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The Millennium goals, National Statistical Offices, the International Statistical Literacy Project and Statistical Literacy in schools

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Abstract

Reaching the United Nations' Millennium Development Goals will become more feasible if there is growth in the number literacy programs in National Statistical Literacy Offices and if the communication between the latter and statistics educators increases. There exist examples of National Statistical Offices working together with statistics educators to create resources for teachers. We compare them in this paper. But there are currently only limited ways in which the knowledge of these resources is disseminated, either nationally or internationally. The ISLP has a major role to play in helping achieve wider dissemination of these resources.

KEY WORDS: Government Statistical Offices; statistical literacy; school curriculum; lesson plans; data handling; metadata; Millennium goals; Istanbul declaration; competitions.

1.- Introduction

Now more than ever, it is important that National Statistical Offices (NSOs) work collaboratively with statistics educators to increase the statistical literacy of school children. Transformations in the information society and the ambitious goals for development set by the United Nations (UN) [48] and the Organization for Economic Cooperation and Development (OECD) [31] call for urgent intervention if we want to avoid a widening of the achievement gap across countries in the world and across different areas of society within a country. International organizations such as the International Statistical Literacy Project (ISLP) [20] and its umbrella organizations (the International Statistical Institute (ISI) and the International Association of Statistics Education (IASE)) can play an important role in facilitating the information flow between educators implementing recent statistics education trends in schools and NSO programs intended to educate children on the importance of their data and products. There are few venues where both statistics educators and NSOs meet together to interact and share ideas at a level appropriate for them both.

Cooperating and coordinating would be difficult if we did not have already some models to follow. We are referring to those NSOs which have succeeded in initiating dialogue and creating programs for children that both follow current trends in statistics education and at the same time help NSOs contribute to the wider goals set by the UN. In this paper we compare some of these programs and discuss the role that the ISLP can play in disseminating their successes to both other NSOs and statistics educators in general.

Section 2 of this paper describes the Millennium goals and the Global Project and how

other international and national organisms have followed suit marking the agenda for NSOs for the next few years. This section describes what appears to be a mandate from International Organizations towards a more statistically literate society in the very near future. Section 3 describes a similar trend occurring in statistics education and research. We provide three or four possible venues that could serve to enhance the communication between this sector and NSOs. Section 4 compares the programs for school children of Statistics Portugal, Statistics New Zealand, Italian Institute of Statistics, Statistics Canada, Statistics Finland, and the Australian Bureau of Statistics. Section 5 describes the International Statistical Literacy Project and how the nature of its goals and its activities make it a very suitable candidate to enhance the communication among Statistics educators and NSOs, mostly because the ISLP's activities involve both. We conclude with some thoughts on what is needed for the future.

2.- Towards an evidence-based world

The United Nations' Millennium Development Goals [48] are: end hunger; universal education; gender equity; child health; maternal health; combat HIV/AIDS; Environmental Sustainability and Global Partnership by the year 2015. To measure progress in the achievement of these goals, the global project , Measuring the Progress of Societies (OECD) [31] is the worldwide reference point for those who wish to measure and assess the progress of their societies towards the Millennium goals. Inspiration for the global project comes from the Istanbul declaration [23], which states that “evidence-based decision making has to be promoted at all levels, to increase the welfare of societies. In the “information age,” welfare depends in part on transparent and accountable public policy making. Statistical indicators of economic, social, and environmental outcomes and their dissemination to citizens can contribute to promoting good governance and the improvement of democratic processes. They can strengthen citizens' capacity to influence the goals of the societies they live in through debate and consensus building, and increase the accountability of public policies.”

Evidence-based decision making at all levels of society is impossible without access to information and knowledge. Many international projects have had to address the issue of access to information and the contribution to information and knowledge flows. Breaking the digital divide among countries to reduce information and knowledge gap is imperative for the millennium goals to be achieved. This has gradually changed the statements on literacy made by UNESCO [47]. The UNESCO's communication and information program has created its own information processing tools, which involve remote database management and a software package for processing and analyzing numerical data (CDS/ISIS and IDAMS, respectively) with statistical methods, recognizing implicitly that statistical methods and data management are crucial for obtaining information and knowledge. UNESCO's programs point to increasing information and knowledge for all people in order to reach "literacy for all" .

Surprisingly, the debates on goals, measurement, evidence-based decision making and bridging the information and knowledge gap, hardly mention the words "statistical literacy" and that is one fact making the flow of information between national and international offices and statistics educators difficult.

For Statistics educators, statistical literacy is two words often used to describe the most elementary dimension of statistics education (with statistical reasoning and statistical thinking being the other two dimensions). In this group, "there is no consensus on what constitutes statistical literacy, but all sources seem clear about the need for people (including learners in both formal, non-formal, and workplace contexts) to develop the ability to comprehend, interpret, and critically evaluate messages with statistical elements or arguments conveyed by the media and other sources. This ability will be termed here "statistical literacy" [14]. Trends in research-based knowledge on statistics education point towards improving the ability of individuals to handle, summarize and produce data to be statistically literate. Thus, a broader view of statistical literacy includes the competency in handling and producing data. This latter idea, with different language and expressions, has also been heard in some international organizations meetings [17][32]. An important component of society under discussion in the statistical literacy debate is children in school.

Both statistics educators and those international organizations which shape the priorities of NSOs seek to fulfill a common goal, even if they don't use the same name for it. Progress towards this goal would be if both sides worked together. There already exist some examples of how that goal can be reached: a recent book of the ISLP [22] summarizes them. There is nowadays not only a potential role for products of statistical agencies to complement the statistical literacy education at the school level [13] but we have concrete examples of NSOs that are doing precisely that. They don't all follow the same model, as we will see below, but they represent a set of pioneering models that should make it easier for other NSOs to start their own programs and for statistics educators to start realizing the contribution that NSOs can make to statistics education in schools. More work in this direction is needed.

