RECENT DEVELOPMENTS IN THE TEACHING OF STATISTICS IN EGYPT: AN EVALUATIVE STUDY IN THE LIGHT OF FUTURE TRENDS IN THE AREA

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This paper aims at providing some conceptions concerning future trends in teaching statistics in general education - both in short and long terms, and recognizing the position of recent developments in the teaching of the subject in Egypt from the suggested emerging trends in teaching statistics.

The paper deals with the state of art in teaching statistics in general education in Egypt, emerging trends in teaching statistics and the position of teaching statistics in general education based on these trends and long term future trends in teaching statistics.

Points of departure for setting up future conceptions of teaching statistics were the paradigm shift in mathematics and the analysis of systems affecting mathematics curricula. The cores of short term trends were; connecting the study of probability and statistics and introducing radical changes to the medium and methods of teaching . The study concluded that later future statistics might not be introduced as a separate subject.

INTRODUCTION

This paper is an attempt to evaluate recent developments in teaching statistics in general education in Egypt in the light of future trends in the area. The present study deals with both short term (5-10 years) and long term (20-25 years) future trends. For short term future trends, it considers, basically, emerging trends in the area as referred to in the literature, while for long term future trends it attempts analysing the systems which affect mathematics curricula.

THE STATE OF ART IN TEACHING STATISTICS IN GENERAL EDUCATION IN EGYPT

Teaching statistics in general education in Egypt was first introduced in secondary education in the academic year 1957/1958 as an optional subject for students of the second grade of the scientific stream, then become a compulsory subject for the same grade in 1961/1962 (Ibrahim, 1981, 199-220).

Teaching statistics started in primary education at the beginning of the seventies with the introduction of the arithmetic mean (Saad, 1971), and in the preparatory stage (7th-9th) grades by the beginning of the eighties with graphic representation of data (Saad, 1981).

The following remarks reveal the underlying factors of change in statistics

syllabuses and the present state of art of teaching the subject in general education in Egypt:

1. Syllabuses of statistics in the different educational stages have been subject to fluctuation according to changes in the structure of the education system in Egypt as well as "developing" teaching the subject by introducing it or some of the included topics in earlier stages . On the other hand, it frequently happened that some topics of statistics were cancelled or moved to higher grades, while the whole subject was cancelled from secondary education during the period 1969/1970 - 1974/1975. (Ibrahim, 1981, p. 201-202).
2. The introduction of "modern mathematics" in secondary education starting from 1970/71 and the following relevant developments have resulted in essential changes in the teaching of statistics. These being the introduction of probability and attempting to connect the study of statistics with the theory of probability.
3. Major topics of study in primary education are: Collecting data, tabulation, graphic representation of data (by bar-line graph, broken-line graph and circular sectors), while the core topics of the subject in the preparatory stage are concerned with measures of central tendency for some values and frequency distributions (whether using arithmetical computations or graphic representation - when appropriate). Dispersion and rank correlation coefficient were taught in the third grade of the preparatory stage, then moved to the first grade of secondary education by the end of the eighties (Al-Hawary et al, 1989/1990) , and were eventually cancelled.
4. Different approaches have been used to teach statistics in secondary education in Egypt within the framework of "modern mathematics". The continuum of these approaches includes at one pole teaching statistics and probability independently and considering their connection at the other . An example of the core topics within the second pole are : Introduction to statistics, inferential statistics, population and sampling, probability random sample, frequency distribution, graphical representation of frequency distribution of a real variable, frequency curves, relative frequency, relative frequency of intervals, numerical description of frequency distributions, central tendency and dispersion (ALESCO, 1979). However, at the moment, statistics is taught in secondary education as an optional subject in the third grade in a course that includes both statistics and economics. Major topics included are: probability, random variables and probability distributions, the normal

distribution, correlation and regression (Al-Khouly and Abdel-Ghanny, 1994/1995).

EMERGING TRENDS IN TEACHING STATISTICS AND THE POSITION OF TEACHINGS STATISTICS IN GENERAL EDUCATION IN EGYPT BASED ON THESE TRENDS

Teaching statistics is supposed to cope with the paradigm shift of mathematics from seeing mathematics as the study of formal systems to seeing mathematics as a living body (Ormell, 1992; Rogerson, 1986, p. 611). This shift has been reflected in primary school mathematics programs "from seeing mathematics as a large collection of concepts and skills to be mastered in some strict partial order to seeing mathematics as something people do" (Romberg, 1994, p. 3655), and in secondary school mathematics programs from the "formal" teaching of mathematics to introducing mathematics as a human activity in order to provide a basic preparation of learners for the full participation as functional members of society (Travers, 1994, p. 3661).

