# TRAINING FOR APPLIED STATISTICIANS

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*What are the skills a person who studies Statistics must know? Which kind of problems would these people have when they start working in groups with people of different disciplines in private or public institutions? Do they know how to solve those problems? Which is the correct way they would be trained so later they can transmit properly the knowledge they received in their professional studies? Finally: which skills would the statisticians really need to know if they want to solve properly the problems they can have in their daily work? This paper examines the answers to these and other similar questions, based on the experience made by the Tres de Febrero National University (Argentine), for those beginning a Statistics career.*

## INTRODUCTION

The motivation for this paper was the search and analysis of some answers to a series of doubts considered when Statistics Career was designed in Tres de Febrero National University (UNTREF) – Argentine in 1998. Those questions were:

- ✓ *What are the skills a person who studies Statistics must know?*
- ✓ *What kind of problems would these people have when they start working in groups with people of different disciplines in private or public institutions?*
- ✓ *Do they know how to solve those problems?*
- ✓ *Which is the correct way they would be trained so later they can transmit the knowledge they received in their professional studies?*
- ✓ *Really: Which skills would the Statisticians really need to know if they want to know to solve properly the problems they can have in their daily work?*

In those times the social-economic reality of the country, and in particular the ones detected in one of the biggest urban conglomerates of the world called "Great Buenos Aires," showed the necessity to have professionals with very good handling of statistical methods, trained to interpret problems and to be adapted to changing situations of the industry, commerce, health, education, farming sector, and to every public entities and private companies where they might make decisions under uncertain contexts.

Until that moment, there weren't enough graduates in Statistics. Statistical problems were solved with professionals from another disciplines with some formation in statistics. In other cases, professionals with similar studies or knowledge of theoretical mathematics or from other countries where call to do the jobs.

These necessities, and the search of the above answers, are what motivated a group of statisticians (graduates from one of the Statistics Career of greater relevance in Latin America (first of Hispanic speech), pertaining to the present National University of Rosario (Argentine)), working together in an interdisciplinary team who belongs to UNTREF, to imagine how the training of these professionals must be in order to meet the complex reality they live every day.

## THE PROPOSAL

The basic idea to respond the raised doubts and to try to express them in a concrete proposal, was to articulate the necessities detected with the necessary theoretical basic formation, along with the practical-conceptual aspects. In this way the theoretical developments offered the base to include the foundations of the diverse methods to unfold, but where the main effort was in the understanding of the socioeconomic reality, and in the solution of the problems that face the productive sectors of goods and services.

Now, *talking about the "Training for applied Statisticians,"* which was the way to achieve those goals? The national antecedents don't exist and the foreign experiences were few or unknown. That's why they decide to "experience."

A *Study Plan* was drawn up, including also *Seminaries* and *Applied Workshops*, starting by the necessities above mentioned and mixing the theory subjects with the ones that use

techniques and methods to solve those problems. In this way they get the necessary knowledge to afford it and also give the learners the possibility of working under the direction of another one in public entities and private companies.

The idea was that as advanced in the Career, accentuated the development of *"the applied" matters*, as much the corresponding ones to specific statistical methods, like which they introduce in applications to other disciplines.

In order to make possible the success of the Plan, the basic condition was that the educational ones of the specific matters of the Career, besides to have the professional and didactic capacity necessary to develop the subjects of their respective matters, worked daily with the statistical methods.

Later, this Plan had to be adapted to general conditions required for university degrees. The norms of the Ministry of Education, Science and Technology of Argentina, impose that the careers of university degree must fulfil a series of requirements, for example: degrees of 4 years of duration, limits in the amount of hours of classes, etc.). Some particular requirements of the UNTREF were added (matters of four months, an intermediate degree Title (Technical level), obligatory matters of general formation, languages and computation, etc.). These points motivated a substantial cut in the initial thematic proposal, because it was created with possibility to dedicate the last year to "specialization subjects," such as Biostatistics, Actuarial Statistics, Econometry, Statistics in Opinion Studies, etc., that were reduced to two optional subjects during the last fourth month period of the Career.

