To the Review Committee, 2023 George Cobb Lifetime Achievement Award in Statistics Education

It is our honour and privilege to nominate **Maxine Pfannkuch**, for the 2023 George Cobb Lifetime Achievement Award in statistics education. The criteria, "an individual who, over an extended period of time, has made lasting contributions with broad impact to the field of statistics education especially, but not limited to, the teaching and learning of college-level statistics", fits Maxine perfectly. We hope that this nomination letter and the attached messages of support will demonstrate how much people value the contribution that Maxine has made to statistics education, not just in New Zealand but in the US and around the world. Her impact has been truly international. Some committee members will also know Maxine. We hope that you will agree that 2023 would be an excellent year to be the first time that this Award recognised an individual from outside the USA and that Maxine would be ideal as the first such recipient. Her contributions have been deeply fundamental and have underpinned so much of current thinking in statistics education.

Giant that he was, George's impact on statistics education was truly global. George also valued Maxine – visiting her, for example, for a week in 2014. Internationally, Maxine has been a highly-influential statistics-education researcher. She was the lead writer for a path-breaking national schools-curriculum-framework of international significance. And she has developed a generation of statistics-teacher leaders in NZ through attracting and supervising a stream of graduate students (almost all practicing teachers), her long-standing graduate-course in statistics education, her generous mentorship and her many teacher-development workshops. Maxine is an award-winning university teacher whose pioneering statistical literacy course has been replicated elsewhere. As Editor of the *Statistics Education Research Journal* (SERJ) and similar capacities there is no one who has worked harder in a more hands-on way than Maxine to improve other peoples' papers and develop other researchers so that they too can have a more far reaching and beneficial impact on teachers and students in classrooms at all educational levels.

Maxine began her career at one of New Zealand's largest high schools (Avondale College), quickly rising to become a very successful Head of the Mathematics Department before going on to a role as a Secondary Mathematics Advisor for the Ministry of Education (teacher-development), and then a teacher-educator (Senior Lecturer at the Auckland College of Education) before embarking on her a career as an academic at the University of Auckland in 1994 and simultaneously starting her PhD (see the opening paragraphs of "Statistical Thinking in Empirical Enquiry").

Maxine's comprehensive end-to-end experience and knowledge of education has enabled her to connect dots and make contributions no one else could make. It has grounded all of her research in the desire to make a real difference for real teachers and real students in real classrooms. It is no accident that when searching for a first role model for educational research, in any area, that benefits teaching practice, the NZ Council of Educational Research chose Maxine Pfannkuch. The result was a 43-page 2014 paper by Rose Hipkins entitled "*Doing research that matters: A success story from statistics education*".

Before further describing Maxine's contributions to statistics education research we will talk about her national curriculum-framework development contributions. This will also put her research into perspective because Maxine's service to statistics education and its people, her personal teaching practice and her research, have always been synergistic with each acting to drive the other two forward.

Maxine's role in national school-curriculum-framework development goes back to her leading role in the writing group for what became the 1992 NZ Mathematics Curriculum, the statistical elements of which were themselves internationally acknowledged as ground-breaking reform; for example in keynotes at ICOTS 2002. But her most important contribution began when she was given the opportunity to be lead writer for the statistics strand of the new 2007 New Zealand Mathematics and Statistics Curriculum (Year-levels 1-13) and was the driving force behind everything done in it. To scope and flesh out a new curriculum under a very compressed time scale, Maxine assembled (of her own volition) a large support and brain-storming team of volunteers that included statistics-researcher academics, professional statisticians, teacher educators and developers, and leading

teachers. This was done under the auspices of the NZ Statistical Association and facilitated by Statistics NZ. The choice the group faced was between pushing reforms then and there, or waiting for another opportunity that might be 15 or 20 years down the track. The team decided to reform and there was then no looking back. Holes in the research base for how to do many innovative things well called for rapid research responses including the development of free, intuitive, visual and accessible software. So some of the research Maxine led was reactive, caused by immediate practical needs (followed by teacher development to spread the new practices widely). But particularly more recently, it has been forward looking to prepare for the next reform opportunities (coincidentally, a new curriculum round has just kicked off). The curriculum-framework Maxine led was a forward-looking statistics curriculum for K-12 students – a curriculum that emphasized statistical thinking, conceptual understanding, the heavy use of technology at senior levels and writing about findings at the expense of mechanical skills. Another feature was the teaching of resampling-inference to the large majority of all NZ high-school students from about 2013, the first large-scale implementations at this level following the national teacher-development "road trip" she initiated and led in 2012.

