- To allow for the development of conference papers on a specific topic. Revisit, refine, and revise some ideas that have already been completed, may boost the insight and the value of the presentation and understanding of the results of studies even with hindsight.

Guest editors have a more active role than journal editors. They are not neutral. They accompany the authors and synthesise the ideas presented. If appropriate, they look for additional discussion papers. It is like working on a monograph with a specific research topic. To summarise: The potential of special issues is to synthesise the ideas of the papers that are written specifically around a common theme by the guest editors to make clear where the problems lie and where the special issue has arrived at contributing.

MANFRED BOROVCNIK

EDITORIAL: BUILDING FUTURE GENERATIONS OF STATISTICIANS – WHO CARES?

INTRODUCTION

For many, the theme of this special issue has been a perennial focus, discussed at national and international fora but perhaps lacking a consolidated emphasis in the literature. Indeed, there have been pioneers in this area; many of whom have led and contributed to international collaborations and research, or assumed executive roles in statistical societies and associated initiatives – too many to name without inadvertently overlooking someone but such should at least be collectively acknowledged.

The field of statistics is increasingly being challenged by competitors, or those purporting to reduce the need for statistics and all that underpins the discipline. Ironically, the global need for statisticians has never been more greatly recognised by employers and governments than over the past decade. So why is there such a misalignment between supply and demand and, significantly, how may we draw a line in the sand and arrest this? How do we ensure that we will not be having these same conversations in another decade, assuming the discipline of statistics has survived!

The aim for this issue was to provide a consolidated platform for sharing the many and varied international initiatives operating towards building future generations of statisticians. It is not expected that this special issue necessarily provides all the answers; however, to solve a problem, one needs to acknowledge that the problem exists, postulate, collaborate, investigate, and take action! Whatever your views on this issue's articles, whether you feel heartened by new and appealing approaches to engage people with statistics, or consider the ideas inadequate or antiquated, the outcome from the focus of this special issue needs to be the same – we, as an international statistical society need to view the education system holistically, recognise the need and our ability to proactively address and contribute to the system and ultimately increase the supply chain, lest the field of statistics otherwise becomes the diamond of disciplines; highly prized but beyond the reach of many and thus cast aside as impractical and unnecessary – or worse, a legend of a bygone age.

The collection of papers in this issue brings together academics from widespread geographical locations and different perspectives on a common theme. You will be able to read how to enthuse young children about statistics via games or software tools and capacity-building practices for teachers and academics within the discipline of statistics and beyond. Many papers document coordinated activities to nurture entry into statistics through competitions, workshops, or conferences. One wonders how long the goodwill of the relatively few academics who engage in outreach activities can continue under the "publish or perish" nostrum and requirements to secure grants along with pressures from other disciplines working to exclude statistics from Big-Data initiatives. The future of statistics and statistics education is

going to be as bright as we are willing to make it. The hope is that the collection of papers in this issue will be useful for many to adopt, adapt or otherwise be inspired to unite, conduct their own outreach activities and engage in surrounding research towards fulfilling the societal need in the era of Big Data.

BACKGROUND

Statistics and the interpretation of data are ubiquitous in the knowledge society and, consequently, statistical literacy is assuming an increasingly prevalent role in education at all levels. However, the perceptions and general appeal of statistics require methods to overcome initial hurdles to gain student interest and keep them interested (Howley, 2008). Statistics has a branding or image problem; often perceived as simply descriptive statistics or mathematics, missing the more interesting experimental, inferential, investigative, and creative aspects.

Further, statistical anxiety is increasingly a major issue, an impediment for young people to access and succeed in university degrees (Chew & Dillon, 2014; Onwuegbuzie & Wilson, 2003; Siew, McCartney, & Vitevitch, 2019; Williams, 2010) with cross-country comparisons indicating that this is not unique to any country (Chiesi, Primi, & Carmona, 2011). Statistics is seen as a beast, it is our duty to reveal the beauty.

It has been a decade since Google's chief economist, Hal Varian, first publicly referred to statistician as the sexy job of the next decade, identifying how Google was building their numbers of statisticians and statistics-oriented employees. There have since been significant reports identifying the predicted shortfall of adequately skilled individuals for the new Big-Data age (Manyika et al., 2011; Puang-Ngern, Bilgin, & Kyng, 2017), a crescendo of discussion, and national and international initiatives surrounding the need to address this shortfall.

Students need to engage with and become more greatly interested in the analytical, statistical and machine learning aspects needed to fill the increasing need for such Big-Data skills. Although universities are introducing new degree programs to address this issue (Kyng, Bilgin, & Puang-Ngern, 2016), earlier appreciation of and engagement with statistics is lacking.

It would seem the perfect opportunity for statistics to thrive – statistics is all about data. What is preventing interest and engagement?

School teachers have rarely if ever experienced statistics in practice, nor do they understand the varied and wide reach of statistical thinking, the techniques and applications, and its importance to study design and inference. Their knowledge about the practicing statistician is at best limited, their focus has been on the many other topics and aspects of teaching. When it comes to teaching statistics, teachers usually concentrate on the theory but not on interesting applications of statistics; supposedly it is easier to teach and assess the theory compared to practical aspects and applications of statistics.

Internationally, initiatives have commenced towards engaging schools, tapping into the supply chain of potential undergraduates, incorporating industry, academics and a multitude of resources and support. The aims of such activity include showing the beauty of statistics in everyday life, creating a comfort zone to deal with data, killing the statisticophobia beast (Dillon, 1982), and finally encouraging new generations to be confident and skilled in data analysis. But what are those activities? Have they been successful? What have we learnt from such attempts, past and present, and where should this lead us?

This special issue brings the spotlight to such activities internationally in an attempt to consolidate existing experiences, resources, and knowledge towards ensuring the diversity of skills, and efforts; outcomes are recognised and utilised that might help to develop increased and potentially more focussed collaborations and successes. We aim to enable educators across primary, secondary and tertiary sectors, and industry and national societies to learn from one another's experiences and potentially reduce the unnecessary duplication of efforts, rather supporting the higher-level learning as a first stage of engagement for creation of increasingly innovative and successful initiatives.

FINAL REFLECTIONS AND CHALLENGE

Why were we drawn to statistics? Was it due to our mathematical abilities or some other reason? Is the work we are performing as we expected it to be when we began our studies?

As you read through this issue we ask you to reflect upon whether we, those who carry the statistics torch, are possibly our own worst enemies? Do we espouse how globally important statistics is, and how it can take you anywhere, to our own detriment? This lack of specific outcomes and career options is exemplified and perpetuated by job advertisements rarely stating 'statistician'. Should we be better connecting the dots for people? People study accounting with the image they may become an accountant; similarly, medicine with thoughts of becoming a doctor, and engineering to construct planes, ships, or buildings. These are of course somewhat trite and inept descriptions of reality; however, the point is that there is an existing connection made between the field of study and the perceived career outcome or job. Are the opportunities from studying statistics so broad and pervasive that without clarification the field seems of little value alone – does it get lost amongst the breadth?

The publications in this special issue address varying elements along the statistics pathway, which may be characterized as focusing on early intervention, supporting the teaching fraternity, support systems for students and early researchers, and Big-Data coordinated approaches. We shall leave it for you to connect the dots on this one.

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