

Exploristica - Adventures in Statistics: a new itinerant exhibition for teaching and learning Statistics

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Abstract

Statistics can be fun. Exploristica - Adventures in Statistics - is a new itinerant exhibition designed to teach the fundamentals and practice of Statistics and Probability intended for students of upper basic and secondary school (12 to 17 years). Describing five important phases of the statistical process - Select, Collect, Describe, Estimate and Interpret – Exploristica is organized in several modules that present the main statistical concepts in the form of games and other interactive experiences.

Keywords: statistics education, descriptive statistics, sampling, games

1. Introduction

Statistical users must be provided with tools to decipher the specific language of statistics and young people, in particular, must be helped to overcome their reluctance to deal with this subject and become critical and responsible users of statistics. Data analysis and the study of probabilities provide a natural environment for students to set up connections between mathematics and their everyday experiences. In fact, in recent years, the teaching and learning of statistics has become more practical, and interactive. One of the main causes that contributed to this improvement is that the paradigm of statistics pedagogy has changed in the last two decades: statistics is more than a branch of mathematics supported by data analysis: it involves experience planning and problem-based matters that needs careful thinking and reasoning (Garfield, 2002, Garfield and Gal, 1999, Moore, 1992, 1998). Under this new paradigm, statistics can be taught with fun, using games based on a series of applied problems – problems that could very well be taken from news items with a statistical content found in the mass media. In fact, the use of fun is consistent with the GAISE recommendations (Aliaga, et. al 2004), which note that active learning activities “often engage students in learning and make the learning process fun” (Lesser et. Al, 2013).

2. Experiences in teaching statistics with games

The idea is far from being new. National Statistical Offices use games to teach statistics and promote statistical literacy. For example, the Schools Corner of Statistics New Zealand (<http://www.stats.govt.nz/>) uses games to encourage students to explore the concepts of statistical methods in a fun and interactive manner. Games have been graded into curriculum levels to help teachers identify which games are most appropriate for their students. In a different site,

the CAUSE (Consortium for the Advancement of Undergraduate Statistics Education) fun items collection is one of CAUSEweb's most-visited resources. Launched in 2004, the collection (<http://www.causeweb.org/resources/fun/>) contained over 400 items as of December 2012.

3. What is Exploristica?

Exploristica - Adventures in Statistics - is a new itinerant exhibition designed to teach the fundamentals and practice of Statistics and Probability intended for students of upper basic and secondary school (12 to 17 years). Describing five important phases of the statistical process - Select, Collect, Describe, Estimate and Interpret - Exploristica is organized in several modules that present the main statistical concepts in the form of games and other interactive experiences. The main concepts to be taught are the types of data, location and dispersion measures (mean, median, standard deviation), graphs (box and whiskers, bar plots, histograms), random and non-random sampling, relative frequency, and probability. In this talk, we aim at presenting the several games and activities as well as the main statistical concepts transmitted to students.

Each participant uses a sheet, the explorer sheet, mounted on a board, where it is possible to collect information, writing notes and drawing conclusions, as requested as long as they go through the various modules of the exhibition.

There are six modules (i) In the Welcome module participants introduce their data and produce graphs and tables and discuss the main results. (ii) in Archery, players use a real bow to shoot arrows at the target and use distances to the target center in order to learn the concepts of location and dispersion. (iii) inside the Submarine, participants perform a journey through an underwater ecosystem where they need to collect a sample of a new species of reptile. Then they produce box and whiskers plots of the data, to help determining the subspecies of the reptile; (iv) the Census Quizz is a set of questions, based on Portuguese Census 2011 data, which players have to answer in the fashion of "Who wants to be a millionaire". (v) in False Dice, participants use four dice, which they roll to discover which of them are fake. (vi) Sampling is a game that uses the big gorilla Conga, to help collecting a non random sample of the inhabitants of the city and compare it with a random sample in order to estimate the proportion of voters in D. Stimacione. Games are complemented by posters that reflect some practical applications of the concepts presented in a playful way: in industry, medicine, etc. Exploristica is a project of SPE (The Portuguese Statistical Society) supported by Ciencia Viva, the National Agency for Scientific Culture.

4. Conclusions

Since March 2013, Exploristica has been visited by hundreds of persons in Portugal. Participants have explored the main concepts of statistics and a first study containing the results of the exhibition is being prepared for being delivered by the end of the year.

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