The NZ statistics curriculum has been recognised as world-leading. Renowned Cambridge University statistician (and "Professor of the Public Communication of Risk"(!)) Sir David Spiegelhalter said in a 2019 interview on NZ public radio: *"New Zealand is the world leader for statistics education. In my book, I give full credit for stealing from New Zealand's way of teaching statistics in schools. It's quite extraordinary the progress that's made. …. And so I am full of praise and try to emulate many of the ways in which statistics education has been developed in New Zealand, which we are trying to get into much more [for] the UK system – based on real practical problems, problem-solving all the time; not just theoretical and abstract ideas…. And that down-to-earth approach is extraordinarily powerful…"* There are similar statements, if a tad more measured, in his book "*The Art of Statistics: Learning from Data*" and by others, for example the 2013 official response by the Royal Statistical Society to the UK government's consultation on "Reform of the National Curriculum in England".

The New Zealand initiatives complement, very well, a lot of wonderful work done in the US. This is why Chris Franklin devoted 6 months to her Fulbright Fellowship project in NZ in 2014/15 "Comparing Practices in New Zealand and the United States" with the express purpose of "an important timely collaboration between the United States and New Zealand, countries prioritizing K-12 statistics curricula in their national standards, to advance the goal of 'statistical literacy for all'." She also talked about *"immersion in the statistics education research being conducted in N.Z. at K-12 in areas of curriculum implementation, student learning, and assessment. The NZ model has global impact for other teacher preparation institutions in the U.S. and internationally."*

But when they are talking about "New Zealand" in these ways, what they are really talking about is the fruits of Maxine's drive and leadership. Many have helped her, but that is how real leadership works. This work is never done. NZ is now engaged in yet another curriculum refresh with Maxine heavily engaged.

In the last quarter century Maxine has become an international leader in statistics education research. Locally she has led, supervised research-students on, or collaborated on, virtually all important statistics-education research to come out of New Zealand. Her 1999 *International Statistical Review* paper, "*Statistical Thinking in Empirical Enquiry*", largely emerged from Maxine's PhD research and has become a (perhaps the) touchstone paper for statistics-education researchers, scholars and reformers. With over 2,250 citations on Google Scholar it is almost certainly the most cited paper in Statistics Education. A follow-up chapter she wrote has over 330 citations. Her 2010 paper in the Journal of Statistics Education won the Journal's inaugural Best Paper Award. She has 80 research outputs on ResearchGate for which about 20 have more than 40 citations and 26 have more than 30. A presentation of 2010's "*Towards more accessible conceptions of statistical inference*", a RSS discussion paper in JRSSA, was the centrepiece for the Royal Statistical Society's celebration of the first ever World Statistics Day (20/10/2010) at the RSS headquarters – that together with the launch of their getstats site. The research she leads is primarily qualitative, the only way forward for uncovering the intricacies of how people are thinking. Research is driven by curricular and teaching needs. Curriculum and teacher development follows from research. Many of

the most important projects have involved teachers as collaborating researchers, providing an important platform for building respectful and productive partnerships with teachers.

Maxine has had many high-profile conference and workshop invitations in many countries around the world. In 2015 she received the Campbell Award, the premier award of the NZ Statistical Association. She is also: an Elected Member of the ISI, was Chief Editor of the *Statistics Education Research Journal* (SERJ) from 2014 – 2018 after serving as an Associate editor for most of its life, Managing Editor and co-founder (in 2019) with Anna Fergusson of *Statistics and Data Science Educator* under the auspices of the NZSA specialising in peer-reviewed lesson plans for teachers at all levels, and Education Director for the CensusAtSchool New Zealand project team since 2003. She has been a leading member of the International Collaboration for Research on Statistical Reasoning, Thinking, and Literacy (SRTL), notable for their biennial research forums and special issues in books and journals, since its inception. She has had a big influence on their research directions and as a mentor of its members, known for her deep and penetrating questions and always bringing people back to fundamentals.

