TEACHING STATISTICS IN GOVERNMENT: A CASE STUDY IN THE BASQUE COUNTRY

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There is a delicate and controversial area not yet very clear between Statistics, as a subject of study and Education as a social phenomenon. The political and ideological factors associated with the social problems worry statisticians, Statistics professors, and specialists in statistical education, and sometimes it also makes them feel inadequately prepared in the face of society. On the other hand, there are few experts in education with enough knowledge of Statistics and its methods, who can study globally and satisfactorily all the problems of statistical education.

On analyzing the goals of statistical education as a reflection of the needs of society, we have to face the problem of detecting and identifying the influence which social needs have on statistical education. This varies from one society to another covering a large spectrum which goes from rigorous centralization to complete freedom in the election of the curriculum by the professor. However, in all cases, there are strong connections between statistical education on the one hand and political, ideological and economic interests on the other, although we should accept that these relations are not the result of conscious administrative decisions.

Nowdays, people tend to consider Statistics as a branch of Mathematics because of the success which mathematical methods have had in the field of theoretical Statistics. However, the eagerness to generalize and abstract has become a danger: to make Statistics a part of Functional Analysis, though Statistics is not the same things as Mathematics. Statistical foundations are not in Mathematics and must be used as an instrument. The ideas and objectives have to determine which mathematical tools to use and which not to use the reverse of what happens today.

To form good statisticians we need to teach the student beforehand how to handle Statistics in real life cases. Thus, they are prepared to deal with important statistical problems.

This way of teaching Statistics requires distinction between two goals. One to consider society as a whole. The other is to think of the students as individuals. In the first case, we should consider the needs which arise from social and economical development, the needs that come from administrative and political institutions, the needs derived from cultural activity, and finally those inferred from the ideologies and values of Society. In the second case, the persons in charge of making decisions about statistical education ought to consider the needs which are important for the public and private life of the person. An example of this could be to understand and judge the phenomena that occur in the natural and social environment of man, or the needs associated with the activity and creativity of the person, etc.

On the different levels of the social and education systems these goals may run into contradictions, and give rise to arguments on how and what Statistics should be taught. This happens in third level education where development of the theory of Statistics is mathematically oriented, while practical Statistics is carried out by the Government. As a result, the theory and the practice of Statistics are separated and independent from each other. This separation is harmful for the teaching of Statistics because, as Bacon points out, the truth in Science lies in the success of its application to material systems.

The teaching of Statistics must be subject to the fact that, as a science, it is a body of knowledge formed by ideas in continuous development, with these ideas upheld mainly by experience. Therefore, progress in the teaching of Statistics will only be obtained by examining together subjects considered different. So, statistical formation, on a basic level, should be carried out in such a way that pedagogical action should be limited to teaching and transmitting Science. As Ortega y Gasset wrote, the teaching of Science must be separate from scientific research. This will avoid the student feeling as an apprentice.

To achieve this goal we have to distinguish between the formation objective, directed to influence the personal and general capacities and characteristics of the student and the professional objective which provides the student with all the knowledge in which Statistics, as such, is essential. In almost every country the teaching of Statistics is approached through the use of formative objectives, based on the psychological aptitudes of the student, which are thought to enable him to develop his mental faculties and transfer knowledge to him. Without doubt, this is where the conflict in the communication of knowledge occurs. How can the teaching of Statistics help to improve the standard of living in a given country? The education of Statistics should be directed towards teaching the student to work in a serious, diligent, and conscientious manner to create economic growth, to serve the community, to work in pursuit of reaching national goals, in accordance with Mach's Principle of the Economy of Science. To reach this goal it is necessary to eliminate subjects that the student does not need to learn and at the same time economize on the ways of teaching what there is to be taught. This way the student will be able to learn more, and develop his capacity to synthesize, thus avoiding dispersion and complexity in the present day education of Statistics.

The social needs of the present are very different from those of one or two decades ago. Technological advance in the field of data processing (computers and personal computers) is transforming the goals of economy, going from an extensive use of resources to an intensive exploitation based on automation, optimization and rationalization. As a result, present programs used in the teaching of Statistics – with emphasis on theoretical and mathematical aspects of the statistical analysis – should undergo drastic changes. These changes demand finding new and innovating methods of teaching, training and research in Statistics, to allow for better communication and cooperation between theoretical and practical statisticians. At the same time, the imbalance between theoretical development and practical applications is reduced.

