web. In 2012-13, we used the assessment rubric developed in the previous academic year taking into account that this year rubric was the only way student could get feedback (it was not possible to give oral feedback after presentations due to the large number of students), and including group work assessment criteria. In the development of the rubric, we had to define indicators in a way that were clear enough for students, and that the content of the talk, and not just how student present information were assessed. It had five components with different weights: delivery (25%), content (40%); visual aids (5%); answering questions (10%) and teamwork (20%). The rubric was made in an excel file to make it easy to use for students, and it was available for students well in advance.

About 50% of the students who did the written exam took part in oral presentations. The rest decided not to make such a presentation although this meant that they were losing one point over ten, in their final mark in this module.

The final mark in this activity was weighted as follows: 70% mark given by lecturer, 20% from the averaged of all classmate marks given to the presenters, and 10% depending on the agreement of their marks in relation to lecturer mark when they were assessing their classmates. We understood that with this weighting, apart from

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promoting group work and the development of oral skills, we worked in the development of critical thinking and on how to accept criticism.

In consequence, the evaluation procedure was a combination of peer evaluation and conventional assessment by the lecturer, and it is fair to say that students were quite suspicious about fairness of this evaluation procedure. This small problem was sorted out demonstrating to them that really they are as good judge as lecturer is. Moreover, we highlighted to them that 20% of their mark depends on how well they have assessed their classmates. Consequently, their classmates, if they want to have a good mark themselves, need to mark him/her well. This method solved the typical problem in peer evaluation of producing excessive high marks (Lu and Bo, 2007).

3. Obtained results

Students' feedback in these activities was obtained using a Moodle survey and asking direct questions face to face to students. Oral feedback obtained immediately after the written and oral skills workshop, showed students considered very interesting the recommendations given about how to improve their oral and written skills, and they valued very positively their participation in the activities included in the workshop. In relation to plagiarism, they thought the lesson was too long, but apart from that, they did not mention any other negative aspect about the workshop.

In the feedback obtained via Moodle survey, carried out at the end of first semester related to oral and written skills workshop, more than 90% of the surveyed students thought this workshop was useful to prepare their laboratory notebooks and essays, and in particular, in the preparation of the oral presentation they carried out in chemistry.

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Again, they proposed to reduce the extent related to plagiarism to promote more practical exercises to improve in how they speak and write.

The marks obtained in chemistry oral presentations ranged from 5 to 9.5, with an average of 7.5. From our point of view, this result is quite positive; that is, the students got involved, and all of them passed, but we cannot forget that only 50% of the students made oral presentation. The rest of the students decided not participate in this assessed activity, and 5% of these students confessed, that their reason for not making the oral presentation was their stage fright.

Moreover, we need to highlight that the students, in general, marked quite well their classmates, except in some punctual case where lecturer had to apply a correction factor to a student who has been marked very low by their mates.

12.5% of surveyed students claimed that oral expositions in chemistry were the teaching activities most useful to learn from all activities carried out in all modules during their first semester, and 37.5% of them thought that about laboratory classes.

Students also claimed they needed ten hours of preparations for their oral presentations, while lecturers estimated they would only need three hours.

Moodle feedback, in relation to oral presentation, was quite positive and students asked to have more topics to choose for their oral presentations. The students think that this kind of activity is really formative and rewarding activity, but more topics related to unit 12 and 13 should be included as options.

The conclusion from lecturers, involved in chemistry oral presentations, was that although students have made important advances in their use of scientific/technical

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languages in relation of their skills at the beginning of semester, there was still a need for improvement there.

4. Future work and links with other modules in higher levels

The oral and written skills workshop will be held again during the academic year 2013-14, and after this study, some modifications will be done considering both lecturers and students´ opinions. The most important changes proposed are the following: (1) to divide the workshop in 2 workshops of 1.5 h each, one about oral skills and another one about written skills, held on different days; (2) to reduce the lesson related to plagiarism; (4) to introduce a practical exercise in the oral skills workshop where students have to prepare a small presentation in advance; (4) to focus more time on the use of technical/scientific language or make students more aware of the importance of this skill.

In chemistry, we will continue with oral exams in laboratory classes and oral presentations assessment, but with small modifications in the rubric. Additionally, we will include more topics for the presentations but always related with organic and inorganic chemistry. E.g., a possible topic for next year would be “Why are isomers important for life?”

We are studying possibilities to introduce more activities to promote oral skills in other modules of the second semester in the first and consecutive years of these degrees. For example, in the module of “Environmental Technologies” (first year, second semester), we have included an oral exam in laboratory work, too, or in other modules like “Renewable Energies” (third year Electrical Engineer Degree), students have to make

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oral presentations and they are thinking about modifying the rubric presented in Figure 1. In addition, a rubric is currently being developed in our school to mark final year dissertations when they are presented orally.

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