3.- Statistics Education in schools and NSOs Programs: venues to speed up convergence of directions

How can NSOs penetrate the world of statistics educators to gain more credibility? How can statistics educators penetrate the NSOs?

It is not in NSOs' mandates to teach statistics to children in schools [43][12]; yet several

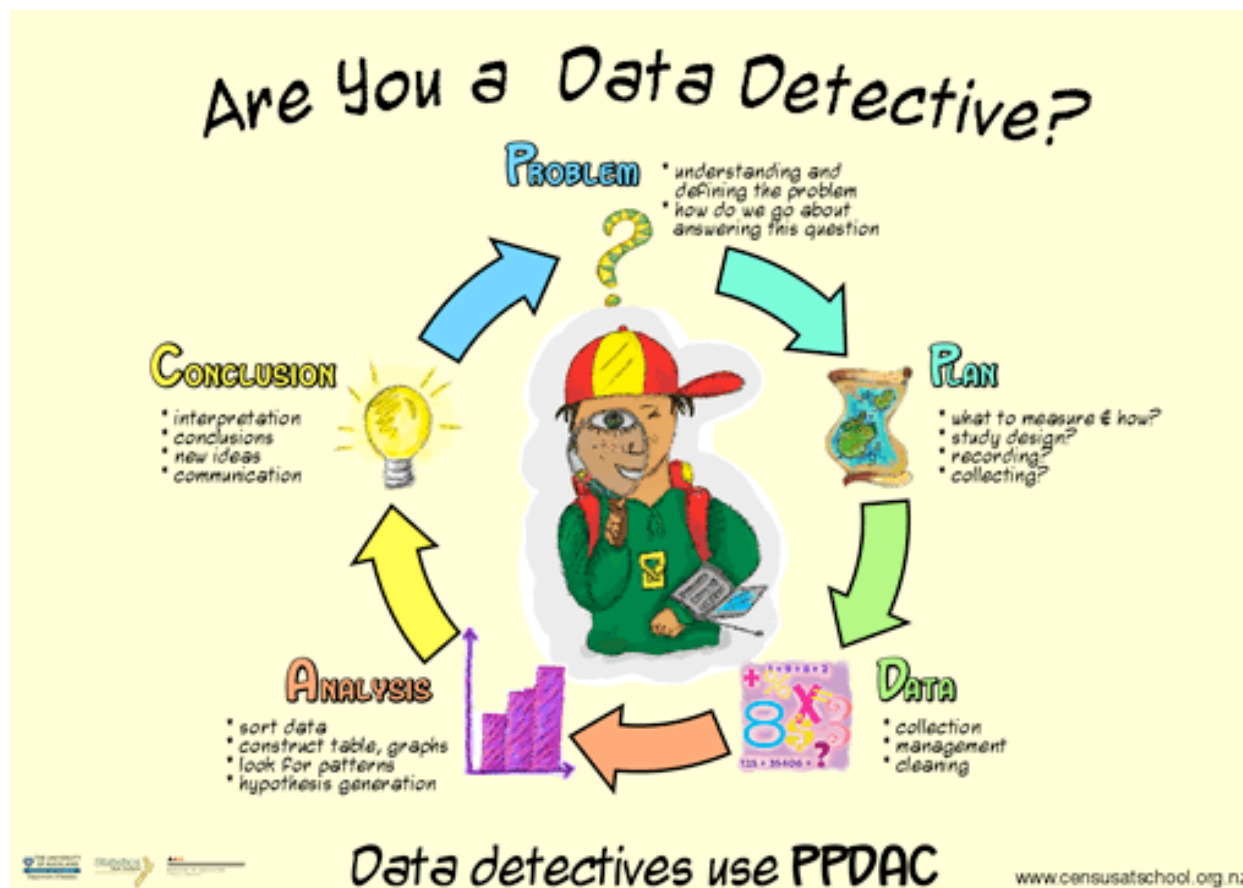


Figure 1. CensusAtSchool New Zealand poster

NSOs try to make it easier for teachers to teach using the NSOs’ official data by providing pedagogical materials using this data or summary official statistics. This enables students to work with real and relevant data [28]. Other NSOs are still behind in this endeavour and have only partially, or not at all, fulfilled their potential to enhance the learning of statistics [15][16]. On the other hand, some statistics educators keep insist that what NSOs do is not helpful for their teaching [49]. As is true in many dysfunctional families, lack of information and cooperation on both sides is to blame for this state of affairs.

The trend in Statistics education at the tertiary [29], secondary and primary levels is to spend a large part of learning exploring, summarizing and drawing conclusions from real, raw, data. The Data detective cycle, as presented by the Stats New Zealand

CensusAtSchool poster (Figure 1) is becoming the dominant view on how to approach the teaching of Statistics in schools [12]. It is also true that at the tertiary level, instructors outside the realm of statistical consulting and research have great difficulty finding new, real and interesting scientific problems with accompanying data to use in their classes and many have little exposure to the use of modern statistical methods in the scientific or social context. There is a need for active statisticians to contribute case studies to the education community [29]. Similarly, more activities integrated with the curricula are needed for schools to implement challenging teaching guidelines. Some NSOs offer prepared lessons and activities as well as aggregate statistics to make it easier for the teachers to do their job. Having more statistically literate individuals will increase the value of the products of these NSOs [22]. But, how do teachers know what NSOs have to offer and how can NSOs know what teachers need for their classrooms? A look at some channels of communication shows that there are ways to speed the flow of information between the two and we look at some of these below.

