DEVELOPMENT OF STATISTICS METHODS TEACHING IN PRIMARY AND SECONDARY EDUCATION (SCHOOL)

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The Federal Law of Education in Argentina has included Statistics in Primary and Secondary School Mathematics, but the teachers were not able to explain the concepts simply enough for students to understand. Several educators groups included some points or chapters about Statistics in the Primary and Secondary School books trying to give different levels of students the principal concepts and examples of Statistics Methods. Now: How much success has there been? Do the students of Primary and Secondary School understand teachers' ways of developing the techniques that they suggested? Are teachers and professors in charge of showing these techniques able to successfully develop those Statistics subjects included in the books? These are the questions examined by this project which seeks to determine whether the adopted methodology could be considered successful and whether teachers are able to transmit Statistics knowledge; and if not, to propose alternative contents, points of view and teaching methods.

INTRODUCTION

This project has formally begun in the National University of Tres de Febrero (UNTREF) at the beginning of the year 2004, and the activities programmed and performed, and the achievements are reviewed here until the third term of the year 2005.

That Project starts from the Federal Law of Education of the Argentine Republic, that included the *Teaching of Statistics* within the subject of Mathematics, and the hypothesis is that *its instrumentation was not successful*, because those who had to apply it (the teachers), were not able to do it, and the attempt to explain the concepts simply enough for students to understand the Statistics methods and tools in text books, was not successful either.

In the Law the Basic Common Contents (CBC) for Mathematics were defined, diagramed by means of "blocks" whose distribution is the following one:

Blocks	Contents
1	Number
2	Operations
3	Graphical and Algebraic Language
4	Notions of Geometry
5	Measurements
6	*Notions of Statistic and Probability*
7	Procedures Related to the Mathematical Task
8	Attitudes Related to the Mathematical Task

THE ORIGIN OF THE PROJECT

The origin points or hypothesis to verify are, for example:
- ✓ Has the attempt to develop subjects of Statistics in an understandable way been successful?
- ✓ Do the students of Primary and Secondary School understand the form used by the teachers who develop the techniques that are suggested?
- ✓ Are Statistics applied in other areas of Primary and Secondary School?
- ✓ Are teachers of Mathematics enabled to develop the subjects of Statistics included in texts successfully?
- ✓ Will information about the subject of Statistics be introduced in other areas of the school curricula?
- ✓ Will the teachers who develop them include specific contents of Statistics in their planning?

✓ If they include them: are they enabled to do it?

The answers to these questions or doubts, gave origin to the work hypotheses in the Project, for whose verification the proposed methodology is summarized as follows.

WORK PLAN PROPOSED

The Plan of Work initially proposed was the following:

1st.   *Research and Analysis of Backgrounds*: Historical evolution of the Education of Statistics in Primary and Secondary School; Analysis of the Law regarding education in Primary and Secondary School; Comparative analysis with other countries; Location and connection with work groups of the country and abroad.

2nd.   *Compiling of Basic Information*: Compiling of the existing information in text books of Mathematics referring to the teaching of Statistics; the search and data summary on the use of statistical methods in other disciplines; Pick up of opinions of state employees, teachers and students on the subjects proposed in the Project.

3rd.   *Analysis and Performing of Proposals*: Analysis and Elaboration of proposals and recommendations for the writing of texts for the Teaching of Statistics in Primary and Secondary School; Elaboration of proposals for the preparation of advanced training courses for Secondary School Teachers; The performance of verifications and contrasts that allow the comparison of educational systems previous to the Law, to those of years after their implementation, and the results that obtained with the proposed changes.

In the following points the activities performed, the findings produced during the preliminary execution of the Project, and the conclusions are enumerated.

ACTIVITIES PERFORMED

Of the programmed activities, in the months after the presentation of the Project the following ones have been performed:

Research and Analysis of Antecedents

Antecedents were obtained on the historical evolution of the Education of Statistics in Primary and Secondary School. The checked documents were from the National Program of Educational Qualification, from year 1993 ahead, in which appears the necessity of capacitate the teachers who are going to transmit to the students the new contents of the programs.

The analysis of these documents illustrate on the foundations for the preparation of the chapters dedicated to Statistics, that were included in the *text books of Mathematics* of Primary and Secondary School. The publishers and authors were inspired by those documents for the preparation of their books.

The search of antecedents and the contact with work groups in subjects related to the Project were also carry out.

