

CENTRAL POLICY ISSUES FACING STEM ADVOCATES: RESOURCE ALLOCATION

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Premier Wayne Goss had a mantra for over-enthusiastic Ministers and Directors-General – ‘Take a cold shower!’ He was warning about budget constraints and the related cost of new ideas. Any attempt to solve the presumed problems related to STEM (Science, Technology, Engineering and Mathematics) are likely to require changes in the levels of existing public and private expenditure. This is as much a political as a technical challenge.

There are three levels of competition for resources:

- Contests over resource allocation between education and other demands on government and private funds - is STEM more important than hospitals, disability services or lowering of taxation? Will individual taxpayers be prepared to pay more to public or private service providers?
- Contests over resource allocation within the education portfolio – is STEM more important than specific vocational training for apprentices, students with special needs, preschools, new schools?
- Contests within curriculum development branches over STEM against other areas.

A Queensland example from the middle of July, with the new ALP government addressing the recommendations of the Bryce Committee on Domestic Violence set up by the former LNP government. The *Courier-Mail* of 24 July included a picture of Rosie Batty, the domestic violence campaigner awarded the title of Australian of the Year, alongside a report on COAG (Council of Australian Governments) discussions about a national curriculum, for children aged 10-17, covering domestic violence. The Queensland Premier, however, ‘wanted lessons on gender equality taught at the youngest possible age, with tougher classes about violence for older children... all the evidence would show the early years are the most formative years’.

STEM proponents similarly advocate that maths and technology should be advanced as rapidly as possible in the early, most formative years. Assuming that there is a finite capacity in a teaching timetable, which demand is to be met most fully? Which topic should get the class timetable hours and the spare staffing capacity? The politics of rising social concerns would suggest that domestic violence would currently be given priority.

DV is just one of the new claimants on time in the much-reviled “Crowded Curriculum”. The range of discrete ‘disciplines’ emerging in response to needs defined by community organisations and/or politicians is immense and diverse: law, economics, management, psychology and driver education at secondary school have all emerged since I was Director-General; Religious education was certainly around then but not federal funding for full-time religious practitioners, and we now have ‘stranger danger’ also successfully demanding time at primary school.

In addition, the devolution of decision-making to School Boards creates inequality and differences in approach. The amount of time devoted to STEM is thus unequally distributed across the education system. Schools with an observably strong record in STEM, privilege some localities against others.

There is a further 'political' challenge for school systems and local managers in another dimension of inequality. Is the objective of schooling envisaged by STEM advocates to encourage and enrich those with above-average ability or potential? Or is the aim to engage the below-average and try to improve their performance?

Clearly some of both, but how much? At what point is it appropriate to divide the school population so that less than 100% get the same curriculum content – hiving off the bottom tenth for remedial work or the top tenth for enrichment, perhaps? Or is a 50:50 split more realistic? Or is it more strategic for the long-term benefit of the wider community to create specialist academies for which the top 10% can compete for places in their final three years of secondary study.

And what happens after year 12? The managers of tertiary institutions – as I once was – exist in a competitive environment. TAFE colleges and universities are funded for the total mix of students they admit, more for some courses than others. Specifying an advanced maths requirement for particular courses – say, biological science or veterinary science – can generate demand for that subject at year 12, but it may lead to sub-optimal levels of course enrolment in the colleges or universities. The same applies to courses in teacher education for people preparing to be STEM specialists. And other educators will ask whether advanced maths is as important for success in tertiary study as specified levels of literacy in English or, from a wider perspective, they will ask whether there are comparable virtues in the study of specific foreign languages for non-native speakers? A former Prime Minister was quite clear about his hierarchy of priorities when he was a Director-General colleague of mine.

The problem Mr Rudd created for me when I was Director-General of Education in Queensland – and which he provided ample resources to help solve - is similar to those who wish to improve the performance of school and universities in STEM subjects: where to find and keep the good teachers. Part of the answer is linked to political economy - addressing the question of remuneration. If there is an over-supply of one product – non-STEM teachers – and a shortage of another, then the price needs to be raised to meet that shortage from other sources. This means paying teachers differentially according to their subject specialization, both for initial recruitment and for continuing as teachers in that specialist area when normal career advancement would take them away from teaching into leadership roles. Both of these ideas are fraught with industrial relations problems inside and outside the school.