Peter Holmes said in 1979: “ Many new developments (in the teaching of Statistics) are based on hunch rather than research. There is not as well developed a theory and body of literature on statistical education as there is in mathematical education. Courses for teachers concentrate on the content rather than the process” [9]. The journal *Teaching Statistics* that Holmes founded is still the only international journal that concentrates on school level statistical material and that is about sharing good practice (at school level) worldwide. NSOs could reach teachers by showing their activities in this journal. Very few articles in *Teaching Statistics* are about the data handling activities of NSOs, or their other statistical literacy activities. Yet, there are numerous activities provided by NSOs that have the same or higher quality as some of the featured activities in that or similar journals [35].

There are other journals dedicated to statistics education not focused exclusively on the school level and not focused exclusively on sharing good practice. The American Statistical Association has spent a large number of years providing schools with activities

aimed to enhance the teaching of statistics (Statistics Teacher Network) and the Journal of Statistics Education (JSE) of the American Statistical Association has a very broad focus, from research to best practice, encompassing all levels of teaching and learning (from school to graduate) in any field of endeavour (from pure statistics to psychology and sociology). A careful examiner of its contents would have difficulty finding articles on the teaching of Statistics at school level, but no difficulty seeing a predominance of articles about, and activities for, the tertiary level teacher and student. Many of these could also be used in secondary education. This journal would also be a good place to display activities and lesson plans of NSOs to improve statistical literacy.

Statistics education research is a field concerned with research-based knowledge about how individuals teach and learn statistics. Sometimes, using theories of education, as they are usually learned in a graduate program in Education, statisticians concerned with the teaching of statistics have engaged in research to find which theory best fits the learning of statistics. Examples of this kind of research can be seen in the Statistics Education Research Journal (SERJ) [38] published since 2001 by the International Association for Statistics Education (IASE) and the International Statistical Institute (ISI). The research presented in this encompasses the learning and teaching of statistics at all levels of education. Articles on SERJ rarely focus on the products of NSOs as subjects of research, not even on those products that contain statistics education programs for children in schools.

Statistics education is a relatively young field of endeavour, thus much work in the areas mentioned above is found on the mathematics literature [42] and in journals dedicated to teaching with technology that we will not mention here. These, too, are appropriate avenues for NSOs to reach a wider constituency. Local mathematical societies also have newsletters that could be used to disseminate teaching activities. Some National Statistical Societies also have Education committees concerned with the teaching of statistics in schools.

Nowhere in this growing body of literature on statistics education research and practice, is there to be found an article on best practices coming from the activities and lessons created by National Statistical Offices to educate the public in statistics.

Proceedings of the IASE's International Congresses on the Teaching of Statistics (ICOTS) found in the IASE's web site, have, once in a while, someone from a government statistical office –mostly some of the authors of this paper- introduce their programs without going into much detail on the activities themselves [4]. But there is no research on the teaching and learning of the materials that NSOs provide to teachers and students to improve their statistical literacy and no presentations of best practice.

No presence in the mainstream journals and conference proceedings in statistics practice and research does not mean that this literature does not exist. Indeed, several NSOs have a close relationship with teachers who use the NSOs activities in the classroom, and these NSOs have their own newsletters, projects, meetings and web sites where experience with the activities and lessons can be achieved. But there is a need to increase the flow of information from NSOs to statistics organizations and vice versa through broader channels of communication.

4.- Common threads and singularities in the contribution of some national statistical offices to the statistical literacy of school children.

The NSOs: Statistics Portugal [6]; Italian Institute of Statistics [18]; Statistics New Zealand [12]; Statistics Canada [46]; Australian Bureau of Statistics [43]; Statistics Finland [37], whose programs are summarized in our recently published book [22] share the goal of helping students and teachers feel more at ease with data handling and the interpretation of statistical results that affect their daily lives. All these NSOs have programs that are examples of cooperation and collaboration between statistics educators and NSOs and they thus serve as models to inspire new programs in other NSOs. In this section, we compare the projects according to contents and approaches.

CensusAtSchool . Three of the NSOs featured in the book are currently running the International CensusAtSchool project (these are the three countries in the Commonwealth of Nations: Australia, Canada, and New Zealand). This project was adapted from the Children's Census initiated in 1996 by Sharlene Forbes of Statistics

New Zealand [11]. Two other countries ran their own national version once (Portugal in 2001 and Italy also in 2001 [8]. All these NSOs share similar goals:

- Encourage children to get involved with data handling and learn statistical skills;
- Provide real data for data handling activities;
- Increase awareness of what national censuses are and what they are for;
- Show how Information and Communication Technology (ICT) can be used effectively to enhance teaching and learning especially in the area of data handling.

Whereas Canada and New Zealand facilitate the acquisition of the children' data by the teachers to use in the classroom, Australia does not, allowing teachers only to use random samples. Portugal and Italy did the project mainly to learn about the children and shared the summarized information with teachers via a publication. The students and the teachers did not share the data, only the results of the survey.

Development of competencies via lesson plans, activities for the classroom and e-books.

The NSOs featured learned very quickly that to get the message across to teachers, well prepared lesson plans and detailed activities and instructions had to be provided to them. For this reason, we can find in almost all the NSOs featured in our book this very important resource for teachers. There are differences and similarities across the countries in these though.

