STATISTICAL LITERACY ACTIVITIES IN PORTUGUESE SPEAKING COUNTRIES

Pedro Campos[1], Mauren Porciúncula[2], Júlio Delgado[3]
[1]Statistics Portugal and University of Porto, Faculty of Economics, R. Dr. Roberto Frias, Porto, Portugal
[2]Universidade Federal do Rio Grande (FURG), Institute of Mathematics, Statistics and Physics - IMEF
[3]Senior Researcher, Inove Research – Investigacäo & Desenvolvimento

The promotion of statistical literacy and capacity building is increasing worldwide. This growth has been motivated by the increase in the general literacy of the populations and by the general improvement of living conditions. Quantitative literacy, and statistical literacy in particular, are more relevant nowadays, given the current pandemic context of COVID-19, where the information burden increased, and citizens need more and more skills to interpret numbers and learn what is hidden behind them. In this paper, we provide a summary of the best practices of some Portuguese-speaking countries that can be seen as inspiring a benchmark that allows the promotion of statistical literacy in other communities that are united by the same language. In addition, we emphasize the role of the current pandemic in the evolution of the activities that promote statistical literacy.

INTRODUCTION

Over the last 65 years the global literacy rate increased by 4% every 5 years – from 42% in 1960 to 86% in 2015 (van Zanden et al. 2014). However, we know that ever more needs to be made in what concerns quantitative and statistical literacy. In the "A World That Counts" report, the United Nations Secretary General's appointed Independent Expert Advisory Group (IEAG) on the 'Data Revolution for Sustainable Development' to call for statistical literacy and recommended that more needs to be done to increase global literacy (PARIS21, 2021). It stressed that the world must acquire a new 'data literacy' in order to be equipped with the tools, methodologies, capacities, and information necessary to shine a light on the challenges of responding to the new agenda".

In a different study from PARIS21, a link between the news in the media and statistical literacy has been analyzed, based on national newspaper archives (PARIS21, 2020), and results suggest that there are important differences in the performance across regions. The study concludes that the use of data in news articles increased substantially in 2020, mostly due to the intensive reporting on COVID-19-related stories. If eliminate COVID-19 related contents, the level of statistical literacy actually remained at the same level in most regions except Oceania. Indeed, statistical literacy levels are not homogenous in all geographical spaces. Within the same country there are sometimes strong asymmetries that make it necessary to develop measures to mitigate these disparities. In this paper we will not focus on these asymmetries around the world. Instead, we propose a set of good practices that can help developing and harmonizing the levels of literacy worldwide, based, for example, on strengthen the communication among countries to establish common education policies.
Section 2 presents three initiatives for Statistical Literacy in Portuguese-speaking countries: Brazillian LeMe; Promoting citizen literacy in Angola and Cape Verde; and Portuguese Exploristica 2.0. The presentation of some details of these projects aims to elucidate the potential of these initiatives, as well as points of confluence between them. Ideas for common goals, developments, and the future are addressed in Section 3, where we refer to the strengthening of partnerships between these ventures, as well as the implementation of these in other countries, enabling more places to be integrated into this network, as well as motivating their replication.

SOME DEVELOPMENTS IN PORTUGUESE LANGUAGE

Reinforcing the communication among countries and sharing good practices is maybe a solution to increase the development of partnerships and mitigate the intra-regional differences in terms of statistical literacy. In this section we address the recent developments in four different Portuguese speaking countries (Brazil, Angola, Cabo Verde and Portugal), regarding projects that aim at promoting statistical literacy.