Another mechanism for increasing supply is to imitate the behavior of the Queensland Police Service in its recruitment strategies when implementing a recommendation of the Fitzgerald Report - to raise the education level of police recruits.¹ The initial aim was to provide financial encouragement to universities to offer specialist courses in police studies within their range of offerings and integrate this within the curriculum of training academies. Quite rapidly, students came of their own volition into what was by then a respected and secure career and the universities could fill courses without direct subsidy. Then graduates from other areas came to view the police service as a career and further widen the base of recruitment. At the same time, the police service also found that the 'new' Queensland had appeal to members of the police and the armed forces from other states and overseas. These 're-treads' brought with them the benefits of their diverse experience and added a level of maturity to blend with the enthusiasm of direct-entry graduates.

Given the current over-production of graduates in STEM-related courses such as Science and Engineering, this might provide a source of teachers with the strength of specialist knowledge not always available from entrants into the teaching service by the more conventional route through courses in teacher education. The economic downturn in the mining sector will also provide a fertile ground for recruiting scientists, especially engineers and geologists, after they have completed the mandatory requirements for teacher certification. They would bring a depth of 'real-world' experience likely to enhance the attractiveness of STEM subjects in the classroom.

¹ The Fitzgerald Report: http://www.tjryanfoundation.org.au/dbase_upl/the-fitzgerald-inquiry-report-updated.pdf

There is no single formula and no easily-adopted industrial relations structure to cope with this diversity. Requiring formal higher maths achievements from school-leavers may close doors to potentially good teachers. In the existing competitive environment, universities might be reluctant to see such a requirement deter the requisite number of otherwise well-qualified applicants. Mandating STEM subjects within the tertiary environment might be a better way to proceed, although this can carry with it the problem of interesting academics in teaching subjects that they might regard as essentially remedial rather than cutting-edge.

And, at the other end of the pipeline producing STEM teachers, there might be more remunerative and attractive options in the commercial world of the private sector or public sector management for the best performers. Labour market analysis remains an inexact science.

The Vice-Chancellor of James Cook University has warned that there might be a down-side in the emphasis on the urgency of getting more students to study STEM subjects at school and/or in their university years: 'I worry sometimes that we approach increasing science enrolments for young students in particular and certainly for girls going into high school, as if somehow this is hard, this is exotic, you're not going to like this, we have to do this for the future of the country, rather than imagining that there is great wonder in science and mathematics. ... How about we think about STEM disciplines, not by saying to people you have to do these subjects, but rather look at the way in which we subtly and experientially integrate these into a broader range of what we do?' (*Courier-Mail*, 6 August 2015)

Finally, there is the wider question of the purposes of education. Lack of proficiency in STEM subjects has long been a general area of criticism, often accompanied by complaints about literacy, but it has taken on a new political urgency on all sides of politics, frequently associated with rising unemployment and the competitive challenges from northern neighbours.

A hundred years ago, T J Ryan became Premier of Queensland after a successful career as a teacher of Latin; when I was Director-General of Education in 1990, the study of Asian languages was mandated for rapid expansion and flowed into the national arena along with its major protagonist; the current Leader of the Opposition in the national parliament, Bill Shorten, favours a focus on technology, specially teaching computer coding in primary schools. Winds of change blow in politics and in curriculum preferences.

Big questions for STEM advocates about the purposes of the education system remain unanswered:

- Should schools promote cultural values? Should universities promote cultural values?
- Should schools include life skills and socialization rather than focus exclusively on technical skills?
- Should universities encourage broad education by mandating cultural electives like creative arts and literature? Or foreign languages?
- How far should parental preferences determine the answers to each of these questions?
- How far should student preference determine the answers?
- At what level of government should the decisions governing choice be taken?