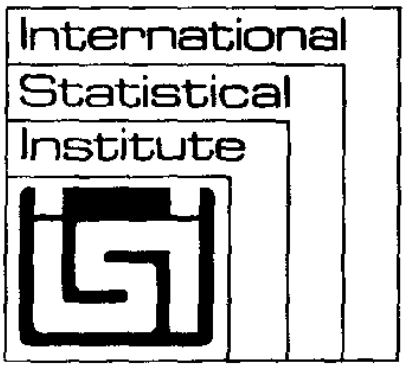
# INTERNATIONAL STATISTICAL INSTITUTE

# Newsletter




## Announcing
## an
## International Association for Statistical Education.

As regular readers of *Teaching Statistics* will become aware, it is planned to use its centre pages to feature international developments and activities in the field of Statistical Education. With the formation of the International Association for Statistical Education (IASE) it is clear that there is universal interest in initiatives in this area. A journal such as *Teaching Statistics* which can provide a forum for the exchange of ideas and experiences, and for debate, therefore has an important role to play. The current issue features an article by J D Godino, who describes the impetus towards both curricular and pedagogic changes in Statistical Education in Spain, and discusses some of the impediments which have still to be overcome. Readers are invited to respond with items with an international flavour for inclusion in future issues.

# TEACHING STATISTICS IN PRIMARY AND SECONDARY SCHOOLS IN SPAIN

## BACKGROUND

At present the teaching of Statistics in Spain in the levels of compulsory education (ages 6 to 14) is very limited, in accordance with the official curricular documents in force. Only in the seventh course (age 13) within the Mathematics program are "notions of Statistics" mentioned, and then without any detail or methodological orientation supplied.

In 1981 a process of curricular change was begun, which ended up being what is called the *Programas Renovados de la Educación General Básica*. Although not officially implanted in the Superior Cycle (ages 12 to 14), the recommendations were favourably received, being much preferred to the out of date official programmes. In the document *Mathemáticas* (M.E.C, 1981) a block dedicated to the study of Statistics is proposed, assigning a period of five weeks distributed in the following way:

Sixth course (age 12) : 3 weeks.
- construction and interpretation of graphs
- measures of location.

Seventh course (age 13): 2 weeks.
- measures of dispersion.

In spite of the fact that this curricular document never became mandatory, it can be said that its proposals are being widely followed in Spanish schools.

With respect to the programs of the first cycle of *Bachillerato* (ages 15 and 16) only in the first course is there any mention made to statistical work, namely:
- Combinatorics. Probability.
- Statistical variables. Measures of location and dispersion.

From the third course of *Bachillerato* (age 17) onwards the official curricular documents propose a more detailed study of the statistical concepts for Science pupils, with the following content:
- Random variables. Binomial and normal distributions.
- Bivariate distributions. Regression lines. Correlation.

It is stated that the objective is to "acquire the concept of random variable to facilitate the use of distribution functions in their application to the biological, physical and social sciences."

## OFFICIAL CURRICULUM REFORM PROJECTS

A new period of experimental reform in the different curricular areas, and in particular in Mathematics, was initiated in 1983 to extend the compulsory education to age 16. The new official approach for Mathematics teaching in Primary and Secondary Education (pupils aged 6 to 16 years) has materialised in a document named *Diseño Curricular Base* (M.E.C., Madrid, 1989) which to date has been submitted to a process of discussion and public debate throughout the Spanish State. In this document some objectives are established and blocks of content and general didactic orientations are outlined, leaving the detailed curricular realisation to teaching centres and to the teachers themselves. So, it is an open and flexible proposal designed to make the content and methodology adequate to the context of each local school group.

Characteristic features of the methodological proposal of the mathematics teaching reform worth noting are:
- the pupil's activity, in interaction with his companions;
- progressive construction of the abstract concepts based on physical examples and games.
- integrated mathematical content linked with solving practical problems and to other topics.

The content of the curricular proposal is broken down into three sections:
- facts, concepts and principles
- procedures:
  - use of different languages
  - referring to the appreciation of mathematics
  - referring to organisation and work habits.

## Treatment of chance and statistics in the Primary Education Reform Project (age 6 to 11 years)

The Basic Curricular Design for Primary Education (M.E.C.) dedicates block 5 to the topic: "Organisation of information. Graphs and introduction to Statistics". In this block are grouped together: techniques of collecting and recording data, representation and reading of simple graphs, and the meaning of the arithmetic mean and the mode.

