A DIRECT METHOD OF STATISTICS TEACHING IN LABOUR, SOCIAL, JURIDICAL OR ECONOMIC STUDIES

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Statistics teaching cannot be done in the same way for all kinds of university pupils, especially without changing the kind of studies that they have seen. For example, it is not the same for students of Sciences or Engineering as for students of any Social or Juridical field. We address this kind of pupil (Social, Juridical, Labour or even Economics). We attempt a direct approach: from any situation or real supposition with real data, extract from such field several questions of interest that should adapt to statistics language, then solve with the necessary statistics instruments, explaining such to students in that moment, if necessary, and, finally, returning to the beginning, to give an interpretation of the results, taking into account the pupils' area of studies or professional orientation.

INTRODUCTION. OBJECTIVES PRESENTATION

In this communication we introduce an experience carried out in the framework of the Labour Relations degree of the University of Granada. The developed work has as objectives:

a) To make easier the learning of theory and practice contents in this degree.
b) To incorporate new technologies as support tools in teaching.

The current society imposes the need, each time bigger, of preparing in Statistics pupils with basic knowledge of Maths and whose objective is to know the basic statistics tools to solve real problems that will appear in the future labour life. This, related to the possibilities that new technologies offer in the teaching field, demand changes in statistics techniques teaching and it is a challenge for the professional teachers. This is the reason why our efforts are oriented to the teaching process guides our students to:

a) To understand and to appreciate the statistics role in his/her future labour environment.
b) To assimilate and value the statistics method, that is, the kind of questions that an intelligent use of statistics can answer, the basic ways of statistics reasoning, its power and limits.
c) To dominate the application and interpretation of the different chosen techniques to answer correctly real questions.

It is also desirable that students learn statistics with new technologies. When these stimulate the learning becomes something educational. The presence of these educational resources in the university teaching is a reality imposed by the practice and a dominant culture, based on the continuous presence of the image that drives us new ways of performance and expression.

At the same time, it is possible to look in detail the justification of the existence of this tool discipline (Statistics), as basic tool to treat data of labour, juridical, economic or social field, and its interpretation. More than one, and two, question this need for these professionals, avoiding the great practice use that they have with the statistics tools. Moreover, the intellectual foundation that is the knowledge of such tools.

We know because of the experience that these students need and intuitive, comprehensive approach and where they do not lose because of difficult developments or calculations. The basic difference of statistics teaching in studies of different kinds (Engineering, Social Sciences, etc.) is usually the approach, the intensity or the kind of application to which is addressed.

We pretend to generate all the content of the official program of the subject through *Suppositions* directly related to the Labour/Juridical world. It is pretended to generate an enough

collection of these real suppositions with real data, to develop them and edit them throughout any publication addressed to students.

We pretend to show the students Statistics foundations (Descriptive, Probability and Inference), as well as the problems solutions, in a direct way. For that, we have faced the student to the possible practice reality throughout a real Supposition of Labour/Social/Juridical/ Economic nature. We have extracted the possible questions that can be observed in the Supposition and we have solved them and interpreted them. Normally, statistic teaching start showing the concepts, developing the study of data characteristics and later, doing examples. The practice has shown the aridity of this, demotivating the student. We think that the student has to see the real situation from the beginning and from this to extract and solve the questions.

EXPERIENCE DESCRIPTION

All these considerations has been taken into account to exceed the specific difficulties that are present in teaching of the subject Statistics in the first year of the Labour Relations Degree (683 registered students in the previous year, 724 this year, in six groups and a subject that is considered difficult in the studies environment), with 6 credits. These are summarised in the following points:

a) A limited number of hours to explain the theoretical and practical contents of the programs for a basic preparation in Statistics.
b) A high number of students where most of them have not got previous knowledge in Statistics and they have a low level in Maths. We also emphasise the lack of motivation in the students, facing non-specific subjects of their curriculum.

Taking into account the described reality and the proposed objectives, our experience is oriented to:

a) To elaborate a teaching material
b) To improve the teaching action using new technologies

In relation to the teaching material, it exists a considerable number of Statistical texts oriented to non-specific studies Statistical studies (Biology, Engineering, etc.) that develops the contents in different levels. But, there is a vacuum in the application presentations with Statistics in the Labour, Social or Juridical field, study object in our students. For that, our main objective has been to introduce a Suppositions collection of the real life according to these fields. Next to a serial of questions to them, those are logic and interesting to carry out an appropriate analysis of these situations. It will be the statistics method application of Descriptive Statistics, of Calculation of Probabilities, of Statistics Inference, of Regression Methods or Times Series, those that will give an answer to the different questions explained. The objective is double:

1) To introduce the program contents in an intuitive, natural way and related to the labour world applications in the future qualified students. This will increase the motivation and interest in Statistical studies.
2) To facilitate the learning of the contents making familiar the student with the different statistics techniques and its application.

