

How to Measure Efficiency in Australian School Expenditure

Prepared by

Vincent Blackburn

Essential Education Economics and SEMETRICA (School Efficiency Metrics Aust)
February 2018

This paper analyses selected existing frameworks for Government Service Provision, Performance Measurement and Benchmarking Metrics methodologies used in the context of School Education by:

1. The Australian Productivity Commission and
2. The New Zealand Productivity Commission
3. The UK Department for Education
4. The OECD School Resources Review
5. E3 and SEMETRICA'S current Australian School Efficiency Reporting Template (ASERT).

Government Efficiency Policy Evaluation Frameworks in Australia, the UK, NZ AND the OECD

- (1) The 2016 Australian Productivity Commission's Report on Government Services (PC-ROGS) Framework relating to School Education

The Logic Model School Performance Measurement Framework developed by E3 using granular school site data closely mirrors that contained in the annual Australian Productivity Commission Report on Government Service Provision, 2016, PC-ROGS Report, 'Approach to Performance Measurement', (1)

The annual Australian PC-ROGS report series outlines a government service performance measurement conceptual framework which includes the principles underpinning their annual assessment of the efficiency and productivity aspects of each State and Territory Government service provision including School Education.

An explicit cost efficiency and productivity benchmark modelling exercise based on granular school site data is not the purpose of these PC-ROGS annual reports. Rather, they provide an annual inventory and time series of

how each sub-federal jurisdiction has developed their more aggregated budgets based on a standard uniform Accrual Accounting format. Such aggregate data allows analysts to assess for themselves how each jurisdiction is performing.

Utilising this aggregate school program costing, staff personnel and student data sets, the measurement of each State and Territory's performance can be assessed yearly and over time. However more decentralised empirical NSW Performance studies using granular School Site data have been undertaken by E3 using more complex Non-Parametric DEA Efficiency and Productivity modelling analytics contained in chapters 4 to 6 of the Springer Book, (4).

These additional decentralised Econometric Efficiency and Productivity Logic Model approaches are the focus of E3's policy research methodology. Using well curated granular data sets these models are fully applicable to preparing the future 4E's, efficiency, effectiveness, economy and equity, assessment needs of the current "GONSKI 2.0" Educational Review, (18).

(2) The 2017 New Zealand Productivity Commission's Framework

A recent New Zealand Productivity Commission's public sector productivity analysis, "Public Sector Productivity, WP 2017/2", May 2017, focuses on Quality Adjusting Sector –level School Education quantity data variables.

This most recent study estimated a range of quality adjusted school productivity measures and discusses the benefits and risks of new approaches regarding teacher salaries and student test performance.

They follow closely the methods of the UK Statistics Office in assessing declining productivity in the NZ School Education sector. Similar comparative studies by the Australian Productivity Commission into assessing and Quality Adjusting Australian School sector performance over time would be a very timely addition to the Public Sector Productivity debate involving Australian schools. NZ Productivity Commission, Public Sector Productivity, WP 2017/2, May 2017.

(3) The 2016 United Kingdom Education Efficiency Framework

By contrast the UK Government Department for Education has recently adopted a more explicit mandated policy evaluation framework to measure the efficiency, effectiveness and productivity of its service provision across all School Education sites in the United Kingdom with effect from 2016. This is well summarised in their documents, "Improving Public Sector Efficiency to Deliver a Smarter State," 25/1/2016, (2)

A specific example of some very relevant School Policy Efficiency Modelling results flowing from this UK initiative across their School Education sector is shown in their recent, "School Efficiency Metric -A

Technical Guide” for the calculation of their new School site Efficiency Metric, February, 2016. (3.)

E3 has been in close contact with successive UK School Education Department Policy units since 2011-2012 sharing its diverse School Efficiency Econometric Research project findings contained in seven collaborative peer reviewed School Finance Efficiency and Productivity papers. These E3 research studies have been published in world leading Economic Policy Journals and a book in the Springer International Operations Research and Management Sciences series entitled, “Non-Parametric Analysis of Education Production and Costs using Data Envelopment Analysis,” 2015. (4)

More details on such collaborations are contained in E3’s two submissions, (initial and follow up), to the 2016 Commonwealth Productivity Commission’s Treasury Mandated Inquiry into the “Australian Education Evidence Base” in 2016, (5 and 6).