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Brazillian LeMe

In Brazil, project LeMe (https://leme.furg.br/pt/a-expedicao) has been developed as a Statistical Multimedia Literacy Project, seeking to promote social transformation through active, playful and interdisciplinary pedagogical practices. It aims to providing leading roles of children and young people as researchers, so that they can identify how statistics are produced, their needs and how they can be used to guide possible social changes in communities. The metaphor of LeME takes children and young people through expeditions, where they embark as crew members - establishing an analogy with the people who guarantee the operation of a boat, due to the intended role of the apprentice. LeME starts from the premise that a subject, to be considered statistically literate, must present requirements demanded worldwide, such as: understanding why data are provided and how they can be found; be familiar with basic concepts and ideas related to descriptive statistics and graphical and tabular presentations; understand how the inferential process is achieved. At its core, LeME contemplates the development of Project-Based Learning (PBL) for the promotion of Statistical Literacy. However, it is dynamically reconstituted from a variety of elements. These are proposed by an itinerant and interdisciplinary team of undergraduate and postgraduate university students - under the coordination of the same professor - who designed the LeME, as well as through the dialogic interaction with the community of children and young people benefited. The elements that give this plurality to LeME (Porciúncula, Schreiber, Almeida, 2019), are related to the activities proposed by this interdisciplinary team, based on references in the field of Statistics, Education, Psychology and Technology.

Through the Learning Projects, children and young people define the theme they seek to research:

- define the population the sample to be investigated;
- develop data collection instruments;
- assume a research function and collect data of self-interest;
- organize this data, manually or using technologies;
- perform descriptive statistics;
- present the results and share them with the school, community or group participating in LeME, through the local school journal (“LeMEcional”) or through Statistical Posters, which can compete in the International Posters Competition of ISLP.

Promoting citizen literacy in Angola and Cabo Verde

Over the last five years, the work of promoting statistical literacy has been based on carrying out various activities (Workshops, competitions, Seminars, Webinar, Distribution of infographics, activity on community and educational radios) with students, teachers, parliamentarians, professional associations (journalists) and policy makers. One of the practices that have proved to be very fruitful is the participation of CEOs and policy makers in conferences and thematic seminars in schools where the experience of using and applying statistics in their professional and day-to-day activities is shared. Both CEO's have addressed different topics in order to demonstrate the importance and implications of decision-making based on statistical information - use of statistics on the day of organizational management (showing applications in the financial, human resources, production, etc. areas). In the same way, policy makers have focused on the use of statistics in governance – on planning the state budget, on defining policy, sectorial publications: education, health, sport, etc. Given the current context of the pandemic, the responsible intend to deepen the practices of creating digital content and disseminating statistical knowledge through community radio – educational and internet – social networks.

Portuguese Exploristica 2.0

Statistics Portugal and the Portuguese Statistical Society (SPE) finished, in 2020, the new Explorística 2.0, a traveling exploratory exhibition containing games and other interactive experiments, with the aim of bringing the fundamentals of Statistics and Probability to basic and secondary schools and introduce them to the Data Science world. This traveling exhibition is an

evolution of its previous edition, "Explorística – Adventures in Statistics", created in 2013 by the Portuguese Statistical Society, with the support of Ciencia Viva – a Portuguese government program for the promotion of education and scientific culture. Exploristica 2.0 integrates several interactive modules, each involving different activities, such as selecting, collecting, describing and estimating. It is available as a traveling exhibition, easily transportable, and in the following virtual versions:

- online via browser, with free access and without installing additional software;
- mobile *apps* for Android and IOS.

There is also a version of one of the modules (Submarino) in virtual reality mode. Explorística 2.0 has a host, detective Sebastian Probable, who is the guide in solving the problems and mysteries that constitute the challenges posed throughout this adventure that comprises six different games:

Clock
In a watch factory, it is necessary to fine-tune the machine where the glasses of the dials are placed, as it has been found that some examples have been produced that have loose or broken glass. With this module, it is intended that students become aware of the use of the most used statistical measures for quality control in industry (mean, median and standard deviation).

Dr.Odd
Dr. Odd was murdered in his mansion. Five weapons, which must be discovered, may have been used in this crime; on the other hand, there are six suspects of having committed the murder. By knowing the odds that each weapon is the murder weapon and each suspect used each weapon, students must calculate which suspect is most likely to be the criminal. This module thus aims to explain the use of conditioned probabilities and the usefulness of the Venn Diagram in this context.

