"STRENGTHENING SCHOOL–INDUSTRY STEM SKILLS PARTNERSHIPS": A CRITIQUE

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Background

The report *Strengthening School – Industry STEM Skills Partnerships*,[1] commissioned from the Australian Industry Group by the Office of the Chief Scientist of Australia and released in June 2017, describes a number of pilot projects in which primary and secondary schools engaged with industry with a view to strengthening the interest of students in science, technology, engineering and mathematics (STEM).

This critique is written in my capacity as an independent scholar. It draws on insights gained at events organised by the Royal Society of Queensland and summarised on its website (http://www.royalsocietyqld.org/education-in-stem/), but it is not written in my capacity with the Society and the views expressed are my own.

The report's findings

The formal recommendations of the report (p. 4) are appended. In addition, significant findings are scattered throughout. It is notable that in order to draft this critique, I found it necessary to aggregate significant findings as the report rambles somewhat and does not present these in any methodical fashion except for the Recommendations, which lack explanation. Even the Project Findings section (6.1) rambles. However, the following significant findings can be extracted:

Issues on the industry side

1. Firms can be motivated to participate, either because of their concern to develop skills for their enterprises or for reasons of broader corporate social responsibility (p. 69).
2. Industry is concerned at an apparent decline in digital skills and the slow response of the education system in satisfying what is now an urgent need (p.18). Many teachers lack the skills to teach contemporary computing (p. 74).
3. Most enthusiasm on the industry side was shown by scientists/engineers/technologists, because of their understanding of STEM (p. 68).
4. Many industry associations produce educational resources for teachers and students and are sensitised to the need for industry to invest effort into developing skills in their future workforce (p. 48).
5. Involvement of international corporations can be subject to offshore corporate HQ policies. Decision-making in small local enterprises is more direct and simpler to negotiate.

Issues on the schools side

6. There is a large array of uncoordinated STEM activities and programs potentially available. Teachers and parents are confused in identifying what is best for them (p.18). The development of the SPI (STEM Programme Index) 2016, and the imminent publication of an online portal for educational materials will help. (These projects have built on Queensland initiatives).

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[1] Australian Industry Group, *Strengthening School–Industry STEM Skills Partnerships*, North Sydney: AI Group, 2017.

7. It is possible that most programs attract only the students who are already interested. Success of the pilot projects depended upon presence of keen, bright students (p. 69), but these are not the ones who most need inspiring.
8. Funds for many worthwhile STEM programs are diminishing and costs are being pushed back onto schools (p. 20).
9. There is a tendency to assume that STEM initiatives are relevant only to university pathways to the neglect of VET (p. 20).
10. "Teacher educator institutions are ideally placed to provide pedagogical support for teachers in the education systems, notwithstanding that their core business is research and teaching students at university" (p. 45).
11. Many teachers lack confidence either in STEM curricula or in embarking on industry partnerships (p. 69).
12. It may be more effective to empower teachers through professional development to bring real world examples into the classroom (p. 70). Teacher development is central to the achievement of progress in school-industry STEM. "There will be no systematic implementation of STEM programs without this" (p. 78).

Issues on both sides

13. Programs commonly rely on receptive individuals on both school and industry sides of the exchange and may not survive departure of one of the partners. The Australian Industry Group chose schools to include in its pilot program after consultations identified a degree of preparedness (p. 23).
14. Also, most interactions depended heavily on volunteering by keen staff. Finding enthusiastic individual staff is critical to success.
15. Education systems and industry do not align (p. 28). Many teachers feel unprepared to embark on industry projects without external support (p. 46). Similarly, many businesses find interaction with schools difficult (p. 73). Education faculties don't necessarily have the contacts (p. 77). The role of an intermediary such as the Australian Industry Group is significant, but that is not their core business.

Third party comment on final point

The following observations relevant to the preceding point have been contributed by a third-party teacher educator:

> One thing from the report is that the responsibility for connecting schools and industry appears to be no-one's core business – not the universities or the schools or even brokers like AiGroup. This resonates with our experience … as well as from discussions with others who have attempted to connect business and schools around STEM. There is a role here for an organisation that can make it their core business. I also note the acknowledgement that schools and businesses have different cultures (p. 9) and the importance of cultures within/between schools. There are other references to cultural differences in 'language' (p. 76) and 'understanding' (p. 21), which together hint at the need for boundary crossers who can broker collaborations in such a way that partners learn about each other's cultures – especially their motivations, capacities and limitations; a shame this point wasn't developed in more detail. These boundary crossers (or facilitators, enablers, etc.) could be NGOs, universities or professional associations, as long as they were able to draw on experience from both sides of the fence and had the collaborations as their core business.

Comments

These findings are not surprising and it is easy to concur with them, with the exception of item 10 above. Pedagogical support after teachers graduate is a responsibility of their employers. Universities are not routinely funded to provide vocational professional development.

Similarly, while statistics can be found to demonstrate that industry as a whole does not contribute much towards training its future workers, this does not necessarily translate into a responsibility of

individual firms to commit resources for this purpose at the primary or secondary level. After all, one limb of the purpose of the education system is to impart skills to young people that industry is likely to need in future. In principle industry pays its taxes to enable this to happen.

It can’t be assumed that exposure to real life workplaces during primary and secondary years is *necessarily* desirable. The proposition needs to be proved and the report does not prove that (and was not required to do so).

The pilots were focused on commercial firms as partners. Yet a quarter of workers are employed in public authorities and exposure to the unique requirements of public service would also be beneficial to students, though it would come with a distinctive set of challenges.

Summary

Industry placements can have mutual benefits but carry significant overheads for both sides. They are no substitute for reform of the education system so that every school graduate leaves with adequate life and work-ready skills.

The students most likely to benefit from industry placements are those who are already bright and alert. A different form of placement is likely to be necessary for the disengaged and underperforming students, and these are a bigger threat to national productivity, let alone social cohesion.

No matter how much pre--graduation exposure students have, entering real-world employment will always be a big step, given that every employing firm is unique.

Industry placements would be considerably easier and more widely pursued if there were a broker able to identify suitable partners and lubricate initial negotiations. No broker funded on an ongoing basis to perform this service is visible.

APPENDIX

Recommendations

Teacher Professional Development

1. Education systems to provide:
- **a) professional development for teachers of mathematics on how to integrate mathematics into a STEM-based curriculum**
- **b) professional development activities for teachers of digital technology on how to integrate digital technologies into a STEM-based curriculum**
- **c) professional development for teachers on integrating other subjects into a STEM-based curriculum**

Resources for Schools

2. Education systems to develop advice and resources for schools on how to engage with industry partners to develop STEM skills in schools.

3. Education systems to promote the three models of school-industry engagement identified in this project:
- **a) single school – single company**
- **b) multiple schools and multiple companies and university**
- **c) multiple organisations – schools, government, peak industry bodies**

Resources for Industry

4. Develop resources for use by employers that highlight approaches to forming partnerships with schools to implement STEM strategies.

5. Establish a national forum that will facilitate dialogue between industry and schools in STEM education, thus enabling best practice to be shared.