

A discussion of the statistical investigation process in the Australian Curriculum

Vivienne McQuade

Australian Bureau of Statistics

<vivienne.mcquade@abs.gov.au>

Statistics and statistical literacy can be found in the Learning Areas of Mathematics, Geography, Science, History and the upcoming Business and Economics, as well as in the General Capability of Numeracy and all three Cross-curriculum priorities. The Australian Curriculum affords many exciting and varied entry points for the teaching of statistics.

The new curriculum also offers an opportunity to explore the pedagogy of using the statistical investigation process (s-i-p). This is based on the premise that the full statistics cycle really does matter and is fundamental to why statistics is important (Porkess, 2012, p. 17). The process of starting with a problem, collecting data, analysing data, and interpreting and communicating results is present throughout the curriculum. This discussion paper invites teachers to examine the intention of the curriculum and to identify where the statistics cycle is both explicit and implicit. It is about looking for the commonalities within and across the Learning Areas to support teachers to prepare materials and learning tasks to build statistical capability by understanding the statistical processes underpinning different representations of the cycle.

Primarily, the profile of statistics has been raised through inclusion of Statistics and Probability as one of the three strands in the *Australian Curriculum: Mathematics* (ACM) and, importantly, it commences at Foundation level. ACM has a varied and different process from each of the four parts of the statistical investigation process (s-i-p) emphasis as described in the Content Descriptions and Achievement Standard for each year level.

Aboriginal and Torres Strait Islander histories and cultures, Asia and Australia's engagement with Asia and Sustainability are the local, regional and global issues identified as the cross-curriculum priorities in the Australian Curriculum. While it may be these issues, rather than the statistics, that grab people's attention, it should be recognised that it is often the statistics that inform the issues. Statistical literacy skills equip students with the ability to accurately understand, interpret and evaluate the data that enrich understandings of these issues.

Statistical literacy is represented in the Numeracy General Capability as the 'Interpreting Statistical Information' organising element. This element involves students gaining familiarity with the way statistical information is represented through solving problems in authentic contexts that involve collecting, recording, displaying, comparing and evaluating the effectiveness of data displays of various types. Importantly, when a search is conducted with the search tool, this capability reveals, through the use of the numeracy icon, opportunities for applying statistical skills in a range of other Learning Areas: Geography, Business and Economics, Science and History.

The Content Descriptions of the data representation and interpretation sub-strand of the ACM for Foundation to Year 10 are where the processes within the s-i-p can be found. It is incumbent on the teacher of mathematics to clarify where their own strengths and focus of each part of the s-i-p lie and to ensure that their

students develop skills in all four parts of the s-i-p. Teachers can ask the questions:

- Are all processes of the s-i-p represented at my year level and is it balanced?
- Is there more of a focus on one particular process than others?
- If each stage has a set of processes within it are there important processes not represented?
- How will we take advantage of these opportunities for revisiting, rethinking and reinventing my teaching of statistics through understanding key statistical concepts and the big ideas of statistics as they are presented in the different entry points in the Australian Curriculum?

To discuss the interconnections within and across the Learning Areas, it is important to note that an explicit description of the statistical cycle is difficult to find in the ACM. The statistical investigation process (s-i-p) can be found in the glossary and there is a diagram which shows the cyclical nature of problem, collecting data, analysing data, and interpreting and communicating.

In the *Australian Curriculum: Science* (ACS) Learning Area, an investigation cycle is explicit. The content in the Science Inquiry Skills strand has five sub-strands: Questioning and predicting, Planning and conducting, Processing and analysing data and information, Evaluating, and Communicating.

In *Australian Curriculum: Geography* (ACG), the stages of an investigation are explicit in the strand: Geographical inquiry and skills. They are Observing, questioning and planning; Collecting, recording, evaluating and representing; Interpreting analysing and concluding; Communicating; and Reflecting and responding.

Another important, new and challenging entry point to the statistical investigation process for our 21st century learners is the general capability, Ethical understanding. There are ethical implications for each part of the s-i-p. In order to build trust in the production and use of statistics, we need to give students the teaching and learning experience in the ethics of devising the problem (ensuring that the questions that are asked are not based on assumptions, for example, based on stereotypes), the ethics of collecting data (permissions, privacy, respect, who owns the data, confidence in purpose of data collection), the ethics of what we do with data (maintaining confidentiality, transparency, check for bias, use appropriate scales, check sample size) and the ethics of how we interpret and communicate our findings (what data visualisation represents the true story, what is left out of a report).

In conclusion, teachers of statistics, producers of statistics and users of statistics, need to look to all the different entry points to deepen students' statistical capability. The statistical cycle may look like the Mathematics Statistical Investigation Process, Geographical Inquiry and skills or Science Inquiry Skills. There may be a different language for analysis or interpretation but teachers are invited to look for commonalities, such as the role of ethics, and connections to build skills in statistics capability in their students.

The Australian Bureau of Statistics (ABS) is a trusted and valuable source of data and products which support the learning design process to increase students' deep understanding of statistics. Education Services, within ABS, aims to enhance discoverability and accessibility of resources for the range of entry points to develop statistical capabilities in teachers and students. For example, the statistical investigation process is at the core of the premier resource CensusAtSchool, and provides a model of sound teaching practice. Teachers are encouraged to visit the ABS website (www.abs.gov.au), go across to the Education tab, and begin an exploration of these resources using an Australian Curriculum lens which supports examining the statistical cycle in its many representations.

Reference

Porkess, R. (2012). *The future of statistics in our schools and colleges*. Accessed from <http://www.rss.org.uk/site/cms/contentviewarticle.asp?article=1200>