Canada's Education Resources [5] , Australian Bureau of Statitics' Education Services [3] and New Zealand's School corner [28], have followed a similar pattern of having detailed and structured lesson plans with activities and working sheets prepared for the

teachers and students, based on data published by the national statistical organizations and sorted according to several criteria: discipline where the

Find info by subject	Active kids activity
Find info for primary	Agricultural statistics in the media – Activity
Information	Activity
Activities	Agriculture activity
Teachers	
Find info for secondary	Be a sport activity
Find info by curriculum	Census treasure hunt activity
Find info by level	Counting people in New Zealand activity
Email Us	
SURF for schools	Drawing pictographs activity
	Drawing pie graphs activity
	Drawing stem-and-leaf graphs activity
	Drawing strip graphs activity
	Drawing tally charts activity

Figure 2. New Zealand’s School Corner

lesson will be used (social, science, mathematics, etc.); level of education (elementary, middle or high school); topic; region of the country; etc., as indicated by Statistics Zealand’s categories given in Figure 2. Separately from this bank of activities, some countries present an e-book with statistical concepts, similar in format to what a textbook would contain. For example, Canada’s “Statistics, Power from Data”[40], and “Teacher’s guide to data discovery.”[44] and Australia’s “Teaching Statistics.”

Statistics Finland’s (e-book) [39] and Statistics Portugal’s ALEA [1] (“lessons on statistics,” “lessons on probability” and the more detailed “dossiers and resources”

lessons Portuguese version), organize the material in terms of lessons similar to those that would appear in a Statistics Textbook, by statistical concept of the Statistics discipline, with examples and exercises drawn from the NSO's official web site. Teachers are provided with the concepts and official information in a user friendly manner, but it is up to the teacher to combine these to make a lesson plan. Stories about the data produced periodically by the NSO are presented separately.

Italy presents a unique case. Using a story telling approach and a hypertext, the "Statistics by Example" [37] contains all in one place in the form of a story. If you are a teacher, you access a lesson as if it was a story. As you read through the story, you run into concepts that may be unknown, in which case you click on the word and have a pop up window coming up in the preliminary section of each chapter. Italy's e-book is very different from that of the other countries, and it is presented in "The Worth of Data" [4]. For example, here is an excerpt from a game in "Statistics by Example" that uses the preliminary results from the 14th General population and household census of October 24, 2001 (the tables mentioned in the text are not included here).

Paolo is 13 years old. He was born in Rome on October the 12th of 1989. He lives in the city with his parents and his older brother, Andrea. In 2002 he started 8th grade in the same public school he had attended the year before. Paolo is a regular kid just like you. We offered to play a game with him: finding himself in official statistical data, that which is produced and published every year by Istat (the National Institute of Statistics).

Going through the Annuario statistico italiano 2002 (the yearly book of Italian statistical data) with Paolo, we found table 26.1 shown below.

Here is Paolo: He is one of the 27,260,953 male residents in the October 24th Census of 2001, as part of the 14th general population census (the 14th since Italian Unification). Moreover, he is one of the 2,380,453 male residents in the Lazio region.

We find him again in Table 2.2 (Resident Population per Region and Age class, not shown here). On the date of the census, Paolo had just barely turned 12. Therefore, he is placed with the 130,460 other boys between the ages of 10 and 14 that live in the Lazio region.

His family (Table 26.1) is one of the 21,503,088 Italian families that participated in the 2001 Census. Also because he lived in Lazio, his is one of the 1,937,353 families to live in that region.

Games and quizzes for students

All the programs featured in the book contain games of one nature or another. Portugal's "Trivial Statistics" (in Portuguese) is a quiz that tests knowledge of official Statistics. The students choose a theme and answer questions on that theme and obtain points. The best players are posted on the web site. The other sites and Statistics Portugal's one also contain games of different nature, all trying to engage the students in Statistics learning and in knowing about the official statistics of their countries and the metadata.

Understanding of Metadata

Metadata is data about data. In the teaching of Statistics in classrooms, it means: who are we talking about; when; where; how did we collect the information; what are we studying? [10]. Some call it the "context" of the data.

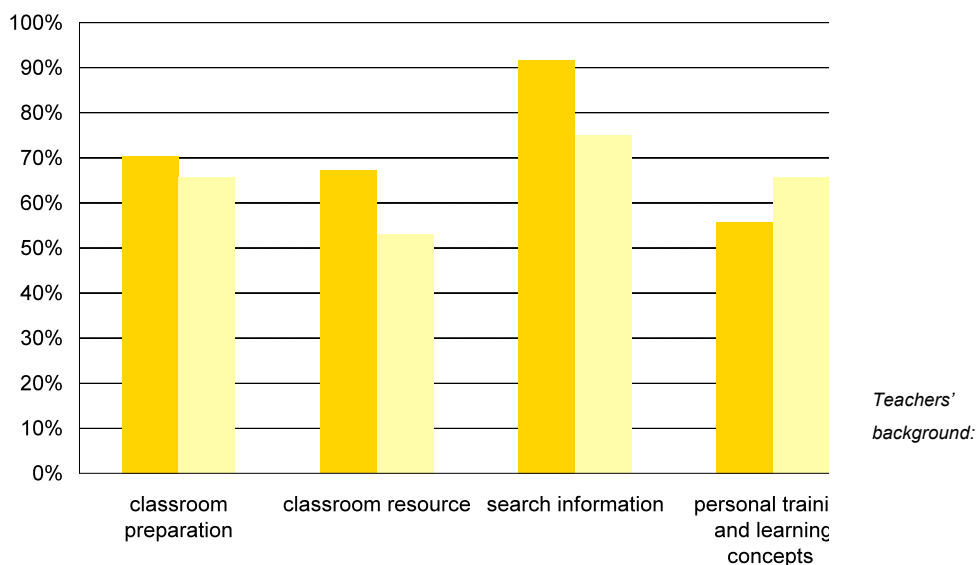
The different NSOs compared here use different approaches to metadata. ISTAT uses story telling directly linked to the data. To deliver statistics by telling stories means to transform facts and figures, by giving them a face, a gender, an age and so on, or by describing a fictional "real person" whom we could meet in our country or in our neighborhood [4]. Statistics Canada, the Australian Bureau of Statistics and Statistics New Zealand have numerous lessons which use as context a specific issue published by the NSO. Portugal and Finland introduce the metadata more indirectly, either via the examples in the e-books or via separate sections on the web page for interpreting the official statistics (for example, the ALEA link "News from Portugal"). All of the projects stress the importance of the metadata in one way or another.