Compiling of Basic Information

The compiling of the existing information in text books of Mathematics referring to the teaching of Statistics was performed, having been detected the existence of 154 different books, belonging to 15 publishers, and that cover the different levels of Primary and Secondary School. Forty of them have been analyzed so far. The following card was made with each of them:

✓ CYCLE (EGB/POLIMODAL) (PRIMARY/SECONDARY)
✓ GRADE / YEAR
✓ NAME OF THE BOOK
✓ AUTHOR / AUTHORS
✓ PUBLISHER
✓ UNIT WHERE STATISTICS SUBJECTS ARE FOUND
✓ EXAMPLE OF THE ACTIVITY
✓ COMMENT OF THEORY USED (if there is one) AND VOCABULARY USED

Here rose the doubt on the use of statistical techniques in other curricular areas of the primary and secondary school.

This, predicted in the initial hypotheses of the Project, was impelled from a reformulation of the "Common Basic Contents" (Primary School Contents) of the Mathematical Area, whose "blocks" were reorganized and set in "axes." In the Level of Basic General Education (EGB) (Primary School) the following organizing axes have been considered fundamental:

Axis	Contents
1	Number and Operations
2	Notions of Geometry
3	Measurements
4	*Notions of Statistics and Probability*
5	Of the Technological Field
6	Of the Ethical Formation

It is appraised that the block corresponding to *Statistics* persists (it is 4th), and that the contents corresponding to the previous block Graphical and Algebraic Language (that at the moment do not appear), has been gotten up to the remaining axes. Within this new curricular design, in Axis 4 a special item called "*Data processing*" appears with the importance of Statistics from the Primary School.

Of the activities programmed within the *Compiling of Information*, the search was made for the application of specific concepts of Statistics in Language, Natural and Social Sciences books for Basic Primary School, level 1 and 2.

A concrete example of the finding regarding the use of *Statistical Graphs* per Area, an interesting Indicator is the "*Average of Graphs per Area or Science according to the amount of books*" consulted:

Area/Science	*Average of Graphs per book*
Natural	13.6
Social	58.3
Language	3.5

With this indicator it is corroborated that it is in *Social Sciences* where some *Statistical* tools are more used.

A "detailed pilot" analysis was also made selecting one publisher and a book of each cycle, observing that the chronological appearance of Cake Graphs in books of Social Sciences, does not agree with the appearance of the subject "Average" in books of Mathematics, which is a necessary item for the development of that type of graphs. The Mathematics books consulted were of the same publishing house.

ACTIVITIES TO DEVELOP IN THE FUTURE

In the future it is foreseen to continue with the execution of the planned activities, apart from taking up formal contact with the Educational Establishments for the compiling of information from teachers and students involved in the education of Statistics in Primary and Secondary School.

It has also been foreseen to continue with the task of analysis and filing of texts and planning of Secondary School.

PRELIMINARY COMMENTS

Even though the task of revision of text books must still be continued, is possible to draw some conclusions and comments, that without being considered final, somehow confirm the hypotheses of the work raised in the Project and the plan of future work. They are:

- ✓ It is doubtless that Mathematics has already gained its curricular space in Primary and Secondary School, established clearly in the Law.
- ✓ There is no doubt either that *Statistics* uses Mathematics as a tool.
- ✓ As well, Mathematics uses *Statistics* as a field of concrete and real application for the students.
- ✓ However, *Statistics* is a relatively new subject for our educational community, clearly mentioned in the Law, but:
  - ▪ Is it possible to take the contents of the statistical subjects and their methods to the Primary School level?
  - ▪ How can the interdisciplinary of *Statistics* with the others subjects (Geography, History, Physics, etc.) be implemented?
  - ▪ Would it not be advisable instead of concentrating the development of the subject of *Statistics* within Mathematics, include and develop it in each of the subjects that require it?
- ✓ The changes in the articulations to Areas like Social, Natural and Mathematical Sciences; the books analyzed and the order and content of items of the new regulation, confirm the hypothesis of the work raised in the Project.
- ✓ The Area of Mathematics has specific contains in its axes of learning of different concepts of *Statistics*, but most tools of this discipline are used by Social Sciences. The same does not happen to the Area of Language where practically do not exist.
- ✓ The relative doubt arises in the teachers and professors in charge of presenting those techniques and activities: are they able to develop the subjects of *Statistics* included in texts? The "gathered clues" suggest that they are not.
- ✓ The other basic doubt is: Do teachers develop subjects corresponding to the axis *Notions of Statistic and Probability* in their classrooms as the curricular design of the Primary School indicates. Again in this case, the gathered elements tend to respond that they do not.
- ✓ However, before proceeding to make proposals that intend modify and to correct the detected problems, it must be clear that the task of revising the text books of remaining cycles: Primary and Secondary School, must be continued and the direct interviewing of teachers and students should be finished.

ACKNOLWEDGMENTS