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Tribute to Jim Ridgway and his contributions to statistics education and statistical literacy

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Introduction

Our friend and colleague Jim Ridgway, who was very active in the area of statistics education, sadly passed away on 3rd May 2024, aged 75 years, after a short illness. In this tribute we describe him as a person, highlight his academic work, and expand on his interest and contributions to statistics education and to the promotion of statistical literacy.

Jim was Professor in the School of Education, University of Durham, UK, for many years, continuing as Professor Emeritus after retiring in 2022. The May 2024 newsletter of IASE announced his death. We have written a brief tribute to Jim that was published in July 2024 by the journal *Teaching Statistics* (https://onlinelibrary.wiley.com/doi/10.1111/test.12382). The current tribute is based in part on the original one, but includes elaborations and details that we hope add to the interest of the statistics education community.

Please note that the July 2024 issue of *Teaching Statistics* also has a tribute to another departed friend and leader in statistics education from the UK, Prof. Peter Holmes, and also included Jim's last paper[27], entitled *New viruses are inevitable; pandemics are optional—Lessons for and from statistics,* published posthumously. For those who do not have access to *Teaching Statistics*, a copy of this last article can be requested from the corresponding author of this tribute. A copy of the original Tribute is stored on ResearchGate and can be obtained by sending a reprint request to Iddo Gal or Joachim Engel via ResearchGate.

Jim the person

Jim's academic background was in psychology, at Sheffield and then at Stirling, through which he developed a deep interest in psychometric testing and assessment. His doctoral research at Lancaster produced psychometric tests for jet fighter pilots which are still the foundations of tests currently in use.

Jim was a very sociable person. A keen member of University College (Castle) Senior Common Room (SCR), attending formal dinners and other SCR events at Durham University, and engaging with a broad spectrum of experts across many fields in those social settings, and following up with reading on topics which had piqued his interest. This meant that his elegant literary style was combined with deep academic scholarship on the subject on which he was writing, interlaced with references to related ideas from other disciplines and historical literary references. Titles for his articles were intriguing, often provocative, sometimes risqué,

and always made the reader want to read the article to unpack the meaning behind the title. The Science, Maths and Related Technologies (SMART) Centre that he founded exemplifies this, as the work was mainly in assessment initially, and its full name (unspoken) originally was SMART Ass.

His career was extraordinary, but we remember him also as having an infectious passion for work, family and friends, travel and food. He was a pleasure and a privilege to have known, and he will be sadly missed by us all. A small selection of comments from the book of condolences, from around the world follow:

> Jim was a great colleague, brilliant scholar, and a wonderful human. I have fun memories from the many conferences together. (Alejandra Sorto, USA)
>
> Jim was always a great presence in IASE conferences and a kind friend. A big loss for our community. (Bruno de Sousa, Portugal)
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> I remember Jim from my very first ICOTS in Slovenia. He was always welcoming and I enjoyed his presentations .... Lots of ideas to take and use in my work. (Pip Arnold, New Zealand)
>
> I remember Jim first of all as a human being. Loving and warm, caring, ready to help, with a sense of humor, interested in you person- ally. Jim was a first class professional and researcher, and passionately engaged in statistical education. He knew how to listen attentively, and even if he had a problem, he knew how to convey his words in a polite and quiet manner so that they would be accepted and heard. (Dani Ben-Zvi, Israel)
>
> Jim's deep thoughtfulness, warmth, humour, love of life and care for others were as great as his intelligence and dedication to education and authentic student learning. They shone in everything he did, as did his love and pride for Anne, their girls, and their family. Jim was wonderful to work and inter- act with. Again and again I would hear from people in statistics education who met him, "isn't he a lovely person." Jim was, and always will be, respected, admired and esteemed by all who met and worked with him, at home and around the world. (Helen MacGillivray, Australia)

Jim's academic work in educational research, statistics and psychometrics

Jim was first appointed as a lecturer in Lancaster, and soon became involved with the work of the Shell Centre for Mathematical Education in Nottingham, which was directed by Hugh Burkhardt. Jim was part of the team at the Shell Centre who, under the leadership of Malcolm Swan, produced "The Blue Box" Problems with Patterns and Numbers[1] and "The Red Box"—The Language of Functions and Graphs[2] which are still regarded as valuable classroom resources 40 years on. This longevity is due in large part to the "design research" style of working where prior research informs creative design, with rapid prototyping ("Fail fast, fail often") and a substantive iterative process of classroom trials and revision. It is an expensive model of curriculum development, but the engagement of skilled classroom practitioners collaborating with creative curriculum developers produced quality materials that represent excellent value for money. In particular, the focus was on developing mathematical thinking skills, not just covering a list of content topics.