Maxine's impact on the practice of statistics education in the US has been pervasive, predominantly through the work of American statistics-education leaders who have been receptive to the experiences from the statistics-education reforms Maxine led in New Zealand and her research and thinking, further developed it for American settings, and implemented it in fostering widespread advances – leaders like Mike Shaughnessy, Cliff Konold, Chris Franklin, Hollylynne Lee, and Joan Garfield and the Minnesota group. "Statistical thinking in empirical enquiry" was foundational to the Pre-K-12 GAISE first released in 2005 (revised in 2007) and, we have been told, has been the guiding document for statistics standards at K-12 in the US ever since its release. Chris Franklin sought, and was awarded, a Fulbright to spend 6 months in NZ working with Maxine. During that time she also learned a lot from Maxine about how to influence policymakers for the common good of statistics education at the school level as well as advancing the appropriate curriculum and standards – knowledge that has subsequently applied in the US. Maxine gave generously of her time to helping improve the draft of the *Statistical Education of Teachers* (SET) which together with Pre-K-12 GAISE has been instrumental in the preparation of teachers in the US. On Chris's return, the NZSA Education Committee on K-12 and the ASA-NCTM K-12 Joint Committee formed a collaboration where we attend each other's meeting to report and most importantly, carry out collaborations. Maxine serves as the NZ liaison. In Michelle Wilkerson's experience in policy-level conversations in the U.S. around K-12 statistics and data science education at the National Academies, the National Science Foundation, etc., she saw the effect of Maxine's work everywhere.

A new wave of Maxine-impact in the US is emerging through her PhD students, particularly Pip Arnold and Anna Fergusson. Pip was a major contributor to the Pre-K-12 GAISE 2 (2020) book with her dissertation work on questioning with Maxine playing a large role. Pip continues to collaborate with the other writers of GAISE 2 with articles, presentations at conferences, and professional development. Anna Fergusson recently finished her dissertation focused on data science with Maxine and has collaborated with US colleagues to present professional development for teachers and at US conferences. Both Pip and Anna have influenced curriculum and standards in the US.

It would be hard to find anyone anywhere in the world who has contributed so much to, and had so much impact on, the world of statistics education as Maxine Pfannkuch. She is a truly inspirational and distinguished leader in the field. We highly commend her nomination to the committee and hope you will agree with us that her dedication and commitment to statistics education is worthy of recognition by this award.

Professor Chris Wild
Department of Statistics
University of Auckland
c.wild@auckland.ac.nz

Assoc. Prof. Professor Ilze Ziedins
Department of Statistics
University of Auckland
i.ziedins@auckland.ac.nz

Assoc. Prof. Stephanie Budgett
Department of Statistics
University of Auckland
s.budgett@auckland.ac.nz

28 February 2023

Supporting Letters and Messages

J. Michael Shaughnessy, *Portland State University, 24 February 2023*

When I first met Maxine over 25 years ago at the annual *MERGA* conference (Maths Ed. Research Group of Australasia) I had no clue what a huge impact Maxine was going to have on my own professional career, and on the entire International Statistics Education Community. At that time Maxine was in the early process of developing a model of statistical thinking, which shortly thereafter led her publishing some of the most significant work in the history of statistics education, including the now famous paper "Statistical Thinking in Empirical Enquiry" in the *International Statistics Review* (1999).

Maxine's many contributions over the years to ICOTS, ICME, & SRTL conferences, her wealth of publications and presentations, as well as her long tenure in editorial roles for SERJ are no doubt very well-known and properly heralded in the stats education community. However, it is the personal interactions with Maxine, working together with her at the University of Auckland, and a few years later in the United States at Portland State University, and her influence on my doctoral students for which I revere Maxine. When we first met, both of us were of a common mind that there was insufficient attention in stats education both in school and at university to some of the most important ideas in statistics, we were missing the mark. Students weren't being immersed in data first, and there was insufficient attention to variation as the unifying theme of a statistical investigation. Soon after I spent several months of a sabbatical leave working with Maxine in Auckland. Together we developed a graduate statistics education course that highlighted the critical role that variation plays in data analysis and a statistical investigation. That course was particularly tailored for students who were interested in doing research and teaching in statistics education. Our time in Auckland led to work on co-authoring some publications and a return visit by Maxine to my university as part of a long-study leave.

During her visit Maxine met with my graduate students in statistics education as we were in the process of writing a grant to the National Science Foundation to research school students' conceptions of variability. Interacting with Maxine was invaluable for both me and my grad students in our thinking about that grant. We were successful in obtaining the grant, and in the process, Maxine helped to mentor three future statistics educators in the U.S., Dan Canada, Matt Ciancetta, and Jen Noll. Jen is now herself a leader within SRTL, and she has also been involved as an editor of some issues of SERJ.