The final version of this PC Education Evidence Based Report was released on 24 May 2017, which supported the contemporary importance of E3’s extended research methodology as being “a more appropriate top down analytic method for evaluating and measuring the efficiency, effectiveness and value for money of the school education system (E3, submission, 17),” page 108. (7)

(4) The 2016 OECD School Resources Modelling Framework

The 2016 OECD Review of School Funding Policies was aimed at improving the Efficiency and Effectiveness of Resource Use in Schools. (8)

This School Resources Review developed a very detailed Logic Model Conceptual Framework examining how resource inputs into schools should best be distributed, utilised and managed.

Their aim was to distil how best to optimise school outputs whilst encouraging successful teaching and learning within a framework of promoting continuous improvement.

This review also provided analysis and policy advice to help governments and schools achieve effectiveness and efficiency objectives in school education. Their conceptual framework considered four resource types, which result from the overall financial resources available to school education:

- (i) financial transfers,
- (ii) human resources,
- (iii) physical resources and
- (iv) targeted programs

This 2016 OECD study framework involved a close analysis of the twin effectiveness and efficiency dimensions incorporating the use of Education Production Functions.

This partial approach however was not as extensive as E3's 4E conceptual framework which incorporates the

- (i) Effectiveness,
- (ii) Efficiency,
- (iii) Economy and
- (iv) Equity dimensions,

Embodied in the Australian School Education framework below.

(5) E3's "Performance Measurement Logic Model Framework."

E3's Logic Model Framework based analytical studies over the last decade in Australian School Education have been calibrated with granular school site data sets. They have comprehensively modelled the quadrella elements that systematically incorporate Efficiency, Effectiveness, Economy and Equity Good School Governance policy dimensions (10). They will be extended by E3 to Monitor new school funding from June 2018 to May 2026 to inform:-

- (a) The Future upgraded and enhanced ACARA and Productivity Commission's 'TOP DOWN' and 'BOTTOM UP' School Efficiency and Productivity Benchmark Reporting Agendas; and
- (b) The "Gonski 2.0" School Sector Efficiency, Effectiveness and Equity extensive annual enhanced Monitoring & Reporting proposals in its future Education Excellence Review Agenda.

E3's future benchmarking studies will initially cover all 9,600 Government and Non- Government Schools retrospectively analysed from 2009 to 2017, then annually up to 2026 across Australia's eight jurisdictions using its Australian School Efficiency Reporting Template (ASERT) framework.

Background to understanding E3's School Efficiency Modelling

State Government and Non-Government schools in Australia are both faced with the continuous challenge of maximising student achievement within finite budgetary resources.

Recent commentary in the School Finance literature in Australia has noted the fact that over the last decade or more whilst there has been a large increase in expenditure per government and non-government school student, there has been a corresponding and disappointing fall off in the test scores of students according to comparative PISA and TIMMS international school

student achievement levels and in ACARA domestically measured literacy and numeracy achievement rankings.

The next stage of Australian School Funding policy proposals were outlined in the Commonwealth Budget on 9 May 2017, approved by both Houses and authorised in Commonwealth Parliamentary legislation of 26 August 2017.

Policy proposals to reverse declining school performance trends are now being assessed by a new Commonwealth sanctioned Review Committee dubbed “The Gonski Review 2.0,” which is required to report on enhancing Australian School Effectiveness and Efficiency, by the end of March 2018.

E3’s Perspective on the stated objectives for the new “Gonski 2.0” Inquiry (18)

In the current Australian Government Budgetary environments it is more important than ever before for schools to operate as efficiently and effectively as possible to optimise the academic impact of every school dollar spent.

Greater value for money objectives should now be incorporated into both government and non-government school funding policies, possibly including a range of innovative teaching programs based on class room “Randomised Control Trial” evaluations. The specific objectives of such proposed RCT studies will be assessed and tested after full documentation is released flowing from this Federal Legislation and made available to School Authorities. Any detailed documentation may recommend that a range of remedial steps be introduced for School Performance Improvement purposes.