In the 1990s and early 2000s Jim was the Chief Psychometrician on two major California curriculum and assessment projects, which radically changed classroom practices. He was a founding director of "Balanced Assessment for the Mathematics Curriculum," the first large-scale mathematics assessment project funded by the US National Science Foundation in the 1990s as it sought to improve mathematics instruction nationwide. The project introduced teachers to problem solving, helped them understand student thinking, and exemplified teaching and assessment practices. The Mathematics Assessment Resource Service (MARS) tests were introduced and used as high-stakes assessments in the Mathematics Renaissance project, and in Silicon Valley Mathematics Initiative's Mathematics Assessment Project's (MAC) annual test. This latter test is still being administered annually and is in its 26th year. The tests involved openness, creativity and justification—so they needed to be human- scored in an accurate and reliable manner. Changing established curriculum and assessment practice in such a radical fashion is not common, and those who worked closely with him testify to Jim's strategic statistical methods and reports paving the way for convincing political skeptics to adopt the tests initially, and later communicating the major gains in student learning that followed. Historical references for this work are not easy to identify, but references 3 and 4 are current hosts of the development of this work.

In similar vein in the United Kingdom, Jim worked with Malcom Swan to develop The Mathematical Thinking Classroom Assessment Techniques (Math CAT) designed to promote and assess thinking skills in mathematics[5] which are important for students in the science, mathematics, engineering, and technology disciplines.

The 2003–2005 World Class Tests (later "World Class Arena") were part of a new UK Government's agenda for high-achieving 9- and 13-year-olds.[6] The goal was to identify and motivate potentially high-achieving students in less supportive learning environments, particularly in inner city schools, with an aptitude for STEM subjects, who would otherwise go unnoticed. The groups at Durham (led by Jim) and Nottingham (led by Hugh Burkhardt) jointly designed a mixture of computer- and paper-based assessments of problem solving across mathematics, science, and technology, with the computer-based tests focusing on using simple investigative microworlds. One particular feature of the Durham work was the use of interactive data presentations to engage relatively young students in reasoning from multivariate data (such as a simulated photosynthesis experiment that explored the effects of both light intensity and temperature on oxygen production[7]). Jim established the SMART Centre in the School of Education, which focused on creating new interfaces and tools for visualization to explore and promote abilities to reason with complex data. This work was based on large-scale authentic data relevant to pressing social problems such as poverty, migration, racial bias and health, again using interactive displays, see reference[8] for examples. Jim's passion for curriculum reform to make mathematics more relevant, and able to be useful across other curriculum areas is evident in reference[7] and in two early papers from the SMART Centre[9,10] which appeared under the Curriculum Corner banner in this journal. It is a sad reflection that many of the criticisms of the mathematics and statistics curricula in the United Kingdom when those papers were published almost 20 years ago are still valid today. In 2004 IASE held a roundtable on Curricular Development in Statistics Education, where 3 papers from different countries independently emphasized the (urgent) need for an early focus on multivariate thinking.[7,11,12] These are now features of the mathematics and statistics school curricula in New Zealand and South Africa.

More on Jim's work in statistics education and civic statistics

Several major projects were to follow: Reasoning with Biomedical Evidence—Understanding Risk[13] was a cross- curricular collaboration between The Geographical Association and The Smart Centre, funded by The Wellcome Foundation looking at the spread of disease; Reasoning with Data in Citizenship[14] was a cross-curricular collaboration between Citizenship and Mathematics; Jim led the production of a classroom module on plausible estimation for the 2008 Bowland Maths materials,[15] which were circulated to all English Key Stage 3 schools; Reasoning from Evidence[16] developed data visualizations and associated curriculum materials to support the teaching of social science at A-level using data sets relevant to the Sociology qualification; Incense[17] developed data visualizations based on the 2011 UK Census for use both in public policy forums and in curriculum materials[18]; Parler[19] was a collaboration with the House of Commons

Library ahead of the 2015 general election in the United Kingdom. The Constituency Explorer had three interlinked components; the Explorer data visualizations, quizzes which provided a gamification element where users could estimate what proportion of their own constituency fell into any response category that there was data available for in the 2011 census, and a set of PDFs which provided extensive data about each constituency. The library had traditionally just provided those data PDFs for each constituency, but the Constituency Explorer interface allowed users to make comparisons between their constituency and others in their region, and in other regions, across a broad range of economic and social variables.[20]

These two projects (references 17 and 18) marked a broadening of Jim's engagement from just curriculum matters to a national profile of increasing citizens' capacity to engage meaningfully with statistics about society.

At the 2013 joint IASE/IAOS satellite conference in Macao, preceding the 2013 World Statistics Congress, Jim gave a key-note lecture entitled: "Open Data, official Statistics and Statistics Education—Threats, and Opportunities for Collaboration."[21] Discussions inspired by his lectures identified the need to educate the public to better understand statistical information about the state of society (e.g., as presented in the media, news releases or in technical reports) as a challenge and genuine task of statistics education. The idea was born to launch an international cooperation to develop concepts and tools to help the public to better understand data and statistics about society: ProCivicStat,[22] funded with support of the Erasmus program of the European Community (2015–2018), was a strategic partnership of the universities in Durham, Haifa, Ludwigsburg, Paderborn, Porto, and Szeged led by Jim, Iddo Gal, Joachim Engel, Rolf Biehler, Pedro Campos and Peter Kovacs with their respective teams. ProCivicStat created a conceptual framework for what they termed Civic Statistics and developed a comprehensive set of teaching resources, implementation guides, teacher preparation manuals and more. The project benefitted greatly from Jim's leadership, his wisdom and broad view of the world.

