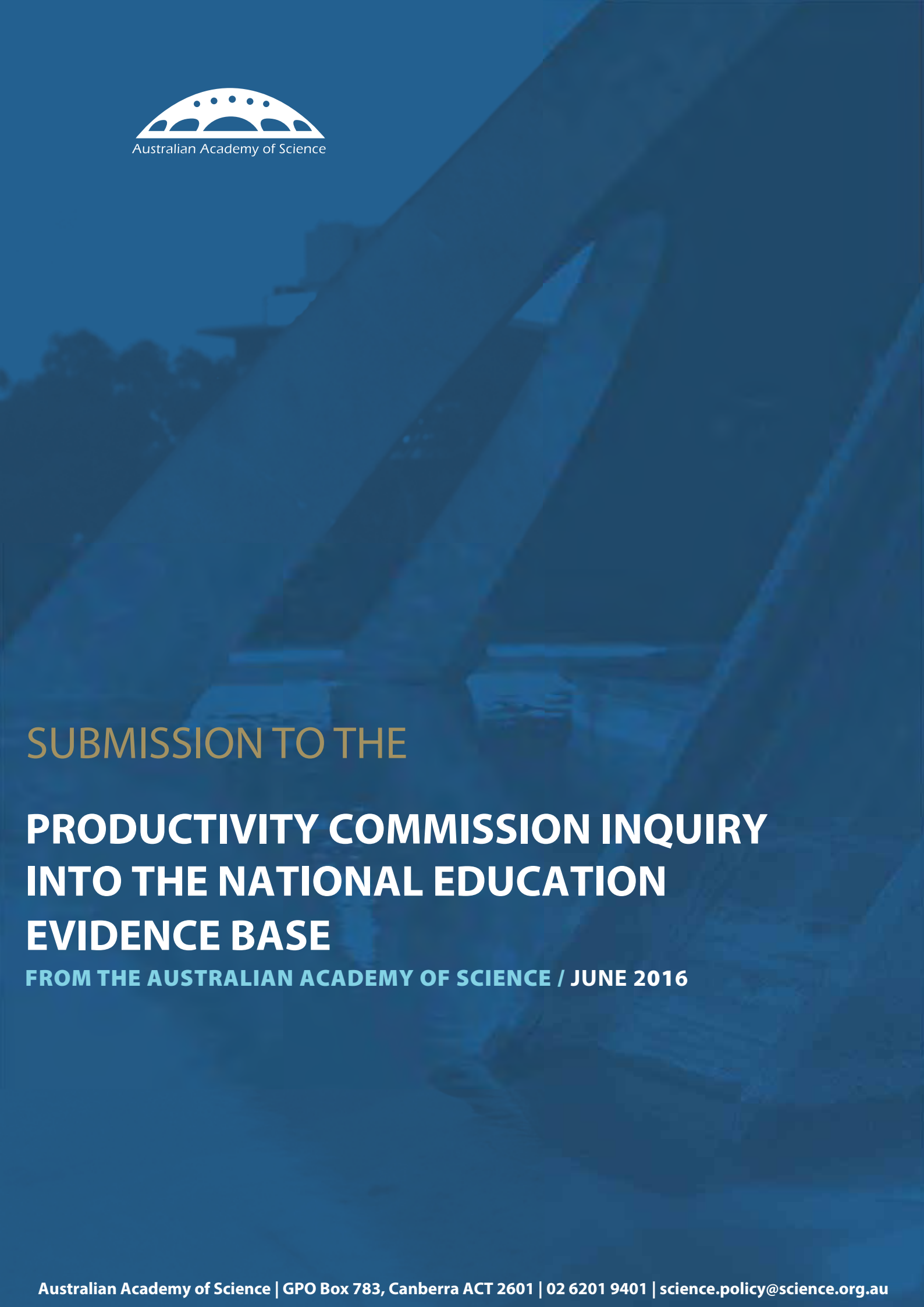

Australian Academy of Science

SUBMISSION TO THE

PRODUCTIVITY COMMISSION INQUIRY INTO THE NATIONAL EDUCATION EVIDENCE BASE

FROM THE AUSTRALIAN ACADEMY OF SCIENCE / JUNE 2016

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AUSTRALIAN ACADEMY OF SCIENCE SUBMISSION

PRODUCTIVITY COMMISSION INQUIRY INTO THE EDUCATION EVIDENCE BASE

The Australian Academy of Science (the Academy) welcomes the opportunity to make a submission to the Productivity Commission's inquiry into the evidence base supporting early childhood and school education. The Academy promotes scientific excellence, disseminates scientific knowledge and provides independent scientific advice for the benefit of Australia and the world. The Academy is made up of over 500 of Australia's leading scientists, each elected for his or her outstanding contribution to science. The Academy would be pleased to provide further information or explanation on any of the points made in this submission.

This submission considers education in science and mathematics fields. This reflects the expertise the Academy has gathered in fifty years of producing high-quality educational materials for schools, starting with the landmark biology textbook *The Web of Life* and continuing today with the acclaimed *PrimaryConnections* and *Science by Doing* programs and the forthcoming *ReSolve: Maths by Inquiry* project.

THE NEED FOR NATIONALLY CONSISTENT AND MEANINGFUL DATA

The Academy strongly supports the use of appropriate evidence to support the development of policy interventions in all areas of governmental activity. Evidence-informed policy supports transparent decision-making, emphasises a rational basis for government action and provides the community with confidence that policy interventions reflect best practice. However, opportunity to practice evidence-informed policy is necessarily limited by the available of relevant, quality data.