Assessment of the programs

We will not find in the web sites of these NSOs any section on the assessment of their education programme's effectiveness and use. Even if each of the countries featured here have done studies to assess their programs, they are not usually published. Assessment

allows us to determine whether the programs are effective in improving the statistical literacy of school students, whether they aid in the professional development of teachers,

Figure 3. Uses of ALEA’s resources by Portuguese teachers.



or simply whether the lesson plans, the games, and other parts of the program are indeed used in the classroom , among other things.

Portugal has used a survey in order to answer to some of these questions [25]. This survey was targeted to the teachers that use the resources available in ALEA’s web page. One of the conclusions of the study was that the teachers with Mathematical qualifications use ALEA more often than others. On the other hand, teachers with different qualifications (Natural Sciences, Economy, etc) use ALEA more frequently for the specific purpose of “Personal training and learning concepts”. Figure 3 illustrates this part of the assessment. The survey did not assess children’ statistical literacy, but does

give some evidence that the effort is worthwhile. It would be desirable to have similar information for all NSO programs.

Competitions

Some NSOs have seen competitions as a way of promoting statistical literacy and, as a side effect, statistical learning in schools.

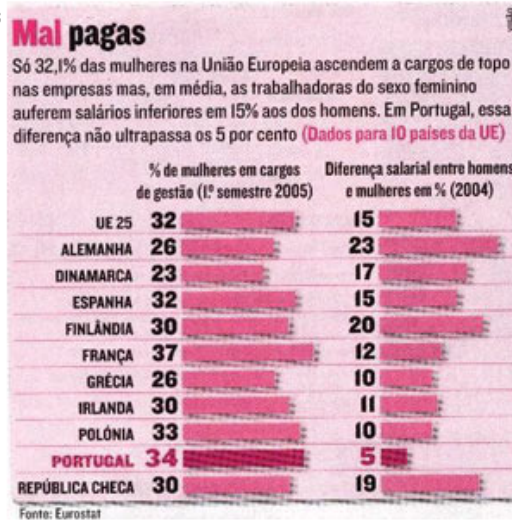
Take for example Statistics Portugal's "Challenges," used in the International Statistical Literacy Competitions of the ISLP. These depart from the notion that the reading of statistical information requires that the reader understands the concepts and the methodology used in its preparation [6]. ALEA's Challenges is a Portuguese language competition containing everyday life problems based on daily news. It is oriented towards secondary and primary school students. Periodically, Statistics Portugal sends an email to subscribers (subscription is free) and students are given a certain period of time to solve the problem and submit their answer electronically. Statistics Portugal keeps an electronic record of the participants and the winners. The questions have two levels, primary and secondary school and are aimed at increasing the ability to read tables and graphs. The problem showed in Figure 4 is an example of such a competition: students were asked to analyse the graphs published in a Portuguese newspaper concerning the difference of wages between women and men in Europe. Women earn lower wages compared to men and besides, only 32.1% of the women in the European Union ascend to top positions in the firms they work. A comparison between that percentage in some European countries is depicted in a bar plot. In a different bar plot, the difference between men and women wages in percentage is shown for the same set of countries. The first horizontal bars in the graphs represent the average values for European Union (UE 25).

Figure 4– Example of ALEA Challenge

Problema de Nível 1

Faz uma **leitura e interpretação dos gráficos** da figura ao lado e indica:

1. Quais são os países da União Europeia (UE) em que a percentagem de mulheres em cargos de gestão é superior à média da UE 25?
2. Qual é o país em que a diferença salarial entre homens e mulheres em % é a mais baixa?



Based on this information there are two different types of questions, with different degrees of difficulty. The questions are grouped according to the education level - basic and secondary. For the basic level, the questions are:

- What are the countries of the UE 25 for which the percentage of women in top positions is greater than the average of the European Union?
- In what country is the difference of wages between men and women lower (in percentage)?

For the secondary level, a different question is posed. Students must consult another graph and compare some indicators such as life expectancy, education level, employment rate, and rate of employment in the fields of Exact Sciences, Maths and Computer Science, considering women in Portugal and in the European Union. Students are asked to comment on a text that states that “Portuguese women are less qualified than the average in Europe, although they get better jobs and obtain higher results in the fields of

Exact Sciences. In some cases, they can even overcome the difference of earnings when compared to men” [6].

After a certain period of time, ALEA posts the names and schools of students whose answers were correct. There is a new “Challenge” every one or two months. Posting the school names and the students’ names brings recognition and provides an incentive for them to participate again.

Other Statistical offices have embraced the idea of a statistical competition, of different nature from that of Portuguese ALEA. For example, Italy collaborates with the Italian Statistical Society in order to organize a National Competition for the best work (research, an article or a study) in statistics. The collaboration includes provision to students and teachers of statistical data and a guide to the use of data and metadata. In the year 2008, the Competition was about women and their condition in the Italian society [18].