The revolution that these changes are creating in society implies an in-depth study of the long-term needs that the individual and the different social groups demand. Although these needs vary greatly in different countries nevertheless there are some common goals: a deep knowledge of Statistics; understanding of the nature of Statistics, including how it was created and how it is used; and the benefit of the application of Statistics in real life situations.

We think the attainment of these goals can be reached through the introduction of a basic program of statistical education. This program could have a modular nature, with broad use of audio-visual media and a rational use of personal computers, using "ready-made" and "custom-built" programs. the plan could also contain the periodic visits of expert statisticians, who will generate interest in the statistical formation of the individual in his professional field.

With the purpose of establishing a Statistics teaching program based on the above mentioned objectives, we began a pilot project in the Seminar of Statistics of the University of the Basque Country in 1978.

With financial aid from the Division of Scientific Policy of the Ministry of Education of Spain (1978-1980) a modular program was started for the teaching of the subject "Probability and Statistics I". This program has improved the training of the student by 30%.

With resources of our University and the collaboration of the Department of Educational Technology of the Institute of Education Sciences we have been making audiovisual material accompanied by teacher's guides to use in class. (Some of these results were presented in Sheffield during ICOTS I).[14] Recently, we have been making transparencies with a personal computer which results in a better presentation of this material.

The acquisition of a lot of IBM-PC will permit the students to solve real applications, and at the time make their own programs within the near future.

Also, the collaboration of the Basque Office of Statistics, The British Council, Service Scientifique of France, and IBM-Spain permitted us to invite distinguished statisticians to dictate monographic courses. We have been honoured with the presence of C.R. Rao, E. Cansado, D.J. Finney and V. Barnett, among others. the professors who dictated these courses and the titles by chronological order are:

C.R. Rao. Linear Statistical Inference (1983)
E. Candado. Sampling and Applications (1983)
V. Barnett. Statistical Education (1983)
P. Clapier, Data Analysis (1983)
P. Deheuvels. Statistics of Extremes (1984)
D.J. Finney, Design of Experiments (1984)
F. Azorin. Theoretic Aspects and Applications on Sampling (1984)
L.A. Santalo. Geometric Probabilities (1984)
J. Tiago de Oliveira. Statistics of Extremes (1985)
J.L. Sanchez-Crespo. Sampling and Applications (1985)

J.M. Fourastie. Index Numbers (1985)
L. Lebart. Analysis of Multiple Correspondence (1986)

The attendance at these courses is given in the enclosed table.

Finally, we would like to mention that the results achieved through these activities have been quite satisfactory both for the University and for the Administration. The demand to learn Statistics in our Faculty of Sciences has increased by 150%. There has been a great increase in the publications of Statistics of the Basque Government, too. They are publishing a series of very interesting books for the statistical community. Among the better ones we find the Proceedings of the International Seminar of Statistics in the Basque Country[17, 18] and a Dictionary of Statistical Terms in English, French, Spanish and Basque.

Table 1
Monographic Courses - Year 1983

Course	Participants (%)			Total
	University Professors	Government Employees	Others	
Rao	72.8	16.4	10.8	100.0
Cansado	17.5	81.5	1.0	100.0
Barnett	51.3	13.9	34.8	100.0
Clapier	35.9	57.7	6.4	100.0

Mean = 92 Participants Standard Deviation = 14

Table 2
Monographic Course - Year 1984

Course	Participants (%)			Total
	University Professors	Government Employees	Others	
Deheuvels	78.3	0.0	21.7	100.0
Finney	30.5	68.5	1.0	100.0
Azorin	12.8	83.4	3.8	100.0
Santalo	92.3	0.0	7.7	100.0

Mean = 98 Participants Standard Devision = 19

Table 3
Monographic Courses - Year 1985

Course	Participants (%)			Total
	University Professors	Government Employees	Others	
T. Oliveira	84.6	0.0	15.4	100.0
S. Crespo	14.9	84.2	0.9	100.0
Fourastie	38.1	60.7	1.2	100.0

Mean = 74 Participants Standard Devision = 23

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