In all the Suppositions the resolution of the different questions proposed will be carried out following the next steps:

1) To translate into the statistical language the logic questions explained.
2) To justify the statistical technique that will answer to each question.
3) To introduce and comment the solution.

It does not consist of, therefore, creating problems or exercises relation in the classic sense, but presenting and studying real situations (suppositions), that include specific data of the area, and that will be part of the future labour world of the students.

First of all, we start a collection of real Suppositions of Labour, Social, Juridical or Economic nature, with real or proposed data. A lot of Suppositions have been collected from several sources, such as national or local press (El País, El Mundo, Ideal, etc.), different web sites

of public or private organisms (National Institute of Statistics, Andalusian Institute of Statistics, Ministry of Labour), own researches, etc. Other, though they are invented or inspired in other sources, tried to show a real and current situation. Anyway, they can be considered as original statements, which cover different problems. From these, it was pretended to propose, in a logic way, questions that professionals of this field, who are not in the statistical world, could set out to carry out an appropriate analysis, although afterwards they could coincide with common questions in statistics exercises. The task has been a hard work, because it was pretended that the questions include, in different levels, all the program contents of the subject. In this process it has been used a lot of bibliography too (see, for example, Abad, 2001, and 2002), daily press, search in web sites, computers use, etc. This has obliged to a following treatment of suppositions and complementary questions, trying to introduce an important variety of themes, the use of a greater part of the statistics techniques that a future professional of this field has to dominate.

Our work continued with the resolution of selected suppositions, which had been classified in three levels according to the tool complexity that were needed. After moving to the statistics language our questions and justifying the statistics concepts and techniques that could be considered, we try to respond in a varied way. This way, questions were answered by hand or by different statistics packets or programs (*SPSS*, *Statgraphics*, etc) or of general purpose, *Excel*, etc. It was pretended not to specialise any of the ways, that the essential did not seem, for example, the program handling, but the use of such tools for the objective pretended. We pretended that a reader that does not use these programs could not understand the outputs and interpretations. The fruit of the exposed work before has been a packet of solved and commented suppositions.

At the end, once used the tools available and interpreted statistically the results, the conclusion was to answer scientifically the questions that were proposed originally, using the conventional Juridical, Labour or Social language.

The following example of Supposition that includes some of the questions explained can serve as a sample:

> *It is pretended to do a study in relation to the unemployment benefits. For that, it has been achieved the following information. The average contribute benefit that unemployed people receive is 540 euros each month, and a 80% of unemployed people receive between 300 and 750 euros, and a 10% receive more than 750 euros, according to a survey of the Centro de Investigaciones Sociológicas (CIS, Sociological Investigations Centre). The 69% of unemployed people consider this a low benefit, facing the 19% that consider that the mechanisms of protection for unemployment are enough. The 70% of the unemployments believe that is very frequent that people that receive the unemployment benefit continue working, or working sometimes, situation considered non acceptable by unemployed people. Necessity and the lack of benefits justify this. The survey data, that was asked CIS by the Ministry of Labour, were collected in November and December 1996 and January 1997 in interviews to 4700 people.*
>
> *a) Identify the basic variable that is considered in this supposition. Comment the suitability of any probabilistic sample to solve questions in relation to this supposition.*
> *b) With the data available try to get the dispersion level that exists among the unemployed people benefits. Are there contradictions with the data available?*
> *c) Observe and comment the mixture of different percentages of this supposition.*

The work developed has been fruitful in the publication of the book whose reference is Navarrete (2005).

In relation to the teaching action and before the question how technology could motivate and facilitate the learning process related to the subject. We have chosen to carry out support or exhibitions with Power Point of the most representative Suppositions of the program contents. We decide for these interactive animations in computers, mainly by its facility to elaborate easiness of handling, view conditions and strong support. This has been possible because classrooms have audiovisuals.

To make accessible the information and material elaborated, it has been done a web site with a clear and simple structure.

EXPERIENCE ASSESSMENT

The user test is decisive; students comment, it is observed their reactions in class and, overall, the results are analysed. In the assessments tests it has been observed an improved of the student's progress.

After the experience, it has been done a survey to the students about their motivation level and their use of the elaborated material. The data have shown an improvement in the valuation of the subject.

Specifically, the next chart reflects, taking as a sample one of the groups involved, a comparative study done about class attendance, proportion of people presented in an exam, proportion of people that have passed the exams before the experience and afterwards:

	Number of registered students	Attendance	% Presented in an exam from the registered students	% Passed the exam from the presented
Before	139	57	45	34
After	133	75	56	55

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