



## DEVELOPING OFFICIAL STATISTICS LITERACY: A PROPOSED MODEL AND IMPLICATIONS

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*This paper points to a gap in the literature regarding the lack of a widely accepted conceptual framework about the knowledge bases that adults at large and non-specialists need in order to be critically aware of social and economic phenomena by understanding key aspects of official statistics. This negatively affects work by official statistics providers and statistics educators. We thus propose a model encompassing six key knowledge elements needed for official statistics literacy and highlight its implications. We emphasize the need to develop a digital textbook about official statistics literacy as well as a modular online course, and point to other directions official statistics providers and statistics educators could take.*

*Keywords:* statistical literacy; competencies; official statistics literacy; dissemination; adult education.

### INTRODUCTION

In recent years, both national and international statistical offices as well as other producers of official statistics have been paying increasing attention to the formal training of professional statisticians who work in national and international statistical systems, and sometimes to the training of other user groups (e.g., MacCuirc 2015). However, the provision of training or resources related to official statistics for wider, non-professional audiences and adults at large has been largely left aside.

Further, there is a surprising lack of solid educational materials in official statistics designed for professionals, i.e., statistics or economics majors (Pfeffermann, 2015). A literature search we conducted did not identify a single current textbook that describes key knowledge bases which have to be emphasized in detail when educating statistics majors about official statistics aside from Citro and Straf (2013). This US-based text focuses both on key aspirations or expectations from an official statistics provider (for example, relevance to policy issues, credibility among data users, trust among data providers, independence from political and external influences), and on numerous important administrative and organizational practices and roles (such as mission clarity, confidentiality, continuous development of useful data, openness about sources, data limitations transparency, and more). These are core issues for all official statistics providers around the world, yet they are not related to the comprehension of the actual products from the content point of view.

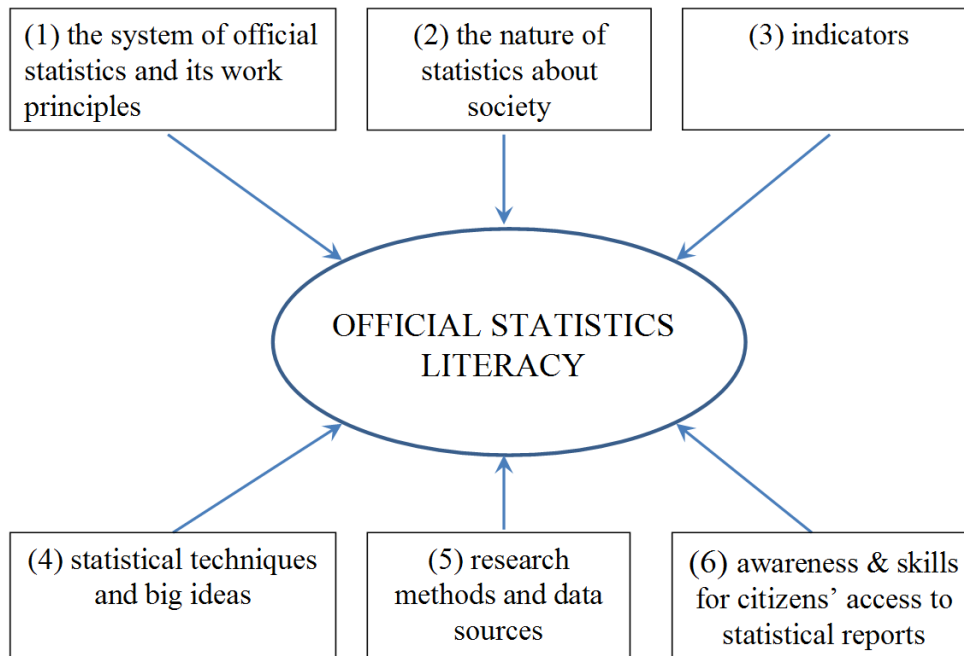
Hence, we focus our contribution on specific issues that official statistics providers may face if they want to help non-specialist users or citizens develop the aspects of statistical literacy (Gal 2002) that pertain to knowledge of, and engagement with, official statistics. For brevity, we refer to this desired knowledge base as *official statistics literacy* or *OSL*. We outline a model comprised of six possible building blocks of the desired knowledge base that is specific to official statistics literacy. Due to space limits we only elaborate on two of its most critical elements in this paper. A detailed presentation of the model and its elements is available in Gal & Ograjenšek (2017). We conclude the paper by discussing selected implications of our proposed model for official statistics providers and statistics educators.

### PROPOSED MODEL

In Gal & Ograjenšek (2017), we argue that the six elements in the model outlined in Figure 1 are unique or specific knowledge bases and skills that citizens at large and non-specialists, as well as specialists in statistics, need in order to make sense of official statistics, in addition to having the knowledge bases and skills subsumed under the more generalized constructs reviewed in the previous

section. A specific point of comparison pertains to the knowledge expected of students who have taken an introductory statistics course at the undergraduate level, which may be the last, and for some students the only, structured exposure to statistics (Moore 1998; Meng, 2009).

**Fig. 1.** Proposed model of six building blocks (areas) of official statistics literacy



Given space limitations we elaborate here briefly only on two elements in the model that we deem key for adults at large and non-specialists, as well as for specialists, when they engage in their everyday or work lives with statistical information from official sources. Such information may be encountered, e.g., in the digital media, when listening to news on TV, reading a magazine article, or browsing the Internet and seeking information on topics of interest.