The Ministry of Education approved the project in 1998; the particularities are summarized in the following points.

## THE RESULT: A CAREER OF APPLIED STATISTICS

Presentation was made in the Ministry of Education, Science and Technology, included the *foundations* to create the Career, existing *antecedents* in the country and outside it, *reaches or incumbencies of the title*, possible *places of work, activities* to develop, *purposes*, and the detailed contents of the Study Plan. About these points it is good to emphasize:

1. The *objective* to form:
   - ✓ Statisticians with good basic theoretical, conceptual knowledge and, *specially, great practical sense and abilities to solve problems* in these areas: Statistics methods and Analysis of Data in public entities and private companies.
   - ✓ *A professional involved with reality*, with scientific formation who allows him to produce ideas to approach and transform reality into a context of an investigation or study that requires the use of quantitative methods.
2. *Graduates with capacity*:
   - ✓ To provide scientific and technological methods, whose adapted implementation it guarantees the obtaining of *better results in the applied investigation, as well as in the improvement with productive processes of goods and services in general*.
   - ✓ To participate in teams of any specialty (social, economic, technical, scientific, etc.), *applying its knowledge in objective form, with critical thinking and clarity of criteria* to offer advising to those who must make decisions.
   - ✓ To have independent decisions in all *Statistic subjects and their applications in any field of activity*, and in personal development about teaching and investigation.
3. *Study Plan* general characteristics:
   - ✓ Previous accomplishment of a *"Levelling Course or Common Entrance"* to all UNTREF Careers.
   - ✓ Career organized in *two cycles*:
     - *General Cycle*: two years and a half of duration, allows students to obtain the intermediate title of *Technician in Statistics*.
     - *Cycle of Degree*: after a year and a half of duration after acquiring the Technician title, students get the *Licensed in Statistics* title.
   - ✓ Dictation *of four month* subjects.

- ✓ *Seminars and Applied Workshops* that includes *practical activities* (like students professions, works of field, guests exhibitions, participation in congresses, investigations, etc.).
- ✓ Courses of *Languages* and *Computation*
- ✓ *Optional subjects* during the last year of the Career, where students must choose two subjects of their preferences.

4. *Study Plan* Characteristics:
   - ✓ 49 subjects with 3.000 hours of actual classes.
   - ✓ Distribution of hours according the *Cycle*, the *Year* in which they are dictated and the *Kind* of subject, is in the following table:

Table 1: *Percentage* of Hours of chair according the *Cycle* and *Year* of Subjects

| *Year* | TOTAL | *Cycle* | | | |
|---|---|---|---|---|---|
| | | *Initial* | *Technician* | *Licensed* | *Special* |
| TOTAL | 100,00 | 6,50 | 54,40 | 32,60 | 6,50 |
| *Entrance* | 6,50 | 6,50 | - | - | - |
| *1º* | 21,75 | - | 21,75 | - | - |
| *2º* | 21,75 | - | 21,75 | - | - |
| *3º* | 21,75 | - | 10,875 | 10,875 | - |
| *4º* | 21,75 | - | - | 21,75 | - |
| *X – S/E* | 6,50 | - | - | - | 6,50 |

This table allows one to know the distribution of subjects, with exactly equal participation for every year, and a greater weight of those than integrates the Technical level.

