

TEACHING IN ENGLISH “MANUFACTURING SYSTEMS” TO STUDENTS WHOSE MOTHER TONGUE IS NOT ENGLISH

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Abstract. All along this paper, I will try to put into words the impressions collected about my lectures during the last academic course. For the first time I have lectured in English, which is not quite usual in my town as English is neither my mother tongue nor of the students attending to my lectures. Therefore, we have made use of a widely-spread language along the world to teach/learn a subject in English which has nothing to do with English philology, but with a field of engineering, more specifically with the Manufacturing Systems. To prepare myself before marking the beginning of this journey towards quality applied to technical teaching, I have attended to different courses to improve in my speaking in English in public, to learn how to write papers in English, and how to organise a presentation for different kind of listeners. To sum up, I have tried to do my best to make the students feel motivated to learn something in English without going to a University abroad, which is not perhaps a possibility for everybody even nowadays. With that aim, apart from the common theoretical lectures where the teacher speaks and the students listen quietly, I have used different media to complement the teaching. In one hand, I have used videos in English so that the students can make themselves familiar with the listening abilities and can visualise the manufacturing process that we are explaining in that moment in the theoretical lectures. In the other hand, I have organised visits to a pair of Manufacturing Companies in the surroundings of our town, so that the students can feel in person how it is the real Manufacturing world. Also, the students have developed their abilities in speaking in English technical vocabulary by preparing in pairs presentations in the lectures. To finish, apart from the theoretical learning the students have been provided with a practical learning, where they have experienced to programme in CNC language with the assistance of a simulator on a computer of what is a turning process and a milling process. Afterwards, they have seen the simulated work pieces being machined in a real lathe and in a real milling machine in our laboratory of machine-tools in the University College.

Keywords: quality, teaching, technology, engineering, manufacturing systems

1. Introduction

For the first time I have lectured in English, which is not quite usual in my town as English is neither my mother tongue nor of the students attending to my lectures. So we have made use of a widely-spread language along the world to teach/learn a subject in English which has nothing to do with English philology, but with a field of engineering, more specifically with the Manufacturing systems.

In our University College we are trying to apply more and more new technologies to the teaching field with the aim of acquiring higher Quality in the teaching system. Thus, we expect to prepare our students more properly according to the european criteria for being suitable for the working-market. Soon we are also going to introduce into our teaching/learning system new study-plans based on the Bologna Process and we hope that it will help our students to open their minds towards the possibility of completing their

studies with a semester abroad in other Universities of Europe or even going to other countries to look for a job as engineers. It is quite a hard work to achieve such an objective as in Spain it is very common not to move from your country unless you go on holidays. That is the reason why people do not use commonly English to communicate themselves. Therefore, that is our first objective, that is, to improve the Quality in our Teaching System in Engineering.

2. Theoretical lectures

2.1. Topics on Manufacturing Systems

The most important part of our teaching system consists on lecturing topics to big groups of students, in our case the different manufacturing systems from machine-tool systems, going through metrology, casting, sintering, plastic shaping, welding and to manufacturing processes by material supply, and that is what we call the *magisterial* lectures.

Apart from this kind of lectures, we also have the *seminars*, which consist on lecturing to small groups of students and the interaction between lecturer and student is supposedly higher.

When we want the students to get more a practical knowledge on the subject, we can apply the *Practices in Classroom*, the *Practices in Laboratory* or the *Practices with Computer* according to the nature of the subject.

What I have done is to use and combine a bit of each type of lecturing system to take a global profit on the part of the students.

As I have already explained in the abstract, I have used mainly the theoretical lectures to explain the different manufacturing systems that we can find in an industrial company. In this part of the subject, students have gained on specific vocabulary to use in manufacturing systems in detail and in industrial technologies in general.

As I have never done this before, I tried to prepare myself by assisting to different courses. One of them for example was *English for improving your scientific-technical writings and presentations*, whose aim was to prepare more clearly the documentation for a paper or for a presentation of certain groups of people, by giving some advices or tips.

Then I also attended another course for *Preparing the teaching plan under ECTS criteria*, for having a bit more clear how to prepare a course under the new credit-system that we are going to apply from next year and onwards. This course was in Spanish, one of my mother tongues.

Then, before beginning with the lecturing of the Manufacturing Systems course in English, I also sat another brief course about *Teaching your subject in English*, which was organised by our University, the University of the Basque Country, who every year offers this course to lecturers that are going to begin lecturing in English. They give you some tips on pronunciation and accent.