Australian educational practices needlessly suffer from a lack of nationally-consistent or relevant data, particularly in science and mathematics. For example, despite each state and territory maintaining a register of teachers in their jurisdictions, counts of the number of science and mathematics teachers in Australian schools are simply estimates – with the best estimates being extrapolation from anonymous surveys.[1] Similarly, relatively simple questions such as how many students are being taught the Australian Curriculum:Science (or even whether students are being taught science *at all* in some areas), cannot be reliably answered. The Commission's own issues paper has highlighted the distributed and inconsistent approach to collecting and maintaining educational data sets; the time and effort required to combine inconsistent, disparate data sets (where they are even available) is a significant barrier to using evidence to better inform policy.

Data on student outcomes in science and mathematics fields are similarly lacking. Australia's National Assessment Program consists principally of the annual NAPLAN literacy and numeracy tests, complemented by triennial assessments in science literacy, informational technology and civics literacy, and the triennial Program for International Student Assessment (PISA) system. Under the NAPLAN regimen, an individual students' literacy and numeracy is tested every two years between year 3 and year 9. Science literacy is tested only for a sample of every third cohort of year 6 students, and again for a sample of 15 year-olds every three years under PISA, with PISA placing a detailed emphasis on science every nine years.[2] This results in a piecemeal approach to student outcome data, so that the ability to make meaningful conclusions on particular policy interventions or educational practices is severely limited.

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[1] See Willett, M., D. Segal and W. Walford (2014), *National teaching workforce dataset data analysis report*, Department of Education and Training, Canberra, pp. 74-76

[2] PISA studies three principal 'domains' – reading literacy, mathematical literacy, science literacy, with the domain of emphasis rotating between each triennial cycle. See Australian Council for Educational Research, Programme for International Student Assessment (PISA) Australia – What does PISA assess?

Indeed, the student outcome data that are collected are of questionable quality. Others have argued that NAPLAN assesses numeracy at a relatively superficial level, and there is concern that the construction of 'league tables' from NAPLAN results may diminish NAPLAN's utility through the phenomenon of 'teaching to the test'.[3] The quality and integrity of NAPLAN (and PISA) data must be beyond reproach, as without these limited outcome datasets, no relevant data would exist to inform policy decisions. Although PISA provides an internationally comparable measure of Australian students, it has no direct relationship to the Australian curriculum, so cannot be used to judge the progress of Australian students against locally relevant objectives.

The Academy considers that data on educational practices as well as outcomes are significantly lacking, so that reform of the current arrangements for the collection and sharing of such data is needed. A national picture of student and teacher characteristics, participation and outcomes must be constructed from data that are consistent, reliable and of the highest quality.

The Academy acknowledges the practical difficulties involved with rationalising the current system, but encourages the Commission to examine the experience in Germany over the past two decades. As with Australia, Germany is a federal system consisting of 16 states, each with its own educational system. After surprisingly poor results in the first PISA test, the states agreed to collaborate and share data to facilitate better national student outcomes, supported by expertise in the central government. The coordinated action between the states gave rise to significant and continuing improvements of the level of attainment of German students in the PISA tests. [4]

Although the exact arrangements for data collection are a matter for government, it is clear that there is scope for increased involvement of a central agency in the collection, maintenance and development of educational data. Despite the existing responsibility of the states for delivering education, central authority over data collection could be established either financially, or through the Commonwealth's responsibility for statistics.[5] It is likely that such a function would be most effectively carried out by government for reasons of both maximising compliance with data collection requirements and efficiency (given that governments at several levels are already the collectors of a considerable amount of this data).

The Academy strongly recommends that new arrangements are implemented for the collection, maintenance and development of educational statistics, with the primary objective to create a nationally consistent, reliable and high-quality suite of educational datasets.

THE NEED FOR SYSTEMATIC PROGRAM EVALUATION

Perhaps as a consequence of the lack of meaningful educational statistics, novel policy interventions into education are not systematically evaluated for their efficacy or levels of use. Although the Academy acknowledges the excellent work done by many in the education sector, including university researchers and the Australian Council for Educational Research, the practice of formally evaluating novel programs to quantify their benefits or otherwise is not a systematic norm in Australia. In the sphere of science education alone, the Academy estimates that more than $100 million has been spent over the last decade on specific school science programs, yet the impact of these initiatives upon student achievement has not been systematically investigated and documented. Citizens rightly expect public funds to be used in the most effective way possible, and it is currently not possible to demonstrate in a rigorous way that resources provided to improve

[3] Australian Association of Mathematics Teachers (2013), *Submission to Senate Standing Committee on Education and Employment inquiry into the effectiveness of the National Assessment Program – literacy and numeracy*, pp. 1-3.
[4] See Prenzel, M., W. Blum and E. Klieme (2014), The impact of PISA on mathematics teaching and learning in Germany, in Stacey, K. and R. Turner (eds.), *Assessing Mathematical Literacy: The PISA Experience*, Springer, Cham.
[5] *Commonwealth of Australia Constitution Act*., s.51(xi)

educational practices have had substantial impact. Where evaluation has occurred, it is piecemeal and ad-hoc, rather than an entrenched practice of investigation and review.

It is highly likely that the lack of detailed and nationally-consistent educational data has considerably hindered evaluation of individual programs. For example, if an initiative is trialled in one jurisdiction, it may be desirable to then compare outcomes in that jurisdiction to control populations in other jurisdictions. In the absence of nationally consistent educational data, such comparisons may not be completely valid, or even possible. Nationally consistent datasets are therefore an essential prerequisite of proper evaluation, which itself is a core component of maintaining best practice.

The Academy recommends that consideration be given to establishing a function of independent evaluation of educational initiatives. This could take advantage of the considerable existing expertise in educational research in Australia, and results of evaluations could help to inform future policy interventions. However, the success of a system of independent evaluation would depend greatly on the development of an impeccable suite of educational indicators.