Another GSO that has embraced the idea of a statistical competition is the Australian Bureau of Statistics. In partnership with several Australian universities, the ABS sponsored a poster competition in 2008. Poster competitions are increasingly becoming a popular way of motivating students and teachers to pursue statistical literacy. Fairs are another way of bringing the competitive spirits of children for a good goal (eg. Statistics Canada [46]).

5- The International Statistical Literacy Project

We said earlier that the ISLP and similar organizations could potentially help increase the flow of information between statistics educators and NSOs with the objective of speeding up their cooperation. What in the ISLP helps facilitate that task and what hinders it?

The ISLP is by no means as influential and as far reaching as the UNESCO. Neither does it have any of the former’s resources, but it is the only international program dedicated exclusively to the promotion of statistical literacy. The International Statistical

Institute (ISI) created it in 1991 with the name “World Numeracy Project” (WNP). In the year 2000, the WNP was put under the umbrella of the International Association for Statistics Education (IASE), and acquired its current name, ISLP. Numerous initiatives were undertaken during the 1991-2000 period, all of them now part of the history of the ISI. The main goal then was to promote national statistical literacy programs, and to mount national numeracy drives in as many countries as possible, but the result of those efforts was mostly publications and documents rather than teaching resources.

During the period 2001-2006, the project was solely devoted to creating a web site of useful resources. A hidden secret, the ISLP web site was the richest pool of statistical literacy information across the globe for most of those years. During that time, the ISLP had a board of directors whose role was only to advise the ISLP coordinator, and the web pages were managed by page coordinators.

In 2007, with the appointment of a new Director, the ISLP reverted to the pro-active goals of the World Numeracy Project, putting more emphasis on action and active engagement in statistical literacy activities in the different nations while maintaining and expanding the rich web site of resources created in the early years by Carol Blumberg and the page coordinators. Several events have taken place since 2007: (a) changing the older web site to a wiki platform, hosted where the main IASE web site is; (b) reverting to the older goal of the National Numeracy Project: namely, the promotion of national statistical literacy programs in as many countries as possible, in cooperation with leaders in their home countries; (c) having a more aggressive approach to promoting the international resources via publications such as e-books, newsletters and the wiki web site, and (d) using the web site also as the vehicle of communication of ISLP activities.

The philosophy of the ISLP about how to promote national literacy programs and drives differs from that of the World Numeracy Project, though. The World Numeracy Project sought cooperation from big international organizations such as the UNESCO, UNICEF and the UN, and received no more than an expression of interest from these organizations. Despite all the difficulties encountered along the way, and the lack of funding, the leaders at the time produced resources that helped us understand the state of statistical literacy in the world. Those efforts, in an era when the Internet and Google

were hardly used by anyone, were priceless. However, it was relied too much on international organizations and leaders. The current leadership of the ISLP learned from that history and chose otherwise: to work with the national leaders of statistical literacy drives in the different nations and bring them on board before reaching the bigger international organizations. The dialogue NSOs and statistics educators has to start at that level.

Examples of the new philosophy of the ISLP is the set of activities we have carried since 2007.

(a) Statistical Literacy Competitions.

Mathematics has had a long tradition of competitions, a good example being the Mathematics Olympiads. Most teachers agree that the Olympiad increases the interest of students in Mathematics even though the majority of the studies on the effects of the Olympiad lack rigor in the design [33]. However, there is no such tradition in Statistics. Those who consider Mathematics as the same as Statistics, would not see the need to have a separate Statistical literacy competition. But statistics educators see such a need to encourage statistical literacy among students. Statistics requires an experimental environment where real data is analyzed with technology to answer relevant questions about the real world. It also requires the ability to understand how the statistical information came about and the distinction between bad and good statistical information. The training needed for this is very different from Mathematics, albeit it uses mathematics like any other field of Science. Many teachers are teaching good statistics to their students. We can use a competition to identify who they are and which schools offer examples of best practices across the world.. The ISLP organizes a competition that contributes to the information flow between educators and NSOs because from beginning to end this activity is done together with the NSOs of the countries participating.

One of the main goals of this competition is to gather under one roof all those teachers in different countries interested in statistics together with their NSOs as teachers usually do not attend IASE meetings, and IASE meetings are not really addressed to them either. Teachers also do not usually attend meetings of the Statistical Societies of their countries

and, rarely, do the Math societies meetings contain a full program in Data Analysis for teachers. Statistics teachers do not have an international forum for their needs. Finally, teachers do not know of the many resources that NSOs create for them. The ISLP competition uses these resources intensively. Training materials and tests of phase 1 can be seen at <http://www.stat.auckland.ac.nz/~iase/islp/competition>

(b) Information dissemination and publications

With a newsletter, a web site, several publications, and presence at many meetings, the ISLP hopes to let many know about international resources in statistical literacy that are not promoted elsewhere. Traditionally, the ISLP has maintained web sites with link to those individual statistical offices that carry some form of training and education programs in statistics.

We (the authors) recently published a book compiling the work of some statistical offices to promote statistical literacy in schools. The book is authored by the program directors in several NSOs, all of them members of the advisory board of the ISLP, all of them authors of this paper. We are in the process of finding the most appropriate venue to make this publication more widely available. In the meantime, we are still accepting chapters on new projects from other NSOs for the e-version (also known as b-version) of this book. The book has been very well received by teachers from secondary and tertiary institutions in different countries who were not aware that NSOs created good lesson plans and data analysis activities appropriate for the classroom. This realization has made some countries aware of the potential source for teaching that they have and has encouraged some to start similar projects in their countries (D'Amelio, 2008, personal communication).

