Statistical literacy – Statistics Portugal approach to improve it

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**Abstract**

Knowing how to use statistical information is a necessary skill to most citizens at professional and personal level and there are no doubts about the key role that educational systems should play in the development of societies with a strong *statistical culture*.

Portuguese statistical authorities are also aware of this concern: stimulating the proper use of available statistics and promoting a greater awareness of respondents (individuals and enterprises) about their importance in survey replies. According to its Vision, Statistics Portugal (SP) intends to be acknowledged internally and externally as “an entity stimulating statistical literacy in society” and has developed different projects, in partnership with the educational community, to improve the understanding and use of statistics by students, teachers and researchers.

This paper will provide an overview of those SP projects, such as, the ALEA project (Local Action of Applied Statistics), providing both teachers and students with learning material for the study of Statistics of secondary education; the network in Higher Education Institutions Libraries; the Training sessions to basic and secondary teachers (facilitated locally in schools); and the Study visits to Statistics Portugal (basic-secondary but also higher education teachers/pupils).

Key Words: statistical literacy, concepts, projects, education, training, partnership.

**1. Introduction**

In present times, the use of statistical information became a current need for most people in their professional and personal activities, as it is essential to their active participation in society.

According to Carvalho (2006, p.7), "the complexity of the world where we live shows that it is unlikely that we comment on a social or physical event without the use of statistics and probability". This author (2003a, p. 538) also refers that "to know about statistics became mandatory if we want to have a critical, insightful and democratic participation in society".

Indeed, in a recent past statistics and statistical information were only used by specialized groups (such as researchers), but nowadays its use is widely present in population’s everyday life.

However, one can still observe weaknesses regarding the knowledge on statistics, as well as regarding its access, interpretation and use of statistical information. Additionally, population in general might not recognize the potential and the power of statistical knowledge to the evolution of society. This awareness led to several initiatives in order to reduce these weaknesses and so helping to increase statistical literacy in society.

**2**. **Statistical literacy**

There are several approaches concerning the meaning of statistical literacy. Ribeiro (2013, p.7) resumes some of them as follows: “Statistical literacy is the ability to handle situations involving statistical knowledge. This capacity covers different skills linked together, such as:

* Ability to understand / interpret statistical information;
* Ability to use statistical information;
* Ability to be critical towards statistical information;
* Ability to communicate making use of statistical information."

The development of these skills enables common citizens to solve consciously the challenges that arise in their daily lives which involve statistical knowledge and its use, enabling them to understand the reality, to have and express opinions, to make decisions, to criticize and to be intervenient in society. Batanero (2002) refers about this subject that the goal is not to provide the common citizen with skills that allow him to solve problems that require a deep and broad knowledge of statistics, but rather to give him a "statistical culture" needed to deal with situations that arise in their daily lives.

In this context, to increase statistical literacy implies to give citizens the proper knowledge so that they can deal with daily situations that require statistics use. Educational Systems have a key role in this area, but the increase of statistical literacy has also been a concern of the entities who produce and disseminate official statistics (Statistical Authorities), such as Statistics Portugal (SP) leading to actions in two ways: promoting the appropriate use of information produced by SP and raising the awareness of individuals and enterprises about the importance of their participation as respondents in statistical surveys/activities.

**3. Statistics Portugal approach to improve Statistical literacy**

SP concerns regarding the increase of statistical literacy are expressed in its vision "as an entity stimulating statistical literacy in society", and also in the context of the National Statistical System Strategy as reflected in the General Guidelines of Official Statistical Activity 2013-2017.

During the last years, SP developed in these area four initiatives directed mainly to teachers and /or students, although applying different approaches depending on the respective level of education.

|  |  |  |
| --- | --- | --- |
| Project | Education level | Main target |
| ALEA | Secondary education | Teachers and Students |
| Network in Higher Education Institutions Libraries | Higher education | Teachers, Students |
| Training sessions | Basic and secondary education | Teachers |
| Study visits | Basic, secondary and higher education | Teachers and Students |

***3.1 ALEA (Local Action of Applied Statistics)***

The project “ALEA – Ação Local de Estatística Aplicada” (Local Applied Statistics Action) was set up for the specific purpose of providing both teachers and students of secondary education with teaching materials for the study of Statistics, although it can be of benefit to other groups of people. It operates mainly through web pages (www.alea.pt) and under the concept of “edutainment”: statistics contents, statistical information and entertainment (the most part is downloadable material).

ALEA arose from a partnership between Statistics Portugal and the Tomaz Pelayo Secondary School, which were joined later by a Department from the Ministry of Education.

The website is currently visited by users from the different Portuguese speaking countries.