The specific Efficiency, Effectiveness, Economy and Equity objectives, (the 4E’s of Good School Governance proposed by E3 are to:-

- (a) ***Undertake School Efficiency Performance Measurement studies-*** which would provide a relative efficiency measurement system to assess each school’s effective use of existing resources.

Such studies utilising E3’s ASERT Methodology will provide policy makers with relative efficiency benchmarking scores for individual and groupings of schools. Such scores will enable the identification of those schools that are particularly efficient and effective in using their financial resources to optimise student learning.

Such upgraded DEA School Efficiency models already proven, tested and disseminated by E3 will enable the relative efficiency to be calculated for each school using ‘Granular’ school characteristics measured on a relative scale of 0 to 1. This school Measurement Metric of Learning and Cost Efficiency Drivers in a four quadrant presentation will cover each year from 2009 to 2017, then up to 2026.

(b) **Set up School Efficiency Improvement Studies**– To be undertaken in conjunction with the Performance Measurement system outlined above to provide information to foster the more efficient and effective use of school resources aimed at raising student achievement.

Such studies would provide the less efficient schools with improvement targets and benchmarks derived from the highly efficient similar ‘comparator’ schools to which they can be compared.

Such comparative focused benchmarking studies for use by School Policy Units, Teachers and Principals need to be undertaken across “Statistically Similar Schools” to compare school groups with like family Socio Economic Status and student characteristics.

These Value for Money studies need to be undertaken with the aim of answering the question of how existing funding from Commonwealth and State sources to individual schools were efficiently and effectively spent on school education from 2009 to 2017.

Accordingly, E3’s modelling studies are intended to answer the dual questions of how well or how efficiently schools spend existing money and to assess whether the new level of future Gonski 2.0 funds allocated to them will be effectively and efficiently spent from 2018 to 2026.

Education specialists are best suited to recommend changes in best practice innovative class room teaching methods using “what works best” criteria, derived from State of the Art Randomised Control Trials.

E3’s School Efficiency Measurement Methodologies

A recent School Efficiency Model is contained in my joint Applied Economics Journal article, February 2016, collaboratively developed with Professors’ Peter Wanke and Carlos Barros entitled “ *Cost and Learning Efficiency Drivers in Australian Schools: A Two Stage Network DEA Approach*”, Applied Economics. February 2016. (11) This paper provides an up to date assessment of government school efficiency outcomes in New South Wales Government Schools.

The key findings of that paper were:

“The specific policy implications for cost and learning efficiency in Primary and Secondary Australian government schools is that experienced teachers and school location appear to be the most comprehensive and relevant drivers for cost and learning efficiency in Primary and Secondary schools”.

“This particular result indicates the systematic benefits of teacher skills and training in consuming less financial resources whilst generating

higher student achievement at the same time. On the other hand, student selectivity appears to be a primary issue of cost and learning efficiency in secondary schools, suggesting that policy makers should pay more attention to the issue of secondary school admission segmentation. In relation to primary education, it is worth noting the role played by attendance and special education offerings on student performance, which suggests a key focus can be found on these issues with regard to learning efficiency”.

“In general terms, the policy implications of this Two-Stage Network DEA research for Australian Schools is the need to adopt similar ‘Benchmarking’ practices for a regular evaluation of their relative efficiency. In addition, these schools should continue to be treated in a segmented way, as the drivers for cost and learning efficiency levels differ substantially between primary and secondary education”.

Whilst this current research has so far been confined to NSW Government Sector schools, future research will consider the application of this Two-Stage Network DEA Model to the other seven State Government School systems as well as the Catholic and Independent Schools school systems across Australia.

Such a policy research extension into these other diverse school governance systems across Australia will help build up the ‘big picture’ of Cost and Learning Efficiency Drivers in all 9,600 Government and Non-Government schools Australia wide, from 2009-2017, then annually up to 2026.

Also another up to date very detailed outline of the importance of E3’s Modelling results is contained in its initial submission to the Productivity Commission, Commonwealth Treasury Mandated Review into the “Australian Education Evidence Base”, and E3’s reply to the Productivity Commission’s December 2016 Draft Report. (12).

