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A COMPUTER PROJECT FOR TEACHING STATISTICS TO TECHNICIANS AND FACTORY WORKERS

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1. Introdution

Most of the papers dealing with statistical education are concerned either with the training of statisticians, the training of teachers who teach statistics or the training of university students. Actually, statistical education in a school or university environment is easy if you compare it to what happens when you have to deal with technicians or factory workers. On one hand, some of these workers have a low educational level and, even when this is not the case, they left the school system several years previously. On the other hand, they are motivated and remain motivated as long as the teaching is not too formal.

We are presently working on a computer project in elementary statistics for technicians and workers in the industry. The project is financed by a group of firms which wants to give a basic statistical education to their employees. These employees are supposed to have reached a 9th year level. And the goal of the training is to provide them with statistical concepts and methodology that will help them first in collecting data and then in making decisions based upon information. The contents include a presentation of the different ways of gathering data, descriptive statistics with one, two or three variables, time series, quality control and a short introduction to the normal distribution. The product must be self-sufficient. Therefore we have to provide any user with information on the computer without the use of an extra manual.

It is obvious that we have to start with examples to introduce statistical thinking and concepts. Although it is a very usual way to proceed in other countries, it is still rare in France. And we have to avoid the mathematical symbols or to introduce them very carefully. It is not so obvious but it is very interesting for the scientists working on the project. Besides, the material is supposed to be distributed in different firms and factories which have neither the most recent computers nor the most recent software. So, we are developing a product which must work on a common PC. It is not totally finished yet but we plan to achieve it very soon and to

test it.

We will present the main steps of our work, the points of interest, and the difficulties we meet in making the project.

2. Presentation of the project

Several companies (car factory, manufacturing industries, banks) have declared that technicians and factory workers must have instruction in elementary statistics. They currently draw Pareto diagrams, use control charts and take a hand on some planning of experiments, without basic knowledge in elementary statistics. Particularly, they are not aware of how important the gathering of data and the quality of collected data are. The companies want a computer assisted learning program which allows in-service training.

The students have reached a 9th year level but some of them did so many years ago. This program, which is financed by a group of firms, must be attractive enough to keep the students until the last chapter. It is difficult to precisely define the audiences. The course must be appropriate for technicians but also for engineers. We have decided that the training is primarily intended for technicians and workers with little statistical education.

Apart the software, we are supposed to provide a user's guide and a battery of tests. The project began in september 1992 and must be achieved at the end of 1993.

3. About the contents

The first chapter deals with the presentation of statistics. We use several examples found in the newspapers and comment on them while introducing the statistical vocabulary. Then the second chapter is concerned with data organization. The third chapter deals with the summarization of data, the fourth one with time series. In the last one, we present the Gaussian distribution and some applications to quality control.

A computer assisted learning program is not a book and we are very careful not to imitate the books. At the beginning of each chapter, a menu is provided. Each idea is developped on one or two screens and, after presenting a notion and an example, we ask the student to do it again. A help on-line is provided, as is a dictionary. A student can access any paragraph of any chapter but if some prior knowledge is required, there is a warning on the screen.

Most of the time, we avoid the use of mathematical formulae. But to deal with the mean or the correlation, it is better to have a formula. The student has access to an icon "maths" where all the formulae are described.

We provide multiple choice items at the end of each paragraph.

4. About the software

The product will be used on microcomputers and "WINDOWS" is required. It has been created with Authorware and doesn't need any statistical sofware. Therefore, students can not process their own data with this program. It was a choice at the beginning of the project (cost, storage memory). We will provide a list of statistical packages that the firm can buy if they want to process their own data (which will probably be the case).

There are several steps in the realization of the computer-assisted learning program:

1 - definition of what is wanted;
2 - scenario;
3 - realization of a prototype;
4 - diffusion.

At each step, there is an evaluation by experts and/or by users. The permanent team working on the project includes a statistician, two computer scientists (the first one manages the project, the second one writes the code), and a graphist.

We have achieved the scenario and work now on the realization of a prototype. We can distinguish two kinds of difficulties:

1 - the first one depends on the audience: we have to avoid formal representations as long as we can and to find a tradeoff between a too literary text and a too mathematical one. We never forget that on one hand the audience does not like mathematics (and statistics is considered as a part of mathematics) but on the other hand they are willing to learn statistics;

2 - the second one depends on the form of training. We write small sequences on a subject keeping in mind that it is not a book and must be more dynamic and alive than a book.

5. Conclusion

Our product is intended for people without statistical education. It is a first level of education but an essential one. We choose daily life examples and our data come from the newspaper or from the firms.

There already exists several products. Most of them have been made for a more highly qualified audience. We insist in our course on data collection. We want to create awareness about data collection among the students. We want to train people to be critical about statistical information they can find in the newspaper and to recognize that, in spite of some bad use, statistics is a valuable tool for their daily life at work or outside work.