***3.2 Some ALEA areas [[1]](#footnote-1)***

***Statistical Concepts*** (handbook) **-** This area presents the concepts needed for learning about statistics, illustrated with examples. The layout follows the programme approved by the Ministry of Education and is divided into the following chapters: “Introduction to Statistics”, “Data, tables and graphs”, “Location Measurements”, “Dispersion Measurements”, “Bi-dimensional Distributions” and “Exercises”.

***Probability Concepts*** (handbook)**-** This area uses interactive environments to support the study of probabilities. After an explanation of introductory concepts given in a chapter entitled “Random events”, the throwing of a dice is simulated and the concepts of “event” and “operations with events” are presented using animations. “Probability Distributions” are then explained and, after a set of exercises, the course ends with the chapter entitled “Simulation of Probabilities”.

***Dossiers & Resources*** *-*This space has been designed to support the preparation of teaching materials on a variety of subjects, to support classes in mathematics, geography, social sciences, economics and others, and contains the following:

* Introductory course on statistical inference. The concepts covered correspond to those in social sciences applied mathematics programmes.
* Activity files for the classroom (ActivALEA), with exercises, notes, observations, comments and proposals aimed at systemising basic statistical training (at an elementary level). Examples: “Population, sample and descriptive statistics”, “Association between qualitative variables – Simpson’s paradox”, “Is a graph worth more than a thousand words?”, “Association between quantitative variables: the correlation coefficient”...
* Educational dossiers on some matters of interest connected to statistics, presented in a simple yet substantial manner. Examples: “Population and demographics”, “Consumer price index”, “Statistics with Excel”, “Probabilities with Excel”, “Presentations with Graphs”, “Statistical Surveys”, “Statistical Software”…).

***Fun with Statistics***  *-*Educational games and humorous cartoons to stimulate the study of statistics and the liking for searching for statistical information.

For example, the game “Trivial Statistics”, allows users to explore, while “playing”, the statistical information universe on the following subjects: Food, European Union, Women, Marriage, Territory and the Environment, Health, Holidays, Education, Crime, Sport, Culture and Leisure, and Communications. Other games include the “Memory Game”, “The Glory of Statistics” and some puzzles.

***Statistics in the Headlines*** *-* References to news items published in the press which contain statistical data. These news items are complemented with other useful information for understanding the subject in question.

Examples: “Portugal is closing its hospital and schools”, “Academic failure”, “School meals”, “Europe – Yes or No”, “Water use badly managed”, “War on smoke “…

***EuropALEA***  *-*Historical information on the main events which lead to the European Union in its present structure and statistical information about each one of the 28 member states organized in four themes: basic information, demography, economy and education.

***Portuguese speaking countries*** *-* Major indicators for each of the countries where Portuguese is the official language.

***Glossary*** *-*Every page on the website has a link to the statistics glossary where definitions can be found for more than a hundred terms.

***ALEA Challenges*** *-* Statistical challenges are put to pupils in order to develop their liking for statistics. These challenges are based on news (on daily life issues) containing statistical information in the text but also in graphics, published in newspapers and magazines. Each challenge has 2 levels: level 1 is for pupils up to the 9th grade while level 2 is for pupils in the remaining school years (up to the 12th grade). There are three challenges per school year; the list of participants with the best answers and the best challenge resolution are publicized in the Website.

**Average number of participants by Challenge each year**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
| 248 | 549 | 840 | 1 087 | 1 250 | 1 467 | 1 289 | 934 |

**Participants in ALEA Challenges (No.)**

**3.3 Statistics Portugal Information Network in Higher Education Institutions Libraries**

This Network started in 2004 and is currently composed of 34 Access Points to SP statistical information operating in Libraries located in public but also private universities and other higher education institutions. They were set up through partnerships between SP and each one of those institutions with the purpose of facilitating and increasing the access and use (which is free of charge) to official statistics, notably by their students, teachers and researchers. However, Access Points are available to all users.

In all Access Points users may browse through our website and consult publications in hard copy and/or CD-ROM, with local support from qualified staff trained by SP in a regularly basis. Additionally, in all Access Points a free telephone line connected to Statistics Portugal’s support service is available for further clarifications.

In the last years, an increased effort has been made to conduct training sessions (a 3h session) to users, assured by SP staff in our partner’s facilities, as the following table shows:

|  |  |  |
| --- | --- | --- |
| Year | Sessions | Participants |
| 2010 | 16 | 344 |
| 2011 | 15 | 273 |
| 2012 | 28 | 346 |
| 2013 | 43 | 738 |
| Total | 105 | 1 701 |

These sessions are focussed on the search and use of data available in SP Portal ([www.ine.pt](http://www.ine.pt)), with a strong practical component.

**3.4 Training sessions to basic and secondary school teachers**

In August 2010, an agreement was made between SP and the *Schools Library Network (RBE)* in order to conduct training sessions on the scope of “Improving statistical literacy to a better citizenship” to basic and secondary school teachers.