In the Final PC Education Evidence Base report released on 24 May 2017 it was indicated that the detailed research accomplishments completed by E3 thus far:-

“Provides a more appropriate method for measuring the efficiency, effectiveness and value for money of the education system,” (Productivity Commission ‘Education Evidence Base’ Report, p108, 24 May 2017).

New Directions in New South Wales State Government Policies to “Improve the Effectiveness of State Spending.”(13).

An example of other potential future applications is outlined in the 2017/18 NSW State Budget with the government aiming at “transforming and delivering better outcomes for the people of New South Wales- through more transparency and accountability for expenditure and better value for money”, **NSW Budget Statement, 2017-18**, p 4-1. Under the government’s Financial

Management Transformation program (FMT) this innovation enables “a focus of moving towards a much more comprehensive view of total government spending,” (ibid, p 4-1).

“This new approach has the ability to measure and monitor the outcomes achieved for the total dollars invested, and improve the effectiveness of total State spending from 2018/19 onwards”. This outcomes approach “ will routinely link financial and performance aspects, covering inputs, outputs, efficiency, effectiveness and equity, driving a performance informed decision making culture, with systematic reviews to ensure continued value for money in public spending”, (ibid, p 4-2), (13).

These New South Wales Government objectives are fully congruent with E3’s 4E Efficiency, Effectiveness, Economy and Equity Logic Model Program Evaluation and Monitoring methodology. This innovative NSW Government focus on Spending Effectiveness now enables E3 to implement its Four E’s-“The Four E’s of Great Governance” in selected NSW agencies.

E3’s Future Performance Measurement proposals

E3’s proposed future School Performance Measurement projects will be undertaken in two phases:-

- (1) The first phase will proceed from the release of the Commonwealth Government’s Legislated proposals for the “Gonski 2.0” inquiry to focus on “The effective and efficient use of Government funding to improve student outcomes and Australia’s National School Performance, as measured by the National and International assessments of student achievement”, (May 2, 2017).
- (2) The second phase has been developed in response to the Productivity Commission’s release of its final report into the “National Education Evidence Base,” emphasising that ACARA significantly increase the rigor and depth of its “TOP DOWN” school site Performance Measurement and Accountability benchmarking evaluation capabilities, (May 24, 2017) (14)

These potential opportunities now involve preparing additional reports Measuring School Efficiency and Productivity Benchmarking for all of the 9,600 schools expanding on E3’s two submissions, favourably discussed in the Australian Productivity Commission’s “Education Evidence Base” Final Inquiry Report of 24 May 2017, P 108.

- The above two policy research issues overlap as both the “Gonski 2.0” Education Excellence Review, (18) and the ACARA School Performance Measurement Reporting upgrade Legislatively Mandated procedures need to be completed by March 2018; accordingly, **E3 can address both analytic modelling issues simultaneously.**

These latter developments highlight the relevance, strategic worth and necessity of E3's proposed implementation of its ASERT School Efficiency Logic Model Performance Measurement Framework approach.

This readily implementable ASERT methodology indicates that a clear cut circuit breaker is now available to overcome the existing ACARA School Performance Measurement policy inertia and myopia, (as outlined in its out dated one dimensional, student test score centric report, "Measurement Framework for Schooling in Australia,") May 2015. (15)

Two future studies to document both government and non- government School Efficiency and Effectiveness Benchmark Performance results will cover the data period 2009-2017, for NSW Schools only.

The initial phase study will use the 2 variable UK School Efficiency Metric (SEM) methodology, (16). This less data granular, yet quickly implementable UK approach will be undertaken as a first "test run" with ACARA My School data for the Government and Non-Government School sectors from 2009-2017.

The UK Department for School Education implemented this methodology across all UK Schools in February 2016, (17). The second phase study will use the Two Stage Network DEA Model with 33 variables for NSW schools.

Both these School Efficiency Metric Models will then be applied across all of the remaining 7 State and Territory Government school sectors initially, and then extended to all Non-Government Sector Schools by denomination type and State for comparison purposes.

Access to all the numerator data, (ACARA test score data), for Primary Years 3 and 5, enables calculation initially of the inter year 'value added' variable for each Primary School followed by all Secondary schools for Years 7 and 9 and Year 12 ATAR University entrance scores in all States year by year from 2009 to 2017.