Obstacles encountered by the ISLP in the pursuit of its goals.

Although progress is being made, the ISLP could gain much more strength if the obstacles that we mention below were overcome. Some of these obstacles are the same that NSOs face in promoting statistical literacy and that all Statistics educators embracing the most recent trends in Statistics education have encountered.

(i) For many, Statistics is subsumed within Mathematics

Statistics is still part of the Mathematics curriculum in many countries. In this scenario, an International Statistical Literacy Competition, like the one organized by the ISLP, or many of the lessons and activities of the NSOs' programs summarized above have no reason to exist separately.

(ii) Competition among institutions in a country.

The ISLP seeks national support for the promotion of the statistical literacy activity already taking place in the different nations. We can only achieve that through the individuals that volunteer to go along with us. Unfortunately, these individuals work and live in separate institutions (such as NSOs and universities), often competing against each other. In addition to that, individuals have their own goals for growth and promotion and sometimes they see the only way for them to grow is to compete not collaborate with others.

(iii) Lack of paid administrative structure to carry our jobs.

The ISLP, from its Director to every board member and activist, is based on voluntary work. All of us do work for the ISLP in our free time, after we have completed a full time job elsewhere (NSO, school, or university) and taken care of our families. As Mary Townsend points out (Townsend, 2008), "It's clear why a full time resource manager is required to keep our *Learning resources* web site vital."

(iv) Language differences and the definition of best practice

It is very costly to translate materials and activities to many languages. Yet, without doing so we can not reach many individuals. It is also hard to ask volunteers to spend time translating without some reward. While this problem exists, we will keep succumbing to the "best practice" syndrome, which basically is that the "best practice" is defined in the language that most people know (often English) because we don't understand potential "best practices" described in other languages. The ISLP has, at the moment, a long list of best practice projects that we have not made public yet because of the lack of resources to translate them.

Some of the obstacles mentioned above are faced not only by the ISLP but also by individual NSOs and statistics educators. Notwithstanding these obstacles, it is clear from the activities of the ISLP that without the dual cooperation of educators and NSOs it will be impossible to reach all corners of the world.

6.-Conclusions

As discussed in this paper there are already a number of examples of NSOs working together with statistics educators to create resources for teachers. However, there are currently only limited ways in which the knowledge of these resources is disseminated, either nationally or internationally. The ISLP has a major role to play in helping achieve wider dissemination. Additional resources are needed to facilitate this dissemination, particularly to poorer countries and into languages other than English but it is expected that with the growth of new statistical literacy programs in NSOs, the growth of communication among NSOs and statistics educators, and the dissemination of these by international organizations like the ISLP, reaching the United Nations' Millenium Development Goals will increasingly become more feasible.

References

- [1] ALEA (Local Action of Applied Statistics) <http://alea.ine.pt/index.html> (Portuguese,with more items); <http://alea.ine.pt/english/> (English).
- [2] ALEA Challenges, Statistics Portugal. <http://www.alea.pt/html/desafios/html/desafios.html>
- [3] Australia's Education Services, <http://www.abs.gov.au/websitedbs/cashome.nsf/Home/Entry%20Page.es>
- [4] Barbieri, G. A. and Giacche (2006). The Worth of Data: the tale of an experience for promoting and improving statistical literacy. Proceedings of the International Congress on the Teaching of Statistics, International Association for Statistics Education http://www.stat.auckland.ac.nz/~iase/publications/17/1A1_BARB.pdf
- [5] Canada's Education Resources, <http://www.statcan.gc.ca/edu/index-eng.htm>
- [6] Campos, P. Thinking with Data: The Role of ALEA in Promoting Statistical Literacy in Portugal. In *Government Statistical Offices and Statistical Literacy*. ISLP <http://www.stat.auckland.ac.nz/~iase/islp/stats-offices-book>
- [7] CensusAtSchool <http://www.stat.auckland.ac.nz/~iase/islp/census>

- [8] Conti, C. and Lombardo, E. (2002). The Italian CensusAtSchool. Proceedings of the Second International Congress on the Teaching of Statistics, 2002.
- [9] Davies, N. and Goodall, G. (2005). The Journal Teaching Statistics. Joint Statistical Meetings of the American Statistical Association. Minneapolis, 8 August 2005.
- [10] Deveaux, D. and Velleman, P. and Bock, D.E. (2008) Intro Stats, 3rd Edition. Pearson, Addison Wesley.
- [11] Forbes, S. (1996). Raising statistical awareness. *Teaching Statistics*, 18, 3.
- [12] Forbes, S. (2008). Raising statistical capability: Statistics New Zealand's contribution. *Government Statistical Offices and Statistical Literacy*. ISLP <http://www.stat.auckland.ac.nz/~iase/islp/stats-offices-book>
- [13] Gal, I. (2003a). Expanding conceptions of statistical literacy: An analysis of products from statistics agencies. *Statistics Education Research Journal*. 2(1), 3-22. (Online: <http://www.stat.auckland.ac.nz/~iase/publications.php?show=serj#archives>)
- [14] Gal, I. (2003b). Teaching for statistical literacy and services of statistics agencies. *The American Statistician*, 57(2), 80-84.
- [15] Gal, I., & Ben-Zvi, D. (July 2004). *Educational Services of Official Statistics Agencies: A Landscape View*. Proceedings of the Special Topic Group on "Research and development in the teaching and learning of probability and statistics", the 10th International Congress on Mathematical Education. Copenhagen, Denmark. <http://dani.benzvi.googlepages.com/EducationalServicesofOfficialStatist.pdf>
- [16] Gal, I. (2007). Proceedings of the 56th session of the International Statistical Institute, Lisbon 2007.
- [17] Giovannini, E. (2008). The Role of Communication in Transforming Statistics into Knowledge. Proceedings of the OECD Seminar on Innovative Approaches to turning Statistics into Knowledge. Stockholm, Sweden, 2008. <http://www.oecd.org/dataoecd/30/32/40293021.pdf>
- [18] Giacche, P. (2008). Italy National Institute of Statistics: emphasizing the Metadata. In *Government Statistical Offices and Statistical Literacy*. ISLP <http://www.stat.auckland.ac.nz/~iase/islp/stats-offices-book>
- [19] Helenius, R. (2008). Statistics Finland. In *Government Statistical Offices and Statistical Literacy*. ISLP <http://www.stat.auckland.ac.nz/~iase/islp/stats-offices-book>
- [20] International Statistical Literacy Project (ISLP). <http://www.stat.auckland.ac.nz/~iase/islp/>
- [21] ISLP <http://www.stat.auckland.ac.nz/~iase/islp/>