We can see the relation between the *Years* of the Career and the *Cycles* in which the same one is divided:

Table 2: *Percentage* of the Hours of chair according to the *Cycle* and *Type* of the Matters

| *Type* | TOTAL | *Cycle* | | | |
|---|---|---|---|---|---|
| | | *Initial* | *Technician* | *Licensed* | *Special* |
| TOTAL | 100,00 | 6,55 | 54,35 | 32,60 | 6,50 |
| *Languages* | 3,25 | - | - | - | 3,25 |
| *Computer* | 7,60 | - | 4,35 | - | 3,25 |
| *Common* | 12,45 | 4,35 | 5,40 | 2,70 | - |
| *Basic* | 12,00 | 2,20 | 9,80 | - | - |
| *Stat. Basic* | 14,10 | - | 8,70 | 5,40 | - |
| *Stat. Theoretic* | 19,60 | - | 16,30 | 3,30 | - |
| *Stat. Applied* | 22,80 | - | 9,80 | 13,00 | - |
| *Applications* | 8,20 | - | - | 8,20 | - |

The Career of Statistics has been divided in approximately three parts of similar importance:

- ✓ One dedicated to general and complementary subjects (Common and Basic Languages, Computer science);
- ✓ Another one to the considered fundamental Statistics (Basic and Theoretical);
- ✓ The rest to the Applications and Applied Statistics.

It can be appraised clearly that as the students advance in the Career, the development of “the Applied” matters is accentuated.

## THE PRESENT STATE OF THE CAREER

To little more than SEVEN years since the initiation of the Career, it is possible to make some commentaries relative to its development, as much as for some presented/displayed particularities, including problems and disadvantages thus also demonstrated. They are:

- An average of 30 students want to study Statistics each year. In the future it is anticipated an annual entrance close to 50 students.
- Since year 2002 to the present, there are 16 graduates.
- Some inconsistencies in the Study plan were detected. In addition the University is reviewing the curricula of all its Careers.
- "The non conventional" activities within the usual Careers (factories, students professions, seminaries, etc.) could have been developed to plenary session, and constitute one of the main strongpoint of the "application" of techniques and statistical methods.
- All the graduates, and most of the advanced students of the Career, are working in subjects of Statistics, as much in public organizations, as in companies and private consultants; with directive functions, technical and educational.
- Research work in issues related to Statistics has reached special relevance within the UNTREF, which has created a Research programme in Statistics and related subjects that will become of utmost importance in the near future.

## ACTIVITIES EXTRACURRICULARES AND POSTGRADUADE

From the beginning of the Career of Statistics, the university carried out extracurricular activities to offer to the professors and the interested ones in general, consisting in a battery of options and specialization in tie subjects with the Statistic.

Of this form, by means of the accomplishment of Seminars, similar Congresses, Courses, Conferences and other activities, the University made possible the students' participation of the Statistics Career in activities bound to its preferences, and made an important diffusion of the discipline and facilitated its professors' updating and specialization in subjects relative to its specialties. Since year 2000, meetings were made with regularity: Studies of Markets, Control of Quality, Sampling, Economic Information systems, Indicators, Scholastic Desertion, Education of the Statistic, etc.

The active participation of educational, graduated and students of this Career in annual activities that organized last year's Statistical Argentine Society stands out, by means of the presentation of works, intervention in Round Tables, and other central activities.

These activities were crowned with two facts of unusual relevance for Statistics and the University:

1. The organization by the end of year 2002 of the "*Megaevent in Statistics*," in that a series of meetings of relevance at national and international level came together, with the participation of the most important Latin American organizations to the discipline. The "Megaevent in Statistics," concentrated on the "Inter-American Days of Education of the Statistics" co organized by the IASI; and "*5º Latin American Congress of Societies of Statistics*" that included the annual meetings of SAE, the SOCHE and ADDS/SINKS it, co-organizers of the same one.
2. The creation at the beginning of year 2003, of the *Master in Generation and Analysis of Statistical Information* in agreement with the National Institute of Statistic and Census (INDEC), tending fundamentally to give a possibility of having specific formation in Statistics to professionals in other disciplines that evolve at the moment or think to do it in the future in activities to the subject. This Master projected within an Agreement Frame made between the University and the INDEC, including in addition: complementation of the libraries, student professions and hiring of students for activities of the INDEC, accomplishment of advanced training courses and specialization, etc. They have already initiated three cohorts.