In these sessions (a 3h session) conducted by SP staff, a first approach is made to the access and use of data disseminated through our Portal and also to some ALEA’s contents in order to help participants to apply this knowledge in their teaching activities. These sessions have also a strong practical component.

The table below resumes what was done on this matter in the period 2010-2013:

|  |  |  |
| --- | --- | --- |
| Year | Sessions | Participants |
| 2010 | 22 | 346 |
| 2011 | 29 | 454 |
| 2012 | 165 | 2 675 |
| 2013 | 64 | 999 |
| Total | 280 | 4 474 |

The training sessions, both in Universities and in basic/secondary schools take place across the country (mainland).

At the end of 2013, Statistics Portugal shared locally these practices, with the Regional Directorate of Statistics of Madeira and Regional Directorate of Statistics of Azores in order to enable their staff to start similar sessions in the autonomous regions.

***3.5 Study Visits***

Study Visits to SP occur on a systematic way since 1993, whose visitors are mainly students from Secondary Schools. They involve a presentation about a certain statistical domain and also a general presentation concerning SP Portal and ALEA Website (as described above). In each visit a set of practical activities in order to promote students active participation are undertaken, with the purpose to raise their awareness about the importance of statistics, their knowledge on concepts and also the potentialities on the use of what is available on SP Portal. This activity also allows to build a bridge between the statistical competences acquired in a school context and actual statistical production/dissemination in SP, as refered by Ribeiro (2013, p.127).

The sessions, that long for 1,5 hour, are presented by SP staff and occur in SP facilities in Lisbon, Oporto, Coimbra, Évora and Faro. Occasionally, SP Staff may undertake this activity in the School facility.

Over the last 3 years, SP hosted 4 354 participants involving 109 study visits. The most requested domains were: Institutional activity and the phases of the statistical process; Census; Demography; Geographic infrastructure; Labour force; National accounts; Consumer price index; and Tourism.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 2011 | 2012 | 2013 | Total |
| No. Study visits | 40 | 21 | 48 | 109 |
| No. Participants | 1650 | 887 | 1817 | 4354 |

Example of the contents on the Demography domain session:

Importance of demographic studies; Statistical information sources of demography; Main phases of the statistical information process applied to demography; Statistical information (such as resident population, population density, population change, birth and mortality rates, migration and net migration; natural and migratory growth); Demography changes.

**4. Conclusions and Challenges**

Generally, one can state that Statistics Portugal is succeeding in its activities towards the promotion of Statistical Literacy. Some examples are:

* The continuous growing of participation on ALEA Challenges;
* The increasing number of Access Points in Statistics Portugal Information Network in Higher Education Institutions Libraries;
* The increasing number of training sessions and of its participants (at the different levels) since these activities were put in place;
* The consistent good results obtained with the customer satisfaction surveys delivered to participants of all sessions described above, both oriented to students and teachers, over the last years;
* The bridge established between the educational community and SP in different levels of statistical competencies.

Concerning the Challenges, SP still has work to be done:

*ALEA*:

* Redesign and broaden the scope of the website, in terms of available contents and its coverage;
* Increase its dissemination at national and international level (e.g. translation into other languages).

*Statistics Portugal Information Network in Higher Education Institutions Libraries / Training sessions to basic and secondary school teachers*:

* Broaden the scope of Statistics Portugal Information Network in Higher Education Institutions Libraries;
* Diversify the existent training models, such as the implementation of the e-learning mode;
* Continue the improvement of training courses models;
* Start training courses of longer duration for teachers on the use of official statistics to produce teaching materials. These courses are accredited by the Ministry of Education.

*Study Visits:*

* Broaden the contents/domains of the study visits and adapt them to different audiences and needs;
* Increase and adapt these model/sessions to school facilities.

*Other:*

Start the implementation of open sessions in SP facilities to the public in general, duly advertised in SP Portal, covering different themes, such as: Access to the SP Portal; European Official Statistics; Consumer Price Index; Labour Statistics; Macro-economic Indicators; Statistics on Demography.

In general, one can say that one big challenge should be to meet the growing demands of the educational community, which makes a larger use of statistics concepts and official statistics. However, the approach to improve statistics literacy is a *never ending story*, that as to be constantly aligned with society needs and expectations.

**5. References**

[1] Statistical Council, *General Guidelines of Official Statistical Activity 2013-*2017, accessed on 15/05/2014 in <http://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_cont_inst&INST=386983&ine_smenu.boui=13918450&ine_smenu.selected=13940415>;

[2] Statistics Portugal (2009 edition), Quality Charter;

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[6] Carvalho, C. (2006). Desafios à educação estatística. Boletim da Sociedade Portuguesa de Estatística - outono de 2006, (7-9).

1. *There is a short English version of ALEA where only a few of these contents are available.* [↑](#footnote-ref-1)