An additional investigation will focus on the Year 12 ATAR University entrance exam results value added as the Secondary senior school numerator in the School Efficiency equation.

The denominator data will be total school recurrent income for each Primary and Secondary school for Years 3, 5, 7, 9 and Year 12 initially in NSW, then extending to the other 7 jurisdictions Australia wide.

The final step will be the calculation of the respective Primary and Secondary School Efficiency values by year from 2009 to 2016 as value added divided by the school recurrent income.

This ASERT schematic of how the summary cost and learning efficiency driver output markers will be displayed year by year and sector by sector is shown in Fig 1.

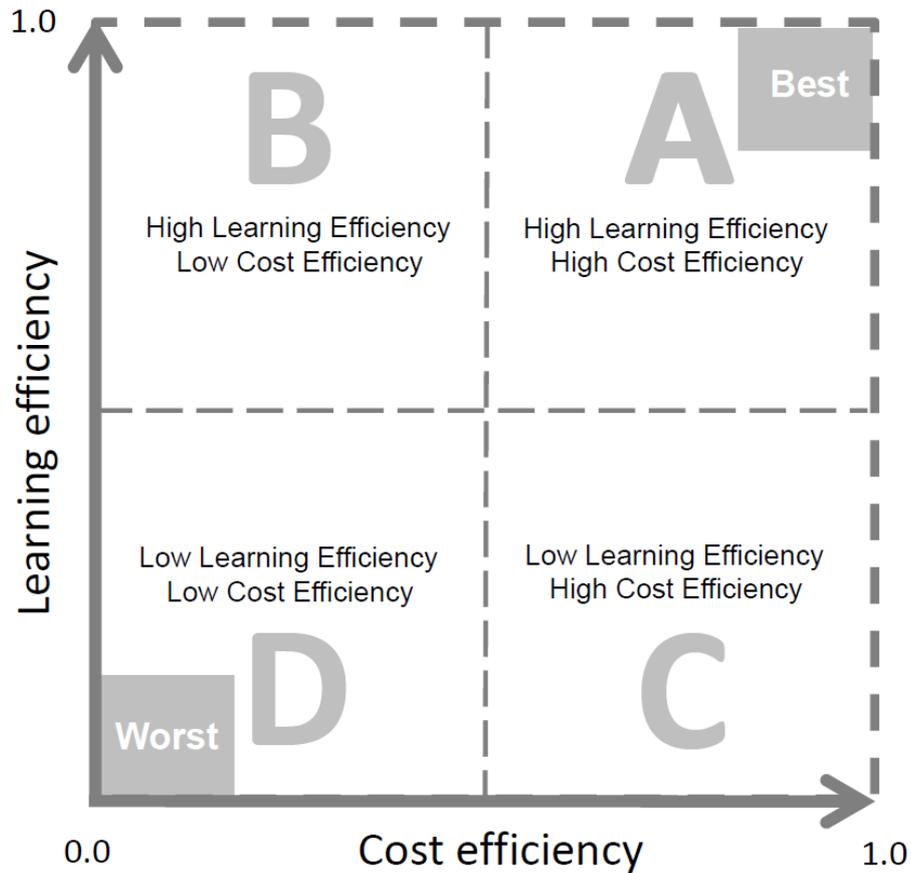


Figure 1.

E3's ASERT Logic Model Conceptual Framework of Cost and Learning Efficiency Drivers and Value for Money Outcomes in Australian Government and non-Government Schools 2009 - 2017

SUMMARY

The next phase of Australian School Efficiency and Effectiveness modelling will build upon E3's past experience in writing seven international journal articles on Australian NSW School Efficiency and Productivity Benchmarking and Performance Measurement from 2009-2017. This research included a book published by Springer in 2015 entitled, "Nonparametric Estimation of Educational Production and Costs using Data Envelopment Analysis."

Project Report time and cost gradients for a range of future School Efficiency and Productivity studies using the ASERT Logic Model Framework are currently being prepared by E3 and SEMETRICA.