Regarding *the nature of statistics about society* (2nd element in the model), we point to recent work by the ProCivicStat project, a collaboration by six universities in five countries (Germany, Hungary, Israel, Portugal, and the United Kingdom) funded by the European Commission's ERASMUS+ program (see <http://community.dur.ac.uk/procivic.stat>), which aims to promote civic engagement and understanding among young adults regarding 'civic statistics' about key societal phenomena. As part of the ProCivicStat work, Engel, Gal, and Ridgway (2016) claim that to be fully engaged, citizens need to understand 'civic statistics' with regard to past trends, present situations, and possible future changes in diverse areas of importance to society such as demographics, employment, wages, migration, health, poverty, access to services, education, human rights, and other domains. The ProCivicStat analysis points to five general characteristics of civic statistics: They relate to *multivariate phenomena* and often to *aggregated data*. They also involve *dynamic data* that change or is updated over time. Furthermore, since data and findings about social phenomena are multivariate, aggregated at multiple levels, and dynamic, their description across time or comparison units requires the use of diverse types of representations and may often be delivered through *rich texts* and *rich visualizations* that are broader and at times more sophisticated compared with the limited range of ideas and representations included in introductory statistics classes.

Regarding *indicators* (3rd element in the model), the literature (e.g., Haack, 1979) suggests that official statistics providers create key messages to decision makers and to the general public regarding levels or changes in dozens of indicators, such as unemployment level, child mortality, gross domestic product, or income inequality (e.g., Gini coefficient). These and many other indicators in use by official statistics providers are often not raw variables, such as those encountered in introductory

statistics, but rather combinations of data elements that may be expressed as percentages, ratios, or numbers on arbitrary scales. They may be computed as simple rates, or be derived as complex aggregates of weighted elements. They may be based either on objective (e.g., consumer spending) or subjective data (e.g., consumer confidence), and their definitions may develop and change over time to reflect society's needs for information.

Whatever their definition, indicators are widely used by official statistics providers to report on a wide range of issues, hence their understanding is critical for all citizens. Although they are seemingly included in the broad description of the prior element "the nature of statistics about society", we highlight indicators as a separate aspect of official statistics, because while they are prevalent in public and political discourse, indicators are hardly ever described or analyzed in textbooks and statistics curricula for non-specialists, or in resources related to teaching research methods (Gal, 2007). This lack of attention to indicators may in part be a result of the fact that some indicators are comprised of *qualitative* variables or derived in part via qualitative methods, or otherwise their meaning and interpretation may require qualitative thinking. Possibly, such qualitative issues are not receiving the same attention from statistics educators, compared to quantitative variables and quantitative issues (see Ograjšek and Gal, 2016).

## IMPLICATIONS AND ACTION PLAN

To date, discussions of the connections between official statistics providers and statistics educators have focused in large part on how official statistics providers can facilitate improvement of generic statistics education at the school or university level. Within this framework, official statistics providers have been contributing to teachers' professional development by offering datasets, lesson plans, ideas for projects and poster competitions, and other resources that can inform class activities or highlight the importance of official statistics. Additional directions are noted by Gal (2002) and Sanchez (2008). Further, de Smedt (2016) describes directions related to enhancing support and explanations for users regarding interpretation of displays and published statistics, and other options.

Going beyond the directions for action noted above, in Gal & Ograjšek (2017) we discuss various implications of the proposed model with its six elements. We conclude from our analysis of the literature that supports the proposed model that unique efforts are needed to promote official statistics literacy. This is because regular statistics education, normally does not highlight the unique aspects of data about society, the complex nature of indicators, and other elements in our model.

Hence, it is important to continue existing collaborations between official statistics providers and school-level educators as noted by sources discussing the development of statistical literacy at school level as illustrated above. However, we believe the vision of systematically promoting official statistics literacy within the general adult population (including actions in countries with characteristics that differ from the few that have spearheaded educational services and activities in statistics education) requires an examination of additional directions – from a long-range future collaborative perspective.

With the above in mind, we outline two possible initiatives and some additional ideas that could be implemented in the international collaborative setting.

Firstly, we propose the development of a textbook on official statistics geared towards statistics majors as well as non-majors who may study selected topics in statistics. We note that there are many more non-majors than majors who take only introductory statistics, and the provision of an accessible textbook may be the first step to helping educational institutions develop new modules or whole courses related to official statistics that are currently lacking.

Secondly, we propose the development of an MOOC or a collection of digital (video and audio) teaching modules for entry-level majors, non-majors, and other groups of interest among the general public. It is hard to expect a single official statistics provider to shoulder responsibility and allocate resources related to both initiatives outlined above, although it would be technically possible. Both initiatives thus call for an international collaborative effort of official statistics providers, statistics educators, specialists in applied fields that rely on official statistics when discussing major concepts inherent to their disciplines, and other stakeholders. Such an effort can, of course, benefit from existing materials and frameworks developed in the context of existing diploma and degree programs listed in the previous sections of this article. Textbook developers participating in this collaborative

effort could build on experiences gained within the framework of the already mentioned Phare project, which resulted in the modular online Course on the European Economic Statistics (Bregar et al. 2000).

In addition, large professional associations with an international outreach and long-standing interest and activities in statistics education can also facilitate collaborations and the long-term development of a textbook and a MOOC. Key actors may be the International Statistical Institute (ISI) and its relevant divisions (the International Association for Statistics Education - IASE and the International Association for Official Statistics - IAOS) as well as the Royal Statistical Society (RSS), the American Statistical Association (ASA), and others.

Finally, it is essential to accompany the introduction of such new educational tools with appropriate research that will examine users' perceptions, value judgments, and reactions, as well as the many ways in which users operate within new digital learning spaces. As Gal and Ograjenšek (2010) argue, research that aims to support learners and users of statistics has to combine both quantitative *and* qualitative research methods, in order to provide effective information to the agencies or actors that develop statistical information products.

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