When considering the impact of one of our leaders in statistics education, such as Professor Maxine Pfannkuch, we of course think of her contributed journal articles, book chapters, leadership in conferences, leadership in editing the *Statistics Education Research Journal.* These are huge accomplishments. But Maxine's reach goes far beyond these most public events, she has touched everyone she has ever met and talked with in statistics education, including many people in the United States. I have just shared with you some of my own personal interactions with Maxine, and she has worked with and influenced many other teachers, students, and researchers in our country. I give my strongest recommendation to the committee that Professor Maxine Pfannkuch be awarded the George Cobb Lifetime Achievement Award in Statistics Education. She is most deserving of this recognition!

Clifford Konold, *University Of Massachusetts, 18 February, 2023*

I was invited to write in support of the nomination of Maxine Pfannkuck for USCOTS's Lifetime Achievement Award. I am happy to do so for two reasons. First, I have long been a careful reader of her research, particularly her work that analyzes the nature of statistical thinking and practice. Her insights about the core ideas of statistics, how they relate to one another, how they appear in the practice of statisticians at work, have guided my own research, the questions I ask and the things I look for in student thinking. It is this kind work, too, that has provided the basis for creating curriculum frameworks and instructional materials that have changed the teaching of statistics over the past 20 years. Second, I love the idea of giving this award for the first time to someone outside

the US, recognizing the fact that statistics education has become an international-collaborative effort and to pay tribute to a person who, from the very beginning of her academic career, reached out to others outside her own country and since then has worked to foster these types of collaborations. Indeed, my first encounter with Maxine was in 1995 when the University of Auckland brought me to New Zealand to spend a couple of weeks in conversation with Maxine, a conversation that has been ongoing since.

Rob Gould, *UCLA, 21 February 2023*

Maxine's seminal paper with Chris Wild in 1999 played an enormous role on statistics education around the world, most directly through its influence on the ASA GAISE report in 2005 but also, along with other work by Maxine, in solidifying the concept of "statistical reasoning", which became the central focus of statistics education in the US in the early 2000's (at least among those who strove to improve statistics education). Maxine's fundamental work on informal statistical inference, reasoning with boxplots, teacher preparation in statistical thinking…these have all had profound effects on the writing of statistical educational resources and, now, data science educational materials, particularly in the K-12 realm.

Michelle Hoda Wilkerson, *UC Berkeley,23 February 2023*

I suspect many people will speak to Maxine's impacts on research, so I'll focus on practice and policy. As I become more involved in policy level conversations in the U.S. around K-12 statistics and data science education (e.g., at the National Academies, the National Science Foundation, etc), I see Dr Pfannkuch's impact everywhere. From her foundational work informing the way that educators and curriculum developers think of the statistical inquiry cycle, her deep accounts of the experiences of teachers as they prepare to teach, to her role in advancing New Zealand as a model of what is possible when statistics are taken seriously in the curriculum. She also has helped to support a whole new generation of scholars who are well respected internationally and whose work I have seen cited frequently in policy conversations, again not only from research perspectives but because of their attention to practice: e.g. Pip Arnold, whose contributions to GAISE II and how we understand questioning and problem formation; Anna Ferguson, whose integrative approach to data, statistics, and computing at the high school and teacher preparation level is, I believe, prescient.
[*Chris Wild*:   **Pip Arnold**'s *major work on questioning and problem formation was done while Maxine was supervising her PhD.* **Anna Fergusson** *has just submitted a PhD on these issues supervised by Maxine*]

Hollylynne S. Lee, *NC State University, 27 February, 2023*

Maxine's contributions in statistics education have been incredibly influential on the development of statistics teacher education materials serving both preservice teacher education students at the university level, and practicing teachers enrolling in online teacher education. Her work from over 2 decades ago (in the 1990's) originating from interviews with statisticians led to dissemination of many ideas through publications and conferences on what statistics thinking looked like and how it was multidimensional in nature. So many collaborative efforts led by her in New Zealand helped establish New Zealand as the place to look to for advanced pedagogy and research in statistics education. The materials developed through two of my recent teacher education curriculum projects contain many references to her work and examples from her research papers. For example, her 2010 article in Journal of Statistics Education (she is lead author) on "Telling data stories: Essential dialogues for comparative reasoning" was highly influential in the design of lessons for teachers on how to develop statistical thinking through comparing groups. Many K-12 teachers in the US have thus been taught using curriculum materials that build from and cite her work (e.g., go.ncsu.edu/esteem ; go.ncsu.edu/amplifystats). Maxine's role as an editor for the Statistics Education Research Journal helped many US-based statistics education researchers have an outlet for disseminating their scholarship about teaching and learning statistics in college and K-12. This helped establish statistics education research as a recognized discipline in the US, a mission and value of CAUSE and USCOTS. I personally had the pleasure of co-authoring a book chapter with her for the 2018 Handbook on Research in Statistics Education. She brilliantly brought together our author team to showcase three

different case studies of how learning trajectories have been used in statistics education research. Maxine's reach and influence in statistics education is definitely world-wide and she is well deserving of the Lifetime Achievement Award.