## Secondary Education (age 12 to 16 years)

Statistics is included within thematic block 4, which includes the study of functions, thus promoting an interconnected study of the relations between magnitudes whether they be causal or stochastic. A graphical treatment of functional relations is advocated. The acquisition of a critical attitude to interpret statistical language is given special emphasis, and the mere calculation procedures are less important, with preference given to analysis, interpretation and decision taking applied to statistical information in a specific context.

Block 5 is dedicated to the study of random phenomena and probability: "Treatment of chance". It is recommended to begin by studying games and random phenomena, with the frequentist approach being used for the estimation of probability. In this document it is stated that such activities contribute considerably to the learning of general procedures, such as the design of experiments, and the observation, recording and search for regularities in the results.

# PRESENT TEACHING SITUATION

Because statistical and probabilistic contents are presently included in Mathematics subjects, most textbooks present these topics with a mainly theoretical orientation. A great emphasis is given to the definition of concepts and to the learning of It is not usual to propose project work in which students need to collect and analyse their own data. Nor is it current to use real data obtained in examples of applications of statistics. This is due, among other factors, to the lack of statistical computer packages in the Spanish language to which the students at these levels have access, and also to the fact that the availability of microcomputers in the schools is still insufficient to allow a generalised use of these tools in the mathematical classroom.

Statistics and probability topics figure, at present, among those which the teachers dislike most. These teachers face the added difficulty of themselves having had a statistical preparation oriented towards theoretical concepts and not towards applications. Statistics and probability topics are therefore usually postponed to the end of the academic year, or even not taught at all. This situation is also influenced by the assessment system used to enter university. To be admitted to university, it is necessary to pass an examination which is called *selectividad*. This exam has a strong influence on the contents that are taught in the final courses of secondary education and also on the teaching methodology. Since statistics questions or problems are not usually included in this examination, many teachers prefer to avoid the subject, or to present it to students only in a traditional way: theory, followed by "stereotyped exercises".

In spite of this negative view, and although there are no great specific curricular projects in Spain like the British Schoo*l Council Project on Statistical Education*, groups of teachers are introducing innovative proposals. This effort is shown in the publications and research reports of groups such as the Azarquiel's group (Grupo Azarquiel, 1982) in Madrid or the Cero's group (Grupo Cero, 1984) in Valencia. Another significant development is the inclusion of specific courses about research on teaching and learning Statistics and Probability into the Doctoral Programs in Mathematics Education at the Universities of Granada and Valencia, and the creation of research teams in these topics at these universities. In particular, at the University of Granada, experiences and research on the teaching of different statistical contents have been carried out since 1986. This has included several financed projects which have made possible the development of a didactical package of programs directed at secondary teaching and a curricular proposal to teach probability (Godino *et al*, 1988).

## THE TRAINING OF TEACHERS OF STATISTICS

The initial *statistical* training of teachers of *Educación General Básica* (pupils aged from 6 to 14) is variable and in general inadequate. It is carried out as a part of the subject of Mathematics in the *Escuelas Universitarias de Formación de Profesores* (University Teacher Training Schools). Trainee teachers are offered a wide variety in which to specialise. Although there is a specific option for science teachers, which includes a better preparation in Mathematics and Mathematics Education, in practice teachers who have completed other options may teach mathematics, and in particular statistics. Some centres, as in the case of the *Escuela de Formación de Profesores de Granada* do offer specific courses on Didactics of Statistics and Probability. Nevertheless, this is an optional subject, and very few future teachers receive this preparation.

Teachers of mathematics at the secondary level acquire a very good initial statistical training (2 or 3 statistics courses at least in the 5 year period of their University studies required to get their degrees). Nevertheless, the approach to the subject is very mathematical, not oriented to applications, with scarce references to curricular or didactical problems. The use of computers is not frequent in the preparation. Only some of the optional subjects recommended to students who prefer to specialise as professional statisticians and not as future teachers include data analysis activities using computers or statistical laboratory activities. Again, this is due to the non-availability of Spanish versions of statistical software. It is also the case that there are a great number of students needing statistical training, but only relatively small number of teachers.

A great effort in the in-service training of teachers is needed in order to assure a successful introduction of the Spanish curricular reform. To encourage this, the Educational administration has formed the *Centros de Profesores* (Teacher Centres), to train and support in-service teachers. These centres have bibliographical and didactical resources as well as educational software and are coordinated by the *Asesores* (Assessors) in different subjects. These assessors have been chosen from teachers with a wide teaching experience, due to their preparation and research work. They have received an intensive training program for a year in different subjects of Mathematical Education. The most relevant international experts in this area have participated as teachers in their preparation. These assessors, *in* collaboration with different University Departments, are now starting several preparation programs to provide for the needs of the community of in-service teachers.

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