- [22] ISLP (2008). *Government Statistical Offices and Statistical Literacy*.
<http://www.stat.auckland.ac.nz/~iase/islp/stats-offices-book>
- [23] Istanbul Declaration <http://www.oecd.org/dataoecd/23/54/39558011.pdf>
- [24] Journal of Statistics Education. <http://www.amstat.org/PUBLICATIONS/JSE/>
- [25] Martins, R., Graça-Martins, E., Oliveira, E., (2007), How can teachers promote Statistical Literacy? Teaching and learning statistics. *Proceedings of the 56th Session of ISI*, Lisbon
- [26] Mathematics Olympiads.
http://en.wikipedia.org/wiki/International_Mathematical_Olympiad
- [27] MERLOT. *Multimedia Educational Resource for Learning and Online Teaching*.
<http://www.merlot.org/merlot/index.htm>
- [28] New Zealand's School corner, <http://www.stats.govt.nz/schools-corner/default.htm>
- [29] Nolan, D. and Temple-Lang, D. (2006). Dynamic Interactive Documents for Teaching Statistical Practice. Proceedings of the 6th International Congress on the Teaching of Statistics, Salvador, Bahia.
- [30] North, D. and Scheiber, J. "Introducing Statistics at School Level in South Africa. The Crucial Role Played by the National Statistics Office in Training in-Service Teachers." Forthcoming in Joint ICMI/IASE study 2008
http://www.ugr.es/%7Eicmi/iase_study/Files/Topic6/T6P2_North.pdf
- [31] OECD Measuring the Progress of Societies
http://www.oecd.org/pages/0,3417,en_40033426_40033828_1_1_1_1_1,00.html
- [32] OECD (2008). *Seminar on Innovative Approaches to Turning Statistics into Knowledge*.
http://www.oecd.org/document/54/0,3343,en_21571361_31938349_39800246_1_1_1_1,00.html
- [33] Plucker, J.L and Callahan, C. M. (2008) Critical Issues and Practices in Gifted Education. What the Research Says. National Association for Gifted Children.
- [34] Poster and Project competition. American Statistical Association.
<http://www.amstat.org/education/index.cfm?fuseaction=poster1>)
- [35] Sanchez, J. (2008a). Using Statistics to make Sense of Data and Summarized Information: the Role of NSOs. *Government Statistical Offices and Statistical Literacy*. ISLP <http://www.stat.auckland.ac.nz/~iase/islp/stats-offices-book>

- [36] Sanchez, J. (2008b). Less Comprehensive and Discontinued Programs. In *Government Statistical Offices and Statistical Literacy*. ISLP <http://www.stat.auckland.ac.nz/~iase/islp/stats-offices-book>
- [37] Statistics by Example http://www.istat.it/servizi/studenti/binariodie/Stat_per_esempi/introduzione.htm
- [38] Statistics Education Research Journal <http://www.stat.auckland.ac.nz/~iase/publications.php?show=serj#archives/>
- [39] Statistics Finland's e-book. http://www.stat.fi/tup/verkkokoulu/index_en.html
- [40] "Statistics, Power from Data", (Canada) <http://www.statcan.gc.ca/edu/power-pouvoir/toc-tdm/5214718-eng.htm>
- [41] Statistics Teacher Network. <http://www.amstat.org/education/stn/>
- [42] Stephenson, W.R., Short, T., and Dietz, J. (2005). The Journal of Statistics Education. An International Journal on the Teaching and Learning of Statistics. Proceedings of the Meeting of the American Statistical Society, Alexandria, Virginia, 2005.
- [43] Taylor, P. (2008) Australian Bureau of Statistics. In *Government Statistical Offices and Statistical Literacy*. ISLP <http://www.stat.auckland.ac.nz/~iase/islp/stats-offices-book>
- [44] "Teacher's guide to data discovery," <http://www.statcan.gc.ca/pub/12-593-x/12-593-x2007001-eng.htm>
- [45] Teaching Statistics. <http://www.rsscse.org.uk/ts>
- [46] Townsend, M. (2008). Statistics Canada. In *Government Statistical Offices and Statistical Literacy*. ISLP <http://www.stat.auckland.ac.nz/~iase/islp/stats-offices-book>
- [47] UNESCO http://portal.unesco.org/ci/en/ev.php-URL_ID=19488&URL_DO=DO_TOPIC&URL_SECTION=201.html)
- [48] United Nations (2000). About the Millenium Development Goals. <http://www.endpoverty2015.org/goals>
- [49] Utts, J.M., Heckard, R. F. (2007) *Mind on Statistics*. 3rd edition. Thomson, Brooks Cole.