JCOM

TWENTY YEARS OF SCIENCE COMMUNICATION: LOOKING BACK, LOOKING FORWARD

# Twenty years of teaching science communication — a personal reflection

**Nancy Longnecker**

**Abstract**

In this commentary, I reflect on twenty years of teaching science communication at universities in Australia, Singapore and New Zealand. I discuss many of the challenges and opportunities for people working in the field. Some of the professional teaching experiences, challenges, and lessons I have learned may resonate with colleagues or help newcomers navigate the complexities of academic landscapes.

**Keywords**

Professionalism, professional development and training in science communication

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## Science communication teaching programs provide a degree or other qualification

This commentary focusses on university science communication teaching programs[1] that help develop professional science communication skills. The main student cohorts for the programs I discuss in this commentary are those who want to incorporate science communication activities into their professional lives, or those who want careers as a science communicator. Science communication graduates forge diverse career paths (see Wilkinson, Milani, Ridgway and Weitkamp [2022], for results of an international survey of 459 science communicators). They run science communication businesses, work as freelancers or are employed by governments, universities, schools, non-government organisations, publishers, traditional media, film studios, design studios, games studios, museums, botanic gardens, parks, etc. They may provide policy advice, teach, research, develop communication strategies and resources, engage in activism, media work, or public relations, plan and implement public events, consult, write, design, interpret, illustrate, or edit. Science communication educators wear many hats to meet the needs of their students.

[1]Terminology: The term *program* is used here to refer to a curriculum of study that leads to a degree or other qualification. I use the term *class* to refer to delivery a subject over one term of study (referred to in different university systems as class, unit, paper, module, course, etc.). Teaching in this context refers to teaching at university level.

In this commentary, I firstly discuss developing an undergraduate science communication program for teaching science students. This kind of teaching may augment students' primary study within a science discipline and is often offered as a 'minor' or supplementary focus within an undergraduate science degree. Graduates from these programs may become professional science communicators but are more likely to communicate science to some extent in other career trajectories. Next, I discuss postgraduate programs developed specifically for aspiring science communication professionals. Many people enter such programs with a science degree or other significant science-relevant experience. Lastly, I present some of the challenges and opportunities that people developing, delivering or supporting science communication programs may encounter.

## Development of an undergraduate program teaching communication skills for science students

At the turn of the century, my colleagues and I at the University of Western Australia (UWA) made a case for a science communication program. We argued that science graduates needed better communication skills to improve their employability and capacity to contribute to society. Similar persuasive arguments have been made (and are still made) around the world; these arguments have helped launch many science communication programs [see, for example Mulder, Longnecker & Davies, 2008; Trench, 2012]. I was hired in a Science Faculty in 2002 (part-time and on contract), along with one other colleague, to develop and teach the university's new science communication program. The program commenced as an undergraduate minor, with many of the classes offered as electives. It is still running, 20 years on.

We learned many things from developing that program and watching it evolve. Fundamentally, our unstated mission, as program developers and teachers, was to train 'science cheerleaders'. My colleague and I are both science enthusiasts and were comfortable with that mandate. Looking back, I realise that I was naïve about science communication's transformative potential. Over time, I have learned that while science communication programs can justify their existence to funders by aiming to train science students to share scientific information with wider audiences, these programs have much more to offer [Trench, 2012].

Within our own university we were inspired by those with more provocative and critical stances (e.g. SymbioticA, an artistic laboratory housed within a science department that provides access to wet-lab spaces for artists to investigate and critique activities within the life sciences). With hindsight, I think our early teaching, students' learning, and research contributions to the field of science communication would have benefitted from more transdisciplinary collaboration to enhance creativity, intellectual enquiry, content, and innovation. Later, I collaborated with the UWA humanities communication program and delivered two classes in their Bachelor of Arts communication course, taught in Singapore. This engendered cross-cultural learning for students and teaching staff.

My first science communication colleague had a sound grasp of education principles, which informed our development of the science communication curriculum. Our undergraduate minor for the Bachelor of Science was made up of classes with learning outcomes that complemented each other and were scaffolded. The program was entirely assessed by authentic or "real world" assignments with no exams. In their review of the science communication training literature, Baram-Tsabari and Lewenstein [2017] note with surprise that relatively few of the science communication programs they examined emphasized an element of 'doing'. Doing is a vital aspect of education and training, supporting the consolidation of learning. The value of authentic assessments [see Ashford-Rowe, Herrington & Brown, 2014] includes opportunities for doing science communication in the context of program-community relationships. This approach, a win-win-win for the community, the program and individual students, is discussed more fully in Longnecker and Gondwe [2014].

