PART 5

South America

CHAPTER 14

*Teaching Statistics in Schools in Argentina**

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14.1 THE EDUCATION SYSTEM

Argentina has a centralized educational system. At the primary (ages 6–12) and secondary (ages 12–17) levels, the curricula and syllabuses are prescribed by the national or provincial authorities and are practically uniform in all schools. They are rigid and schools have no part to play in the revision, inclusion or elimination of topics. The only exceptions are some private schools and some secondary schools depending on the universities, which have an experimental character and are authorized to construct their own curricula and syllabuses. But they are probably no more than 10 per cent of the total schools.

At the university level things are different. Each university (Argentina has 21 national universities and 23 private universities) is free to decide its own curriculum and syllabuses on a very general basis. This enables them to experiment and to initiate reforms: such syllabus reform often takes place. In the primary and secondary schools, on the contrary, the rigidity of the educational system makes any kind of reform difficult and the introduction of new topics suffers an excessive and unjustified delay. Let us consider the case of the teaching of statistics.

In almost all the universities there exist regular courses on statistics and probability, tailored to the needs of each specific career (mathematics, physics, biology, economics, computer sciences . . .). They are traditional courses for which there are many standard textbooks. Some of the universities have advanced courses on statistics and some research institutes on the subject, but only one (University of Rosario) has a degree in Statistics (more or less equivalent to a Master in Statistics) initiated in the late fifties. Some projects of different kind, leading to a terminal degree in Statistics (not yet a Ph.D.) are starting at present in other universities. Their purpose is to supply the professional statisticians needed by the government or industry.

14.2 TEACHER TRAINING

Teachers in primary and secondary schools are generally, not trained in the

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universities, but in pedagogic institutes directly dependent on the Ministry of Education. These institutes have uniform curricula, with subjects and syllabuses very difficult to change. Only a small percentage of the total number of teachers have been trained in the universities, where they have a better mathematical training but a lower pedagogical formation. For the first time, a course on Statistics and Probability was introduced in 1966 into the curricula for pre-service training of teachers. Teachers graduating before that date will not have received a formal training in the subject.

Since 1966 all teachers have followed a regular course on Statistics and Probability. However, the course is a traditional one, without any emphasis either on its teaching aspect, or on the content and methodology suitable for lower levels of teaching. To repair this situation, several training courses in statistics and probability for in-service teachers have been organized, to which we shall refer later.

14.3 STATISTICS IN PRIMARY AND SECONDARY SCHOOLS

The primary school in Argentina, which is also the period of compulsory schooling, runs from the beginning of the school life (age 6) up to the age of 12 years. The official syllabuses do not contain any reference to statistics. Its possible introduction, it seems, is not yet being considered.

The secondary school has a basic cycle (ages 12 to 15), common to all kinds of secondary schools, and an upper cycle (ages 15 to 17 and sometimes ages 15 to 18) with different specializations, mainly baccalaureat and technical or vocational schools. Statistics appeared at secondary level for the first time in an official reform of syllabuses in 1967. The following topics were included as a part of the mathematics course of the first year of the upper cycle (age 16): Population and sample: qualitative and quantitative attributes. Frequency. Histograms and frequency polygons. Measures of central tendency and measures of dispersion. Classical definition of probability and introduction to an axiomatic definition. Conditional probability. Random variables. Mathematical expectation. The binomial distribution. Idea of the normal distribution and statistical applications: confidence intervals.

All these topics are expected to be taught in 3 or 4 consecutive weeks (12 to 16 hours of class).

In 1978, by way of an experiment, some topics in statistics were introduced in the second year of the basic cycle of some vocational schools (age 13). The topics are: Descriptive Statistics. Organization and interpretation of numerical data. Frequency. Representation of frequencies. Position and dispersion parameters (total time 12 hours of class).

However, a preliminary evaluation of teaching statistics in secondary schools shows things not to be satisfactory. The topics are taught as isolated 'quanta' of knowledge without the necessary integration with other parts of the curriculum and the remaining content of the mathematics courses.

At present there seems to be a general agreement between school teachers and educators in Argentina that teaching statistics must start at a fairly early stage in elementary teaching. The question is how and to what extent the

statistical methods and concepts should be presented to the pupils. In this sense, the results of the English Schools Council project on Statistical Education, will be very interesting and useful. (See, for example, Kapadia, 1979)

In some meetings of teachers of mathematics held on that question at Cordoba (1978), Buenos Aires (1979) and Santa Rosa (1980) it was generally accepted and recommended that teaching statistics in secondary schools, besides starting earlier than at present, must be spread as a part of every course of mathematics, taking all opportunities for using the methods and language of statistics, taking examples and experiments from other subjects of the curriculum and from everyday life. The following topics, among others, were explicitly recommended:

(a) *Statistics and Geography:* length and volume of rivers, heights of mountains, population of countries and towns, temperatures, barometric heights, ...

(b) *Statistics and Sciences:* biological and genera, properties of plants, duration of life, rates of growth, . . .

(c) *Statistics and the School:* height and weight of pupils, number of brothers, number of uncles, results of examinations (correlation between marks in different subjects), distances from the school to the house, games, . . .

(d) *Statistics and Language:* frequency of each vowel in the national language, applications to cryptography, frequency of the alphabet letters as first letters of the words (number of pages of each letter in a dictionary) and as first letters of names (number of pages of each letter in a telephone guide).

(e) *Statistics and Mathematics:* distribution of prime numbers (less than 500), distribution of natural numbers which are sums of two squares, problems on taxi-distance (minimum number of ways from the origin to each integer point of the line $x + y = m$, where m is an integer), frequency of pairs of digits in the final two digits of a page of a telephone guide which are both even or both odd. . . .

These topics and others, which are being elaborated as elementary modules for teaching statistics, must be treated with plenty of graphs, figures and diagrams, with data taken from encyclopedias, official reports or direct measurements. All these activities provide the opportunity of computational practice for pupils. A simple pocket calculator must be available, to avoid long and tedious computations.

A permanent recommendation to the teachers is that all topics must be taught having in mind that the practice of mathematical skills is only a part of the objectives of teaching statistics: in any circumstance, statistics must be presented as a basis for deducing consequences and making decisions or testing hypotheses.

REFERENCE

Kapadia, R. (1979) Statistical education 11–16 – the Schools Council Project. *Teaching Statistics*, 1, 11–14.