Explora: A Chilean Science and Technology Outreach Program in Probability and Statistics

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Abstract:

The Chilean National Committee for Scientific and Tecnological Research (CONICYT) has scientific outreach programs, under the umbrella of the Explora (Explore in Spanish) Program. This program finances small projects, addressed mainly to children, and this paper discusses the experience of the authors with the two related projects: *Randomness, Science and Society I and II.*

The project were aimed at secondary school students, mostly 15—17 years old. There were about 200 students in all, selected by their Mathematics teachers, from about 20 different schools. The project consisted of three modules: *Statistics and Media*, *Exploratory Analysis*, and *Probability*. The first module develops common sense and critical spirit for reading information from the media. The second formalizes ideas from the first, introducing the concepts through experimentation by the students and written materials make heavy use of cartoons relating the concepts with everyday life. Interpretations are emphasized and mathematical language is avoided as far as possible. The last module deals with probability, using an empirical approach, involving both physical experiments and simulations. The last two modules required the students to carry out group projects. In both years the students were able to develop interesting statistical projects, most of which related to social issues. In the second year were the students were able to organize a successful probability fair. The skills that the students acquired with a minimal amount of tutoring were outstanding. On the average, students seemed to have fewer learning difficulties than their teachers, who helped co-ordinating the students from each school.

Keywords: Statistical education; Statistics and the media; Probability and simulation; Workshop.

Introduction

Research in teaching statistics is very recent in Chile, a great impulse for its development was provided by the educational reform, which was initiated about five years ago. This reform included, for the first time, a significant statistical contents at the high school level [4]. Also in the last few years, other institutions, like the Chilean National Committee for Scientific and Tecnological Research (Conicyt) became more involved in scientific outreach programs. The main one is an umbrella program called Explora (Explore in Spanish), which finances fairly small projects aimed at children. This paper discusses our experience with two such projects: *Randomness, Science and Society I and II* [2]. They were aimed at students from year 10 and 11 (about 15—17 years old), coming from 20 different schools. The about 200 participants we selected by their Mathematics teachers.

The project consisted in a workshop divided in three modules: *Statistics and Media*, *Exploratory Analysis*, and *Probability*. The first one develops common sense and critical spirit for reading information from the media. The second formalizes ideas from the first, introducing the concepts through experimentation by the students and employing written materials that make heavy use of cartoons to link the concepts to everyday life. Interpretations are emphasized and mathematical language is avoided as far as possible. The last module deals with probability, using an empirical approach, involving both physical experiments and simulations.

Statistics and Media

To motivate the students participating in the project, the first two sessions are devoted to the presentation of a series of headlines and articles published in the written media, which show statistical results in an appealing form. The students are asked to analyze this information and to discuss among themselves different interpretations that can be made starting from the headlines. It is seen that most articles are either misinterpreted or show clear biases. As an illustration we present below three particular cases, in the context where they were presented: Surveys, Sampling, Exploratory Data Analysis and Misuses of statistics. The articles and their headlines were extensively discussed in terms of methodological aspects, and even touching some ethical aspects in journalism.

There is an uneasy relationship between statistics and the media, particularly with the written one. There is a real need for mutual feedback and it is a recurrent fact that the most diverse statistical contents are used to structure a main page, as a simple manner of attracting the attention of the reader. Unfortunately, this relationship is not always beneficial for the statistics. Although the persistent use of statistical arguments provides a good visibility for statistics, it is not uncommon that the reading of the statistical outputs is misguided. The success of the editorial line seems to rest on the low statistical literacy of a large part of the population.

In virtually all places in our planet, political surveys are tools for getting information, but are usually manipulated by interested parties, and the media acts as a box of resonance. Our country doesn't escape from this general phenomenon. Indeed, prior to our last presidential election (December, 1999) a new "journalistic word" came to life: *statistical tie*, to represent a not significant statistical difference between the intention of vote of the two main candidates. As shown in the newspaper covers, this statistical result was key to the composition of the most diverse headline and it was the form of communicating this virtual "statistical tie."

However this relationship between statistics and the media is not only present in the political area, but rather it pervasive through different areas. Two of them stand out: TV viewers' measurements and investigative journalism. The first has had great communicational impact. Since the last decade, the *people meter* (measure of the rating of television program) is used in our country. In nearly four hundred households at Santiago (Chile capital city) of slightly over a million, electronic information is gathered on the TV consumption. This information is very appreciated by publicity agencies. The particular case of soap operas in prime time stands out as a very important one. In fact, true communication battles have been fought, based on the results of the people meter. I don't believe necessary highlight that this measure is sustained and- in the more varied times, truly defend for the statistics. Needless to say, the validity of the people meter has rested on statistical arguments, and they have been used to this effect.

Regarding the second area, investigative journalism, the use of statistical support of the most diverse journalistic articles has been growing. It is no longer sufficient to highlight the main result, but rather there