Joan Garfield, University of Minnesota, 18 February 2023

Maxine's research on the nature of statistical thinking, had a huge impact on the work we did at the University of Minnesota. When exploring assessment methods, we used her work to think about how to observe and evaluate students statistical thinking. In our curriculum projects we used to research to come up with models of teaching statistical thinking. This happen, particularly in the CATALST project (https://www.tandfonline.com/doi/full/10.1080/10691898.2020.1787115) where our main goal was to help students reason and think statistically.

Andrew Zieffler, University of Minnesota, 27 February 2023

Maxine Pfannkuch's work has had a large impact on the statistics education research (and more recently the data science education research) that we have undertaken at the University of Minnesota. While her work with Chris Wild on statistical thinking is foundational to the discipline, it is her work on statistical modelling that has helped us re-think and frame students' reasoning and understanding within our own research. As an early editor of SERJ, Maxine was instrumental in moving the discipline forward, which is in part why statistics education programs in the United States exist today.

Nicola Justice, Pacific Lutheran University, 18 February 2023

I think one of the most important things I learned in the graduate program in statistics education at University of Minnesota was how to spell Pfannkuch.!!!! We were always citing articles and basing our work and our studies on things that she had done, and so in all my drafts of papers and literature reviews and synthesis of the work that has been done that name kept coming up again and again! That is to say that Maxine's work has been some of the most crucial and innovative and foundational to the entire discipline of statistics education research. Her contributions are widespread and invaluable.

Nicholas Horton, Amherst College, 26 February, 2023

Maxine Pfannkuch has had a huge influence on statistics education through her interactions with Chris Wild. One highlight is their transformative paper "*Statistical thinking in empirical enquiry*" in the *International Statistical Review* (1999, cited more than 2,250 times according to Google Scholar) that provided a bridge between mathematics education and statistical practice. Maxine's other work on the development of statistical thinking for teachers and students has moved the field and provided a firm foundation for recent work on statistics and data science education, informal inference, and modeling. Her editorship of the Statistics Education Research Journal helped the journal move from a fledging with a handful of papers to a respected outlet for cutting edge research on statistics and data science education. While she has been grounded in the transformational educational environment for school-based statistics in New Zealand, the impact of her efforts and research have been felt in the US and worldwide.

Jennifer Noll, *TERC, 27 February 2023*

I am thrilled to write in my support of Dr. Maxine Pfannkuch for the George Cobb Lifetime Achievement Award in Statistics Education. Maxine's work in the field of statistics education has been some of the most influential work in the field. Two seminal articles, "Statistical Thinking and Statistical Practice: Themes Gleaned from Professional Statisticians" (Pfannkuch & Wild, 2000) and "Statistical Thinking in Empirical Inquiry" (Wild and Pfannkuch, 1999) were incredibly influential in developing my own thinking when I was new to the field of statistics education research and this work has withstood the test of time in terms of how highly relevant it is today. The PPDAC (Problem, Plan, Data, Analysis, Conclusions) framework has been a useful lens with the work I do with

teachers of introductory statistics courses as a way to support teachers thinking about how they can utilize activities that allow for student engagement with all cycles in the classroom. In addition, the PPDAC framework still has relevance in this era of data science as many of the major tenants still apply toward thinking about how to work with new forms of data as well as complex and messy data. The critical habits of mind described in Maxine's work with professional statisticians is applicable when considering new issues in light of developments in technology and how researchers and educators must to take a questioning stance regarding how personal biases may be introduced into their models (including Machine Learning and AI models). In fact, I have been applying ideas from these papers to my recent work studying novice teams of undergraduate statistics and data science students while they work on open-ended, complex data at a datathon event.