This 'doing' feature of our program was based on our teaching philosophy, which saw learners as apprentices entering a professional field of activity. We considered the production of communication resources to be highly appropriate assessments. The lack of exams was an advantage for marketing this program to undergraduates, but we were involved in many robust discussions while trying to gain academic committee approval for the assessments. Some colleagues were adamant that an exam was essential for any university class.

Our program was not affiliated with a journalism department, and our media focus involved working *with* media rather than working *in* media. Teaching about working with journalists in radio, television and print media was our early focus. This focus has evolved dramatically with massive changes to the media landscape in the past 20 years. We shifted focus to what was then referred to as 'new media' [Rifkin, Longnecker, Leach, Davis & Orthia, 2009]. Social media, podcast and short-form video are now common features in science communication teaching and practice, with direct communication between producer and audience.

## Program vulnerability and development

In our undergraduate program, students in any science major could take a science communication minor, provided that: 1) their curriculum plan had the flexibility to accommodate it and 2) students knew about us. These factors continue to be two of the major stumbling blocks for increasing undergraduate science communication student numbers.

Advocates of university science communication programs need to be aware of the political and economic realities of funding and cash flow within their institutions and nations. In Australia and New Zealand, for example, the funding models of predominately public universities make developing an undergraduate program particularly challenging. Government funding to support undergraduate education provides for 'bums on seats', with total teaching funding divided and flowing to university departments based largely on enrolment numbers in classes. Many colleagues support the teaching of science communication in principle but may hesitate to recommend classes in another departmental cost centre. They may be reluctant to part with income as well as precious contact hours, when a full curriculum in their home department is their higher priority.

It took eight years of lobbying at multiple levels within the university to obtain approval to deliver a first-year science communication class. A university-wide conversation about curriculum restructure resulted in the decision that communication skills were an essential graduate attribute and that all students should take at least one communication class [Barrett-Lennard, Chalmers & Longnecker, 2011]. That requirement did not go unchallenged but when an introductory science communication unit, SCOM1101, was finally introduced, I taught over 600 students in 2012. This brought significant income to my home biology department.

Regrettably, I was still unable to convince a mid-level, academic decision-maker to hire another dedicated science communication academic, despite strong support from the head of the department and a sound business case for what was by then a ten-year-old program, with large student numbers and research income. One of the biggest obstacles for science communication programs is a persistent view that any science academic can teach science communication because they have some practical communication experience. I argue that is like claiming that any academic can teach reproductive biology if they have had children. While many science communication academics do in fact move laterally from another science discipline into science communication (including me), we have devoted considerable time and effort in learning and teaching science communication. This is more than most science academics are prepared to do.

To better articulate the value of a full science communication program — and to have that story told by student voices — I ran a competition, providing a prize for the best student essay on: 'Why [the university] should have a science communication program'. Those essays were compiled into a report with archived information about the program that I hoped would be useful for my successor(s) [Longnecker, 2014]. One excerpt follows:

> *To me there is no question we should have one. I wonder why it is even an issue, why something so obvious needs to be justified. . . The Science Communication program has given me so many opportunities that have enhanced my work and life. . . as an employee, a student, a teacher and a member of the community. These are transferable skills at work in the real world. We talk about them and want our students to have them, and claim that a science degree will provide them. The Science Communication program is a great example of where the promises really are delivered.*

Funding at universities can be tenuous, and science communication programs can be particularly vulnerable to change [Trench, 2012]. The COVID-19 pandemic had an enormous impact on university funding. For decades, Australia and New Zealand's largely government-funded public universities have relied on international student fees to supplement underfunding by successive governments. With both countries pursuing COVID-19 elimination strategies in 2020, international enrolments and income fell dramatically and immediately when borders closed. Some academic programs have been discontinued or contracted and many academics in Australia and New Zealand have lost jobs; yet the science communication programs in those countries have largely survived. Perhaps one factor is recognition of the importance of evidence-based communication for community well-being.

## Postgraduate programs for aspiring science communication professionals

The undergraduate science communication program, which I helped found in 2002, quickly expanded to include a postgraduate program, first offered in 2005. The postgraduate focus aligned with global trends in science communication education at the time, with most programs around the world being delivered at postgraduate level. Our program was aimed at aspiring professional science communicators, and the program content was informed by my experience working for eight years as a professional science communicator and by survey results from members of the Australian Science Communicators Association. The program was also shaped through opportunities to share and learn from colleagues around the world through the Public Communication of Science and Technology (PCST) Network [e.g. Mulder et al., 2008]. The emphasis on doing science communication described earlier remained a key focus.