And just to mention another of the courses attended with the objective to improve my English and my lecturing in this language, there is another course named *Workshop for improving scientific and technical communications skills in English*. It can be said that this time the participants to this course had to present one presentation in class and make the tasks of the chairman to another fellow's presentation, as if it was a real conference. Thus, I have tried to gain enough ease to feel myself confident to offer this subject in English in our University College. It has been the first subject,

together with another subject named after “Fundamentals of Computer Science”, lectured in English in the history of our University College of Engineering of Vitoria.

2.2. Presentations during lectures

From time to time students had to prepare presentations to defend during the lectures. They worked in pairs and they had to use different sources to find the information to expose in the lectures to the other students and to me.

The aim was that they get used to look for information in the internet, looking for catalogues, or in companies, so that they were able to explain the manufacturing system to achieve a final work piece. Thus, complementing the theoretical content studied by my magisterials.

3. Videos on manufacturing systems

I have found that sometimes it is difficult for a student to understand a manufacturing system only with the theoretical explanation given during a lecture. Therefore, in some of the lectures I had played some videos spoken in English for the students to get used to the sound of the Language. There, the manufacturing systems defined in theory appeared in images making clearer how it worked.



Figure 1. www.mechanicalengineering.tv

To this point, we have experienced theoretical lectures, practical expositions during lectures, videos for a better understanding of the theory, and we have two more facts to analyse yet.

4. Visiting Manufacturing Companies

Twice in the semester we visit a company; last semester we visited Tubos Reunidos, s.a., which makes seamless steel tubes, pipes and tubular products for diverse destinies as for example petrochemicals by continuous casting, a drilling and a later sinking milling with drawing. To finish with the process they add a surface finishing.



Figure 2. Tubos Reunidos, s.a. / Talgo / Biennial of Machine-Tools in the Bilbao Exhibition Centre

We also visited a second manufacturing company named after Talgo. It is a part of the bigger company Renfe which basically manufactures trains, narrow-railway or high-speed rail. There they explained to the students how they work with aluminium to complete the frame and all the extruded parts and how they weld every part.

The idea is alternatively to visit manufacturing companies and the Machine-Tool Biennial organized in the city of Barakaldo in the nearness of Bilbao. That means that this year we will visit the Biennial of Barakaldo so the students will see in situ real machine-tools and other machines. In these kinds of trade fairs some machines are exposed open, and the students can see the inside of the machines. And by the way, can make themselves familiar to the names of some of the exposing manufacturing companies. One of the most important facts is that there are not only Basque manufacturing companies, but also those from other countries.

5. Practices

5.1. Simulation of two manufacturing systems

In our department of Mechanical Engineering in the University College of Engineering of Vitoria, we use a simulator for the computer called WinUnisoft which helps us programming in CNC the programs for work pieces for a Lathe and for a Milling-Machine. Thus our students can write the programs and see on the screen of the computer how will get the final work piece.

In this subject, we explain the program for two work pieces for the Lathe and then we explain the program for another two work pieces for the Milling-machine.

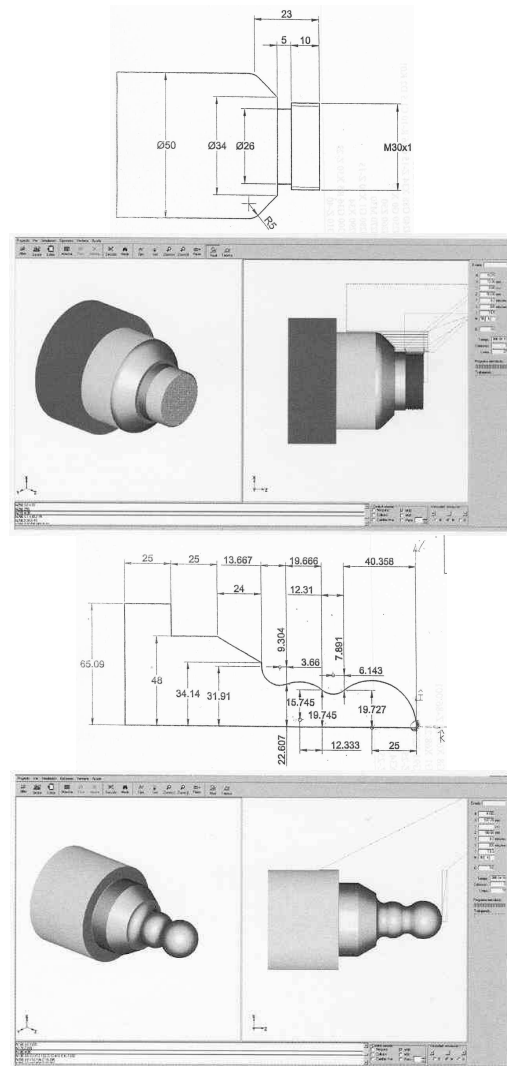
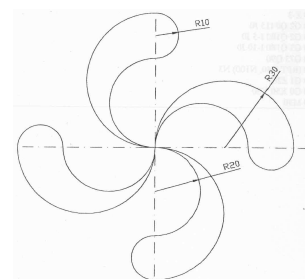