Maxine has written a multitude of exceptional research articles in statistics education that it would be impossible to discuss the influence of them all. However, more recent influential work includes, "Experiment-to-causation Inference: Understanding Causality in a Probabilistic Setting" (2015) and "Innovations in Statistical Modeling to Connect Data, Chance and Context" (2018). Maxine's work on inference and modeling was directly influential to aspects of my CAREER grant in terms of how I designed aspects of my introductory statistics activities and had an impact on hundreds of students who took that course. When I first began my studies in statistics education research I read so much of Maxine's work. Her writing was incredibly influential to me, not only because of the new ideas she raised around the teaching and learning of statistics, but because of how accessible and clear her writing is. Meeting her and getting to know her at the SRTL forum was such a great honor and it was lovely to find out that not only is she an excellent researcher, but an incredible human who was always willing to chat with new researchers about their ideas and welcome new researchers into the field.

Gail Burrill, *Michigan State University, 26 February, 2023*

Maxine has provided a valuable resource for me in my work and is currently a wonderful collaborator on a paper. Her depth of knowledge and ability to express ideas are outstanding. I also have noted that she has been a colleague and resource for educators such as Chris Franklin who have indeed made an impact on US statistics education. From an international perspective, Maxine's leadership moved SERJ into a much better position in the academic world, and she was responsible for encouraging me as IASE President to move the publication process to an online platform and to establish the SERJ Advisory Board, providing advice and guidance.

Jane Watson and Greg Oates, *University of Tasmania, 27 February, 2023*

It is with great pleasure that we write this letter of support for our friend and colleague, Maxine Pfannkuch. Maxine is an unassuming, quiet achiever, firm in her beliefs about the content and teaching of statistics at the senior secondary and tertiary levels, and passionate about making a difference for teachers' and students' statistical reasoning and understanding. Her research reflects her beliefs, and her leadership and strong contributions to the development of statistics education deserve serious consideration for this award.

Maxine's Lifetime Achievement began with 20 years as a senior secondary mathematics and statistics teacher, including as the inspirational Head of Department of a large secondary school in New Zealand, where she led the implementation of the new national statistics curriculum. This was followed by an advisory role with the New Zealand Department of Education, in which Maxine began the reformation of one of the most advanced school mathematics curricula in the world. To our knowledge, New Zealand has the only school curriculum that includes "Statistics" with "Mathematics" in the title of the school mathematics curriculum, and Maxine has played a critical role in connecting university statistics research with the school curriculum.

Her seminal work with Chris Wild, while completing her PhD, resulted in several internationally renowned papers on empirical enquiry in the field of statistics, developed through examining the work of their applied statistics colleagues. This resulted in a significant paper in the International Statistical Review in 1999, which has attracted over 2000 citations to the current time, and introduced the extensively-used mnemonic PPDAC, for the process "Problem, Plan, Data, Analysis, Conclusions". Her later work has introduced bootstrapping as a key concept in helping students understand random sampling and particularly confidence intervals.

Maxine is an elected member of the International Statistical Institute and has been a constant contributor to the *International Conference on Teaching Statistics* (ICOTS), the *International Collaboration for Research on Statistical Reasoning, Thinking, and Literacy* (SRTL), and other international conferences where statistics education features, including being the convenor of the very successful SRTL-4 in Auckland in 2005. She has assisted with the organization of many ICOTS and *International Congress on Mathematics Education* (ICME) conferences, where she has been invited to Chair Topic Sessions and present keynote lectures.

One of her major contributions to the field of statistics education recently was to the first *International Handbook of Research in Statistics Education* (Springer, 2018). She was one of the six section editors of this important book, as well as sole author of one chapter, and co-author of another chapter.

The Statistics Education Research Journal (SERJ) is the only journal dedicated solely to research in statistics education. Maxine first served as an Associate Editor from Volume 3 (2004), and was later appointed as Editor from 2014 to 2018, when as Immediate-Past-Editor, she became a member of the inaugural SERJ Advisory Board, making significant contributions, including chairing the Editorial Selection Committee for 2023.

As a person who continues to believe in spreading the message of statistics education and statistical literacy to mathematics teachers at school, Maxine generously gives talks in many settings. In Tasmania, we were fortunate in 2018, when Maxine accepted our invitation as a 'Visiting Scholar' at the University of Tasmania. Maxine gave the Keynote address for our Mathematical Association of Tasmania (MAT) Annual Conference, presented several workshops for Higher Degree Research students and Early Career Teachers, and presented a Public Lecture. The MAT Keynote, Making Sense of Data-based Information in Society: What should students learn?, was recorded and remains current as required viewing by the preservice teachers in our University of Tasmania BEd and MTeach courses. It contains absolutely fascinating examples, that are accessible for a general audience in an easy to understand manner.

