# Some Comments on Teaching of Statistics in the Department of Mathematics

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What is Statistics? There have been many definitions; indeed scholarly articles have carefully collected together hundreds of definitions [1]. One frequently used is that statistics is concerned with the characterization, development, and application of techniques for;

I. The statistical design of an investigation, whether it be an experiment, a survey, an observational study, or a model building study;

II. The summarization of the facts from the investigation;

III. The inferences that can be drawn from the facts of the investigation about parameters in the population (or generalizing from the specific sample to the general population).

The subject of statistics, as a formal area of human thought, is very young. Fifty years ago, there were virtually no courses at the university level in statistics, very few departments of statistics, virtually no university programs in statistics, and, for that matter, little statistical literature. As late as 1939, Prof. Wishart [2] deplored the lack of an adequate textbook on the theory of statistics. However, statistics was very much alive and there were many prominent statisticians. Addressing the Royal Society in 1942, Prof. M.G. Kendall [3] described the profession in the following glowing terms:

"Beginning as a small sect concerned only with political economy, they have already overrun every branch of science with a rapidity of conquest rivalled only by Attila, Mohammed, and the Colorado beetle.

They have ousted mathematics from its position as the matrix of the sciences, and they are beginning to appear among the arts ... "

Today, there are about sixty departments of statistics among universities in the United States [4] and many more abroad. The subject matter of statistics is highly specialized and statisticians are identified by their area of specialty. There exists a vast statistical literature, several professional journals, and many excellent textbooks at all levels.

In as much as statistics uses mathematics as its language, it has led some to believe that statistics is a part of mathematics. On the contrary, statistics is a subject in its own right as is evident from the following excerpts from the writings of the two early pioneers on the subject:

"Mathematics plays a great and growing part in statistical theory, and there could be no theory without it, but that theory is no more a branch of mathematics than is engineering, physics or astronomy ... "— Dr. Maurice G. Kendall, 1942

"Statistics like engineering, requires all the help it can receive from mathematics, it can never become a branch of mathematics ... "— Prof. P. C. Mahalanobis, 1950

It is true that statisticians use mathematical tools; the more mathematics he knows, the more sharper are his tools, and the better he is able to do the job. But, the job itself is not mathematics and any person with training in the use of sew or a hammer is not sufficient to make one an architect.

In the absence of the statistics departments in many colleges and universities generally the statistics courses are taught by the non-statisticians in the departments of mathematics, business, economics, agriculture, psychology, industrial engineering, etc. The training of many of the professionals teaching and practicing statistics outside the department of statistics is often of the traditional single subject type, oriented to either mathematics, economics or engineering, and usually of an abstract nature without any contact with data and without any clearly perceived purpose. The greatest danger lies that tranining of this type does not guarantee any knowledge of the professional work of statisticians. The position is roughly somewhat like what it would be to accept a master's degree or a Ph. D. in biochemistry as the equivalent of the M.B., or M. D. degree awarded on the basis of a full course of professional training in medicine. The consequences are as much of a tragedy as it would be if a Ph. D. who had worked intensively on the synthesis of a vitamin but had not surgical training were to be placed in charge of brain surgery.

The obvious degradation of quality of statistical education and inefficiency of overlapping and duplicating courses, given independently in numerous departments by persons who are not really specialists in the subject, has led to the suggestion that the whole matter can be taken by the department of mathematics. However, the teaching of statistics in the department of mathematics is doomed to failure, as has always happened, because it means that teaching of statistics is put under the jurisdiction of those who have no real interest in it and are relatively "ignorant "of the subject. As a matter of fact, there is some merit to the concept that statistics courses be taught by non-mathematicians. The following description given by Harold Hotelling [5] in this regard nearly half a century ago is still true.

" ... the teaching of statistics cannot be done appreciably better by mathematicians ignorant of the subject than by psychologists or agricultural experimenters ignorant of the subject. The latter indeed have a certain advantage in that the problems seem more real and definite to them; they can sense the difference between the important end the unimportant questions, even if they cannot express the questions in clear mathematical language, and can sometimes arrive intuitively at a correct result that leaves the mathematician puzzled. Also, they can understand more readily that can the mathematician the examples, drawn largely from the biological material, which play so important a part in some of the leading expository work on statistics, such as R.A. Fisher's Statistical Methods for Research Workers ... "

More recently, there have been voiced serious concerns on the part of many educators regarding teaching of statistics by mathematicians [6]. Furthermore, statisticians working outside the department of statistics may find themselves in a quagmire of professional impediments. They may feel professional isolation and will have considerable difficulties in having people to talk in statistics. Their professional endeavors and merits may largely go unappreciated. In a symposium of the teaching of statistics in Japanese universities and colleges it was pointed out that [7]" ... no Japanese universities and colleges have an independent department or unit of statistics, which is a formidable obstacle to improvement of statistics teaching in Japan ". In addition, it was noted " ... how different is the teaching of mathematical statistics in the mathematics department from that in other departments of natural science and technology ".

Many prominent statisticians have long urged that the statistics courses should be taught by a statistics faculty from a separate unit or department of statistics, not by a branch of mathematics, economics, business, or industrial engineering. In many countries, especially

Great Britain, the most stable, productive, and viable statistical centers have been those where the statistical discipline is autonomous. If statistical education is to progress and the benefits and values of statistical science are to be made statistical science are to be made available to the academic community and the public in general, educators and university administrators at every institution of higher learning should give serious consideration for establishment of a separate unit or department of statistics.

# References

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