Keeping in mind such a paradigm shift and its possible implications on mathematics education, the applications of statistics in almost all other disciplines and in everyday life, the opportunities provided by learning statistics for students "to become involved in situations that are similar to a real scientific approach" (4 : 3682) and the recent literature in teaching the subject, emerging trends of teaching statistics can be summed up as follows:

1. The study of statistics should be included in all educational stages and streams in a rather spiral way (Romberg, 1994, p. 3656; Travers, 1994, p. 3661; Fischbein, 1994, p. 3682).
2. Statistics is to be studied in connection with the study of probability (Fischbein, p. 3681).

Some of the implications of such a view are as follows:

a) Teaching probability should start from primary education, or kindergarten, by introducing "notions of uncertainty and chance" on empirical grounds (Romberg, 1994, p. 3656; Fischbein, 1994, p. 3682).

b) Descriptive statistics must be introduced as a pre-requisite to the study of inferential statistics as well as their direct applications to every day life situations (Mina, 1997, p. 48).

c) Among the topics to be studied in secondary education are : The relation between probability and relative frequencies; simple and compound events; the concept of sample space; probability of unions and intersections of events; conditional probability; the law of large numbers; binomial, normal, and Poisson distributions; confidence intervals, and so on. (Fischbein, 1994, p. 3682).

3. The medium of studying statistics should be basically real data and problems, not "school" data . Special attention should be given to collecting data and sources of them .
4. Discussing and interpreting the data should be an essential part of teaching and learning statistics (Rogerson, 1988, p. 2).
5. Means of computation must be comparable with those means being in real life. This implies the use of calculators and computers in calculations and statistical analysis as well as using calculators from the first stage of education (i.e. kindergarten or primary education).

In Egypt, we may safely say that mathematics education has been influenced by the "traditional" paradigm of the subject. Within this framework, the position of teaching statistics in general education in Egypt from the above mentioned trends can be respectively summed up as follows:

(1) Statistics is taught in the primary and preparatory stages, but as a part of an optional subject at the secondary level .
(2) The study of probability is not introduced except in an optional subject. It can be here said that the connection between statistics and probability is taken into consideration throughout this course and that it deals only with some of the topics used to be covered at this stage. The study of inferential statistics is not included, but the study of such a course, however, can be considered as an appropriate pre-requisite for studying it.
(3) Units of statistics in primary education meet partly real life data and problems, whereas the units on statistics in preparatory education are typically "cook- book" statistics.
(4) Some schools pay attention to encouraging pupils in the primary level to attempt discussing, interpreting, manipulating and distorting data to reach some conclusion. This however is subject to certain conditions relevant to teachers efficiency and

his/her commitment to using the teachers guide . Apart from primary education, pupils are not encouraged in such a way.

(5) Calculators are not allowed to be used in primary education except since recently in the last year. Although the study of computers is being disseminated in secondary schools, statistical analysis is not taken into consideration in such a study.

Some decisions can be taken to put the above mentioned trends into practice including changing the structure of the educational system. The real challenge however is to change attitudes of teachers and educators, may be pupils and parents also, towards mathematics education as well as introducing the necessary changes in teaching methods, educational media and evaluation.

LONG TERM FUTURE TRENDS IN TEACHING STATISTICS:

Formulating some conceptions about long term future trends in teaching statistics must be built upon wider conceptions for school curricula. In an attempt to reach conceptions of the former, an analysis of future conceptions of the educational system in Egypt, the Egyptian culture, the regional culture (the Arab culture) and the humanistic culture has been carried out (Mina, 1997). Some relevant conclusions are :

1. Scientific knowledge is growing with accelerated rates, and in the meantime it is easy to reach new knowledge . This will result in memory losing its importance as a base for education and concentrating on dealing with knowledge and its use in problem solving .
2. Unity of knowledge is in the process of going beyond “interdisciplinary sciences” and might be reflected in what we call “functional encyclopaedism”, where data collecting for dealing with any problem or issue will take an “encyclopaedism” form- including its development since emerging, so that students can analyse, study and discover by themselves the great scientific points of departure in different fields. In association with that point, a simplified study in methodology should be introduced.
3. Developing creativity will be the major core of the educational process, and the minimum level of creative education will be “having taste for the creative process” . This will be associated with employing “functional encyclopaedism” , in addition to
4. “memory” losing its importance in the educational process, besides giving more

attention to criticism and hermeneutics in curricula of education .

5. A great attention should be paid to connecting knowledge to its technological applications, and revealing the role of knowledge in changing reality .
6. After the stage of computer literacy, the study of computer will focus on collecting data, self-study and using means of communication.
7. Means of teaching will depend on discussion, dialogue, brain storming and dealing with alternatives.
8. New means of evaluation will be developed, including continuous evaluation, self-evaluation, open - book exams and research assignments.

From the above mentioned findings we might say that statistics - even mathematics - might not be taught as a school subject, or course, but in the context of integrated units dealing with problems near to real life and/or scientific nature, within a different educational atmosphere, means of teaching and evaluation .

This situation, side-by-side with developments in statistics and its computer packages, will open the door for the employment of advanced statistics in rather early educational stages.

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