Maxine is an inspirational and passionate leader in the world of statistics education and we are proud to support her for this award.

Matthew Beckman, *Penn State University, 28 February 2023*
I've always regarded Maxine as a titan in the field and a true leader in research for Statistics Education. She's adept with big, transformative ideas, carefully framed, diligently studied, that lead to conclusions and frameworks that reverberate in the literature for decades. For example, in Maxine's simple yet deep question responding to Chris Wild's suggestion that students should "think statistically" in the opening vignette of Wild & Pfannkuch's (1999) paper in International Statistical Review she asks "What *is* statistical thinking?" It's the perfect example of a question we all feel like we could have or should have asked. Like a person staring at a piece of abstract art and wondering if they could have done it. Sure, anyone could shape the words to ask the question, but Maxine knew just when and how the question needed to be asked and then she and Chris went on to set the foundation for decades of Statistics Education Research into statistical thinking, expertise, integrated understanding, and more. In my view, her contributions to the extraordinarily progressive approach to statistics education in NZ has also set the standard for what's possible in statistics education, especially for learners in gradeschool, and has no doubt helped reshape the role and posture of statistics in K12 curricula around the world.

On a more personal note, I developed my high opinion of Maxine from afar while still a graduate student, but when I submitted my first paper to SERJ and received a personal reply from none other than Maxine Pfannkuch as editor I was frankly star struck. The decision for that first paper was to revise and resubmit— twice!—which is an arduous process as an author (twice!), but for me it afforded many interactions with Maxine that I'm sincerely grateful to have had. Even as an unproven and unknown researcher, I sincerely felt as if Maxine (as editor) treated me with the kindness and wisdom of a mentor. Years later I had the good fortune to meet Maxine in person for the first time at an SRTL forum in New Zealand. She enters the room with a quiet and unassuming humility, yet her deep thinking, big ideas, and incisive comments reshape the field. She's held in

extraordinarily high regard by her colleagues, students, and I'm sure many anonymous graduate students like I was—dazzled by her ideas, even if slightly unsure of themselves when pronouncing her surname.

Pip Arnold, *IASE Executive, NZ teacher developer, 27 February 2023*

Maxine has been for me the backbone of statistics education in New Zealand. In her quiet unassuming way, she commands any space she is in. Her knowledge of statistics education is without equal in New Zealand and would sit alongside other leaders internationally. I have always valued her perspective and authority in the area. I was privileged and continue to know this to be true as she was my doctoral supervisor. She can make you feel like you can conquer the world and guide you when you hit bumps in the road. I still rely on her and expect her to be able to answer any question I have about statistics and statistics education. Without a doubt Maxine has made a difference, for me, for people I work with and for all students in New Zealand.

New Zealand's statistics curriculum in schools was the result of the input of many, but Maxine secured the funding and gathered a team to look at how this new and exciting curriculum could be implemented. Our statistics curriculum continues to be leading edge, and this is due in a large part to the work Maxine has done, both leading and supporting school-based research in statistics education in New Zealand. Maxine's own doctoral research underpins the statistical enquiry cycle on which the statistics curriculum is based and supports developing novice statisticians in our schools.

Above I reflect on Maxine's impact on statistics education in New Zealand, but Maxine's influence is wider than this. For many years she has been on the editorial team for the Statistics Education Research Journal (SERJ). Many early and later career statistics researchers have had the opportunity to benefit from Maxine's influence through this journal, and many of these researchers are from the USA. Following in Maxine's footsteps and with support from her, the latest two editors are both from the USA, Jennifer Kaplan, and Susan Peters.

From 2017 to 2020 I was involved in the rewrite of the Guidelines for Assessment and Instruction in Statistics Education (GAISE II). I was invited to be part of the writing team because of my PhD research. Maxine was my primary supervisor and through her support and guidance, I became one of the authors of the GAISE II book, a major statistics policy document in the USA. This work has extended into writing papers for other journals with the GAISE II team, presenting at conferences with them and supporting materials development.

Maxine is a rock star, in New Zealand and internationally, in statistics education. She supports us to become the best that we can be. She supports the system to be the best that it can be, and for that I thank her.

Sibel Kazak, *Pamukkale University, 26 February, 2023*

I met Maxine at the 10th International Congress on Mathematical Education (ICME-10) in Copenhagen, Denmark in 2004 when I attended the Topic Study Group 11: "Research and development in the teaching and learning of probability and statistics" in which Maxine was a member of the organizing team and a presenter. At the time, I was in the initial stages of developing my PhD research in statistics education. This was also my first international conference experience without the presence of my PhD supervisor and a great opportunity for meeting world-renowned statistics education researchers. One of them was Maxine and she was very welcoming, helpful in making me feel comfortable in the group, and encouraging for my work.