Doing is also a key focus at the University of Otago's science communication program where I work now. Most of our science communication postgraduate students produce a creative component as part of their Master's degree. PhD students can also include a creative component in their research thesis. In doing, our students have produced a wide spectrum of outputs, including exhibitions, teaching resources, films, podcasts, articles, books, games, and web sites. Combining creative and academic research components into one thesis has challenges, especially in a one-year Master's thesis year. As one example, if the Master's candidate (often a natural science graduate) is doing empirical research, they may need to learn about new social science research methods and develop the skills to employ them properly, while also producing a significant creative communication output. This requires serious time management skills and the ability to juggle between very different tasks — good preparation for a science communication career. Students have opportunities to expand as professional creatives and critical thinkers as they develop both creative and research skill sets.

One recurring question posed by science communication scholars has been to what extent students need to know the theoretical underpinnings of the science communication skills they learn [e.g. Baram-Tsabari & Lewenstein, 2017; Mercer-Mapstone & Kuchel, 2017; Turney, 1994]. Without a theoretical foundation on which students can build their growing repertoire of communication skills, they proceed with a 'gut feeling' of what works. While this sometimes results in excellent science communication outcomes, it can also yield predictable failures, most often when novice science communicators adopt a deficit model approach, assuming that providing facts or evidence will result in effective persuasive communication. The failure of this one-size-fits-all approach has been demonstrated time and again, in diverse contexts [e.g. Kahan et al., 2012; Lee & Garvin, 2003; Wynne, 1992].

For decades, science communication scholars have pointed to a lack of consensus in the field regarding core threshold concepts that need to be taught to aspiring science communicators [e.g. Besley & Tanner, 2011; Bray, France & Gilbert, 2012; Mulder et al., 2008; Turney, 1994]. This discussion about defining core concepts has gained momentum in recent years [Lewenstein, 2022; Baram-Tsabari & Lewenstein, 2017; Besley, Dudo, Yuan & Ghannam, 2016; Mercer-Mapstone & Kuchel, 2017]. The recently formed PCST Teaching Forum, an activity of the PCST Network, is a welcome development that should facilitate greater sharing of global experiences and resources beyond previous regional teaching initiatives.

Audience focus is one accepted threshold concept — understanding that an essential step of planning any communication involves consideration of the audience and alignment of communication objectives and methods with that audience [Longnecker, 2016, 2022]. Science communicators must also recognise that:

- there is value in different sources of knowledge [Thornton & Bhagwat, 2020]
- science communication is cultural [Blue, 2019; Longnecker, 2016]
- there is need for inclusivity in science communication [Archer et al., 2020]
- participatory science, including citizen science [Bonney, Phillips, Ballard & Enck, 2016] is valuable
- there are diverse and rich histories of science communication globally [Gascoigne et al., 2020].

## Challenges and opportunities

The pandemic and belated awareness of the urgent need for action on climate change may have created institutional and wider support for teaching science communication in some instances. Social fragmentation, rapid changes in communication ecosystems, and increasing complexity of communicating during times of crisis and uncertainty mean that most science students and scientists will benefit from learning about how to communicate effectively and professionally beyond their disciplinary community.

Some ways that we might better serve our students to work in these fast-paced communication environments include:

- embracing transdisciplinary collaboration to inspire creativity, intellectual exploration and innovative practice
- including theory in the curriculum and core threshold concepts
- including the opportunity to critique science, considering various sources of knowledge and growing beyond being 'science cheerleaders'
- sharing best practices with colleagues from other institutions, obtaining feedback from science communication professionals and professional associations, and — of course — using student feedback
- remaining aware of the vulnerabilities of funding, but being careful about using 'deficit' arguments (e.g. 'better science communication can stop mis/disinformation from spreading and grow public support') when seeking institutional or external support.

Those of us who have dedicated many years to teaching science communication obviously aim to provide useful learning opportunities that are informed by a growing body of literature [see, for example Besley & Tanner, 2011; Besley et al., 2016; Bray et al., 2012; Fähnrich et al., 2021; Longnecker & Gondwe, 2014]. Yet, providing empirical evidence of teaching and learning success remains difficult. There is no control group. Much research relates to teaching communication skills to scientists rather than science communicators [Besley & Tanner, 2011; Fähnrich et al., 2021]. Better evidence for the impact of science communication teaching and learning would certainly help those advocating for support of programs and improve the learning and teaching in science communication overall. As science communication educators, we need to critically evaluate, document and share the outcomes of what we do.


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