Figure 3. CNC programmed work pieces for the lathe



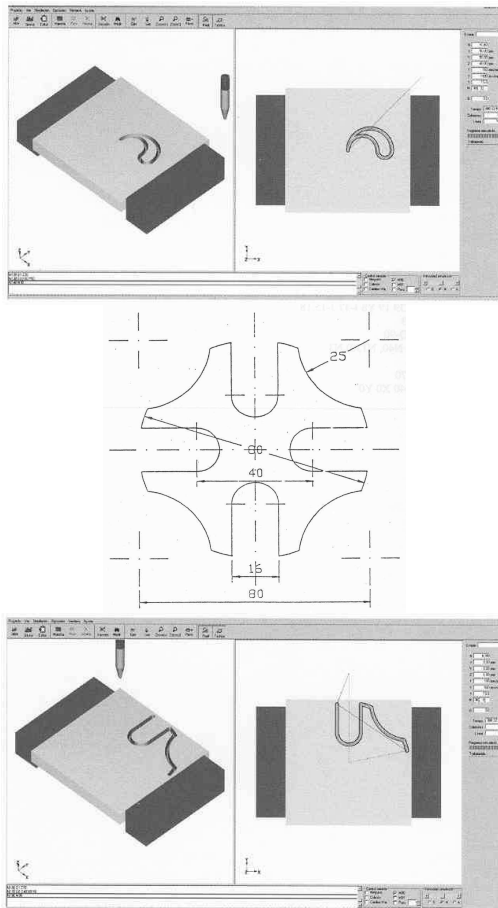


Figure 4. CNC programmed work pieces for the milling-machine

By the use of these practices, we hope that the students learn to identify at least the most common orders of the CNC programming, as nowadays in the manufacturing field it is the most used way of programming the process of a work. In spite of this, it is less and less common to write explicitly the program in a CNC editor, as today's machines allow to input the drawing of the work piece and the machine itself translates it into a CNC program.

Through this subject, we explain the program for two work pieces for the Lathe and then we explain the program for another two work pieces for the Milling-machine.

5.2. Manufacture of two manufacturing systems

After we finish all the sessions for the simulations, and hoping that the students have acquired a minimum knowledge on programming manufacturing systems on a NC machine, we go to the machine-tool laboratory of the department.

There, we have some educational machine-tools; more exactly we are using in this subject the lathe and the milling-machine that we own from

the Fagor Firma. They are Numerically Controlled machine-tools, and we make real what we simulated on the computer a few sessions before.

Here we use a raw bar of aluminium for the lathe, a small cylindrical work. And we also use a raw parallelepiped PVC piece to manufacture the final work on the milling-machine.

First of all we insert the raw bar of aluminium into the work space of the lathe. Then we adjust all the parameters of the machine, that is, we look for the zero coordinates on the work piece for each of the tools on the store of the machine. We have to be careful so that we make correspondence with the CNC program. Although we have already the program saved on the memory of the machine, we explain how it should be done to introduce a new program on the machine. Then, we simulate on the screen of the machine the theoretical process so that we foresee possible errors in the coordinates of the program or in the path described by the end of the tool. Finally, we manufacture the work piece, simulated previously (which has to coincide obviously with the simulation made on the computers by the WinUnisoft software). I think this is the most preferred part for the students, as now they can see the process working on itself, making noise as the metal is being cut and feeling whether the material gets hot or not.

Afterwards, we repeat the same session with the second work on the lathe, and with both of the works on the milling-machine, which works very similarly to the lathe.

References

Now I will mention the different web pages used to obtain the pictures used on the paper. I have not used any written references as books or papers from other people, so none of my references will have a personal author.

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