Since then, our paths have crossed repeatedly over the years through other international conferences in statistics education, such as ICOTS (2006-2018) and SRTL (2007-2019). Throughout this time, I feel very privileged to have many formal and informal interactions with Maxine on teaching and learning of statistics and probability, particularly at school level. Personally, her support and guidance have been invaluable to me when I needed in various research projects. She is a great listener and very generous in offering her insights into various aspects of statistics education. Furthermore, her contributions to our understanding of statistical thinking process and students' conception of statistical and probabilistic ideas and tools have been inspiring for the statistics education researchers at the international level.

In conclusion, Maxine Pfannkuch's accomplishments and commitment to the improvement of statistics

education have been much appreciated. I strongly support her nomination for the George Cobb Lifetime Achievement Award in Statistics Education.

Sharleen Forbes and Mike Camden, Education Committee of the NZ Statistical Association, 4 February 2022

We are extremely pleased to be supporting the nomination of Maxine Pfannkuch for the George Cobb Lifetime Achievement Award in Statistics Education. Maxine has taken a key role in many ground-breaking events in the progress of statistical education in Aotearoa New Zealand. Our letter focusses on her contributions to statistical education in this country.

The New Zealand Curriculum (2007) contains a progressive and innovative section on 'Statistics and Probability', and Maxine had major inputs into this. Central to the strand is statistical thinking in the context of statistical investigation and reporting. The ideas in here originated in Maxine's PhD, and in her seminal paper with Chris Wild: Statistical Thinking in Empirical Enquiry (1999). When the 2007 Curriculum was being written, we were fortunate that Maxine was employed as one of the writers. She was then and remains a member of the Education Committee of the New Zealand Statistical Association (NZSA). She worked on the text with the rest of the committee, ensuring that this section of the curriculum is statistically and pedagogically sound. The resulting content on statistics has worked well for this country, and has been used as a resource overseas. New Zealand is internationally acknowledged for being a leader in terms of its school curriculum in statistics.

A major innovation in the 2007 curriculum is the introduction of resampling methods for inference. Its Level 8, for the last year of schooling, contains this objective: Make inferences from surveys and experiments ... using methods such as resampling or randomisation to assess the strength of evidence. Maxine's involvement in the international research community meant that she and colleagues were able to persuade us all that this approach to inference would be an advance. It could be made intuitive and visual. Subsequent work by Maxine and colleagues on reasoning and software systems made it just that.

Maxine and colleagues produced a flow of research papers on new conceptual pathways to inferential reasoning and dynamic visualisations that support this. After the release of the curriculum document, the country produced downstream guides for teachers, with details and progressions. Also the country reviewed its senior secondary school Achievement Standards. Students are assessed against these standards for the National Certificate of Educational Achievement (NCEA), in each of the last three years of schooling. Maxine contributed her insights, either directly to the Ministry or via the NZSA Education Committee, to all these.

The other side of successful statistical education is having a knowledgeable and capable teaching workforce. Maxine has made a major contribution to this through university Masters and PhD programmes, the Statistics Teachers' Days run annually by the University of Auckland, and many presentations to teacher groups. Maxine has an empathy with teachers, based on her own experience as a classroom teacher. Whenever any change is proposed, Maxine raises the issue of how teachers will be supported in effecting the change.

Maxine is well-known internationally for her research in the teaching of statistics in school classrooms. She is always careful to show that proposals are evidence-based in appropriate research. Many of her research projects have been collaborations with classroom teachers, and this brings benefits to the teachers and their students. In the last three years, Maxine and colleagues have set up the online journal Statistics and Data Science Educator (SDSE). It has peer-reviewed lesson plans for teachers and by teachers, at all levels, from early childhood to graduate. It is a professional growth opportunity for both its readers and its writers.

As members of the NZSA Education Committee, we really enjoy and appreciate Maxine's contributions. We've done that for 20 years, and we hope to continue. She is dedicated to statistical education, and can be depended on to get jobs done. Statistical education is facing some new issues: new data types and the data deluge, data ethics, equity in education, indigenous data sovereignty, new data visualisation methods, and more. Maxine is always ready to raise these, examine them, and look for solutions.

Maxine has a lifetime of achievements in statistical education, and she remains very active in this vital area.