Attention is now being focused on scoping the necessary steps involved in:-

- (a) A proposed Australia wide Two Stage Network DEA study using the ASERT methodology from 2009-2017 for commencement after the "GONSKI 2.0" Review team report is released in March 2018, (18).
- (b) This will feed into a School Funding Monitoring Enhancement study for the School Metrics Task Force group in the Commonwealth Department of Education. This will address the strong criticism of the Department in the Australian National Audit Office, (ANAO) report of 6 December 2017. A review of the ANAO report and proposed actions are attached.
- (c) Further reform steps urged by the Productivity Commission to upgrade ACARA's existing "Top Down" Evaluation capabilities as well as setting up a new "Bottom Up" Education Evidence Based Board (EEBB) need agreement before any future amendments to the ACARA legislation.

This latter EEBB body would need to be given an extensive range of upgraded capabilities authorised in amended Commonwealth Legislation agreed to by the COAG Meeting of First Ministers, in early 2018, (that is the Prime Minister, all Premiers and all State and Territory Education Ministers).

These amendments to the current ACARA Act will for the first time give top priority focus to upgrading its current deficient "TOP DOWN" Monitoring, Benchmarking and Performance Measurement capabilities.

Such amended Commonwealth Legislation would need to include new powers for ACARA to undertake extensive and novel "BOTTOM UP" Evaluations using proven Randomised Control Trial, (RCT) Methodologies to recommend better Teaching practices to enhance Student performance.

Details on these proposed enhancements to ACARA capabilities were outlined on page 252 of the Productivity Commission's "Education Evidence Base" Final Report of 24 May 2017.

REFERENCES

1. Productivity Commission, “Report on Government Services”, Approach to Performance Measurement, Volume A, Chapter 1, 2017.
2. UK Treasury, “Improving Public Sector Efficiency to Deliver a Smarter State”, Public Sector Efficiency Group, London, 2016.
3. UK Department for Education, “Guide to the School Efficiency Metric Tool”, London, January 2016.
4. Blackburn, V.C, Brennan, S, and Ruggiero, “Non-Parametric Estimation of Education Production and Costs Using Data Envelopment Analysis DEA”, Springer International Series in Operations Research and Management Sciences, New York, 2015.
5. Blackburn, V.C, “E3’s Logic Model of Performance Measurement and Accountability Policy Issues for Australian School Education Sectors”, Submission to the PC Education Evidence Base Report Inquiry, August, 2016.
6. Blackburn, V.C., “Response to the Productivity Commission’s Draft Report on the Education Evidence Base Report, October 2016.
7. Productivity Commission, “Final Report, Education Evidence Base Report, December, 2016.
8. OECD, (2017), “The Funding of School Education: Connecting Resources and Learning, OECD Publishing, Paris.
9. Blackburn, V.C., ‘E3’s Logic Model of Performance Measurement and Accountability Policy Issues for Australian School Education Sectors’, Submission to the PC Education Evidence Base Report Inquiry, August, 2016.
10. Haug, A., and Blackburn, V.C., Government Secondary School Finances in NSW Schools: Accounting for Student’s Prior Achievements in a Two Stage DEA at the School Level “, Journal of Productivity Analysis, April 2017.
11. Wanke, P., Blackburn, V.C., “Cost and Learning Efficiency Drivers in in Australian Schools: A Two Stage Network DEA Approach,” Applied Economics, February, 2016.
12. Blackburn, V.C., “Response to the Productivity Commission’s Draft Report on the Education Evidence Base Report, October, 2016.
13. New South Wales, Budget Papers, Budget Statement 2017-8, “Improving the Effectiveness of State Spending”, pp 4-1 to pp 4-5.
14. Productivity Commission, “Final Report, National Education Evidence Base Report, May, 24, 2017, P252.
15. Australian Curriculum, Assessment and Reporting Authority, “Measurement Framework for Schooling in Australia”, May 2015.
16. UK Department for Education, “School Efficiency Metric: A Technical Note on the calculation of School Efficiency”, London, January, 2016.
17. UK Department for Education. “School Efficiency Metric: A Technical Note on the Calculation of School Efficiency”, London, January, 2016.
18. Australian Government, “Quality Schools-Review to Achieve Excellence in Australian Schools Report”, The “Gonski Review 2.0,” expected in March 2018.