Conga
With the elections approaching, the president of the parish council, D. Stimacione, wants to know if he has a chance of being reelected. With the help of the great gorilla Conga, first a convenience sample is collected and then a stratified random sample, verifying how different the results are, in one case and the other, when it comes to estimating the expected number of votes in D. Estimate.

Patchwork
After a bank robbery, scraps of fabric are discovered in a nearby garden and several suspects whose pants were torn as they passed through that garden are arrested. Making a collection of pieces of fabric on the spot, in order to constitute a representative sample, based on this pattern, we seek to identify the assailant, according to his torn clothing.

Quizz
Competition-game, in the style of "Who wants to be a millionaire", in which the team that can answer correctly and faster to a set of questions about official statistical information wins.

The key
In this module, we teach how it is possible to calculate the area of a circle by making successive throws of small cubes in a quadrangular area in which a circle is inscribed. This simulation system – the "Estimatron"! – is based on the Monte Carlo Statistical Method. Repeated rolls with the Estimatron allow you to check the ratio of the area of the circle to the area of the square.

Submarine
A submarine trip is on a lake where you have to collect specimens of a new species of predatory reptile that is making fish disappear. Participants weight, measure and identify the sex and age of each of the specimens they capture (and then return to the water). After this data collection, it is explained how to draw up a diagram of extremes and quartiles. Finally, based on the information that Sebastian Probable already has, obtained in previous expeditions that identified the existence of 3 different

habitats in the lake, students are challenged to find out in which of these habitats they were collecting specimens.

COMMON GOALS, COMMON DEVELOPMENTS, AND THE FUTURE

On several occasions, as we share a common language, initiatives have been taken and contacts have been made to establish joint partnerships. For example, access to the contents of the descriptive statistics and probability courses available at ALEA (www.alea.pt), a Statistics Portugal website dedicated to schools, was given to bank managers in Brazil for internal training purposes. The two statistical institutes in Portugal and Brazil (INE and IBGE) have organized common initiatives in the form of seminars and conferences.

Likewise, contacts have been made with Angola so that Exploristica can travel in Angola's schools. Recently, on May 4th, 2021, in the light of Statistics Angola in Schools (INE NAS ESCOLAS) program, the Luanda Medium Institute of Economy (IMEL) exhibited the Statistics publications and manuals produced by the National Statistics Institute (INE, 2021). The presentation took place on the sidelines of a talk on Consumer Price Index Statistics (IPCN) aimed to familiarize the students of the Statistics and Planning course of the II Cycle of that institution with the immense and rich statistical collection available at INE. LeME has already been implemented in Mozambique. Further efforts are needed to develop it Portugal, Angola and Cape Verde. Universities in these countries maintain several agreement and receive students from Statistics and Maths in post programs. Also, between Statistics Cabo Verde (INECV) and Statistics Portugal (INE), there have been old contacts to develop joint ideas in the field of dissemination of statistics. The initiatives of ISLP (International Statistical Literacy Project) contributed to a great union of efforts through its country coordinators. This union has allowed enriching the existing share of resources on the ISLP website (ISLP, 2021).

Bringing together the experiences mentioned above and based on the principles that led to the creation of the Community of Portuguese Language Countries (CPLP), which favors the deepening of mutual friendship and cooperation among its members, the opportunity emerges for the creation of a "laboratory for the promotion of statistical literacy" (LAB ISLP - CPLP project) in the near future. The idea is to create an open and permanent space for sharing knowledge, experience, and promotion of statistical literacy for the citizens of the community, taking advantage of the historical, cultural, and linguistic heritage that unites them, involving all stakeholders (Governments, INE's, Universities, among others) aligned with the objectives of the ISLP.

Fig 1. Portuguese speaking countries potentially involved in the Laboratory for the promotion of statistical literacy" (LAB ISLP - CPLP project)

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