Equipping citizens with skills to make sense of data and empowering them to make informed decisions based on data has far-reaching implications for society. For democracy to function, citizens must have a critical understanding of quantitative evidence on key issues relating to the social and economic well-being and human rights. This implies the capacity and knowledge to access data, critically evaluate the reliability of data, and to understand representations and analyses of data, for example, as through innovative visualizations. The ability to assess the credibility of information and its sources may never have been more important than in our days. Ridgway[23] is an important paper which provides a good summary

of his broad world view of the role of statistics education and reasoning with evidence in combating the rise of misinformation in the modern world. Ultimately, Civic Statistics is an important mechanism to encourage civic engagement and to stabilize democracy. However, there are major problems posed to social progress that stem from large gaps in public understanding. A great deal of the public inability to reason with evidence can be attributed to problems with education systems world-wide. ProCivicStat culminated in a 2022 book, edited by Jim, titled "Statistics for empowerment and social engagement: Teaching civic statistics to develop informed citizens."[24] Besides serving as editor Jim contributed as co-author to 9 of the 26 chapters of this book. His ideas added substantially to Part 1 of the book explaining the concept of Civic Statistics, tracing its history, and justifying its place in the curriculum including a Plan for Action that identifies responsibilities, roles and actions required of key players in the education system, if statistics teaching is to be reformed. Another chapter Jim co-authored, focuses on data visualisation, a game changer in communicating complex information due to dynamic visualisations that provide opportunities for citizens to ask and answer their own questions about data. There are few better examples than a pandemic to demonstrate the importance of Civic Statistics. Citizens and governments need to take account of existing and emerging evidence , in order to decide on effective action. One chapter (authored together with his daughter Rosie Ridgway) is devoted to illustrations and classroom activities around Covid-19.

Another chapter, also co-authored with Rosie, maps out the place of Civic Statistics in a changing information eco-system more and more information is accessible to the public, yet much of it without any fact-checking and some deliberately disseminated as fake news with the sole intention to influence people behaviour in certain ways. In another chapter Jim (with Rolf Biehler and Pedro Campos as co-authors) explored the relationship between Civic Statistics, Statistics and Data Science in a fast changing world. It is a plea to empower citizens to engage in discussions about the use of innovative, AI-controlled technologies..

Jim was a prolific researcher and author who has made numerous contributions to the field of statistics education and to the statistics (and mathematics) education communities through many research papers, talks, and workshops on assessment, statistical literacy and reasoning with evidence, and through serving in various professional capacities. Among other things, Jim served as a Vice President on the IASE Executive Committee; was a co-guest editor of a SERJ special issue on Statistical Literacy; a guest co-editor of a special issue on Teaching Data Science & Statistics of this journal; Chair of the International Statistical Literacy Programme (ISLP) working party on statistical literacy (SL) and Citizens; a member of the editorial board of The Statistical Journal of the International Association for Official Statistics; and a speaker at the 2nd UN World Data Forum in Dubai in 2018.[25] Jim was the 2023–24 Teaching Statistics Trust lecturer for statistics, with the title Statistics vs the Apocalypse: Addressing real world questions in teaching. A video of the lecture given in Newcastle was recorded.[26]

Perhaps the last substantive piece of work Jim was involved with was reviewing some curriculum materials produced in the United States, related to COVID-19, as an example of the potential of civic statistics and doing an evaluation using the framework developed in the ProCivicStat project, and then relating it to UK curriculum reform proposals. The paper[27] reporting on this was compiled by James Nicholson and published as a joint paper posthumously with Jim. We reviewed the materials independently of one another, but then spent some considerable time on the phone discussing them, and how they might be developed further, and the potential future collaboration with the Boston group really excited Jim, as did the collaboration he was just embarking on with his daughter Rosie, at Durham, on

AI and Data Science. While it is a sadness personally, and a loss to the respective communities that he was not able to participate in these collaborations, Jim would have preferred to depart while buzzing with new ideas than to fade quietly into the night. It is perhaps fitting that this last paper deals with several of the major themes of our joint work over 20 years – the development of data visualisations that high school students and adults alike could be comfortable interacting with and 'seeing the stories in the data', developing curriculum materials which addressed real social issues, through to the PCS project with its framework for analysing materials in the field of Civic Statistics, and addressing our ongoing concerns about how to influence formal curricula to provide more meaningful educational experiences for future generations.

Jim was an insightful leader, full of wisdom and with a broad view of how statistical knowledge impacts human life and society as a whole in the digital age. He was generous in sharing his ideas with others, expressed his appreciation for the thoughts and ideas of his partners (even in situations where he disagreed), encouraged the pursuit and sharpening of one's own ideas. With Jim's passing, our community has lost a gentle and wise thinker and a wonderful human being.

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