



**OPTIMISING STEM INDUSTRY-SCHOOL PARTNERSHIPS:  
INSPIRING AUSTRALIA'S NEXT GENERATION**  
Response to Issues Paper (December 2017)

**12 February 2018**

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**About Catholic School Parents Australia**

Catholic School Parents Australia is recognised by the Australian Catholic Bishops Conference through the Bishops Commission for Catholic Education as the national body representing and advocating for the parents and carers of over 765,000 children and young people who attend the 1738 Catholic schools across Australia. CSPA works in collaboration and consultation with the National Catholic Education Commission.

**Catholic School Parents Australia**  
National Representation - **Advocacy** – Leadership

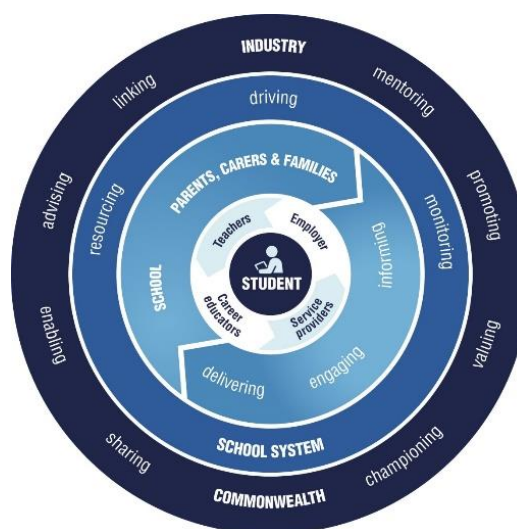
## Preamble to CSPA's response

The focus of CSPA's response to the STEM Issues Paper focus is from a parent perspective. In referring to the *Note from the Chair* (Alan Finkel) in the paper (p. 4), CSPA strongly recommends that, like Teachers, Parents need to be included as central around the work of this important Forum. The 2016 LSAC report (referred to in the Issues Paper on page 42) noted how 88% (29%, 12%) of 14-15 year old boys and 86% (32%, 12%) of 14-15 year old girls talk to their parents about their future plans – career aspirations. The bracketed percentages represent teachers and career counsellors respectively. The strategic role that parents play around career aspirations of their children in an overwhelmingly majority of families is very clear.

The recently completed report of the National Career Education Strategy Working Group (November 2017), also referred to in the Issues Paper noted that:

*Research has found parents and other family members have the most significant influence on school students' career aspirations, and on their subject choices. They tend to shape students' ideas, raise or lower their ambitions and push them in certain directions. The more engaged parents are with their children's future educational aspirations and with their school, the better the educational outcomes for the young people (p. 13).*

*At right, is Figure 2 (p. 8) from the report showing Stakeholder roles in student-centred career education with Parents/Carers/Families with central prominence.*



Parent engagement has been named by successive governments as a core element of the national reform agenda, yet it has been the least defined and least resourced area. The current federal government's *Students First* agenda also names Parent Engagement as a core reform area. After forty years of research, parent engagement is more clearly defined as are ideas around its implementation, however parent engagement is still not widely evident in a vast majority of schools. There seems to be little understanding of *why* parent engagement is important and *how* to work with families effectively to support students' learning and development. CSPA's current DET sponsored nation-wide, cross-sectoral research project is well positioned to add to this space by revealing key contemporary strategies around the implementation of parent engagement for student learning in primary and secondary schools.

In an earlier submission to government, CSPA suggested that given the research available around parent engagement as an influence on student learning, including Barr & Saltmarsh (2014); Emerson et.al (2012); Goodhall et.al. (2011); Weiss et.al (2010); Harris et.al. (2009); Pushor (2007) and Redding et.al. (2004) as examples, parent engagement not be viewed as an *external factor* affecting student learning outcomes, but a *partnership factor* integral to giving parent engagement more prominence. Also it was noted that there was increasing evidence of the positive impact of parent engagement on student learning within lower socioeconomic contexts, and this would provide a welcome variance to the usual trend of lower SES correlation with lower student learning outcomes. Several years ago, the current Education Minister, noted how greater implementation of parent engagement strategies could be a very cost-effective means of improving student outcomes.

It is CSPA's strong belief that if there is to be change around a greater focus on STEM related studies by school students then a key focus of governments and schools needs to be around coordinated

approaches to recognising parents and in turn enculturing parents so as to inform them around the positive benefits of their children's work within STEM related studies, starting with the early years. For example, a fear of Maths by many adults including teachers continues to have a detrimental effect on students engaging in the broader STEM related disciplines and needs addressing as part of a broader, complex strategy.

### **Provisional Recommendations**

- 1. Universities should reinstate prerequisites for university entry with the aim of ensuring students study STEM subjects in senior secondary school so that they are well prepared for further study and work.**

CSPA does not support a presumed inference from PR1 that all students study STEM subjects in senior secondary school. A sound understanding of Numeracy skills has been described as *a critical enabler of any STEM career, so the natural feeder subject for a career in technology is mathematics* (Finkel, 2018). A study of maths reinforces the problem solving and reasoning skills required for STEM (Science, Technology, Engineering and Maths). While CSPA understands that a compulsory study of maths to year 12 is still not generally accepted in all States and Territories, CSPA suggests that there should at least be strong formal skilling around numeracy as a language for life in every year of schooling. Also, having numeracy as a focus to year 12 could have the added benefit of some students not 'giving up on maths' from about year 9. Notably such countries as Sweden, Japan, Korea, Taiwan, Finland and the United Kingdom have made the learning of maths compulsory for all year levels in schools.

- 2. The key elements of effective, scalable school-industry partnerships should be identified by the Forum to help industry target its engagement towards programs that make a difference and to assist local businesses leverage their local connections.**

CSPA believes it will be useful for industry and school communities to have access to a national resource which outlines context-specific, effective-practices around school-industry partnerships.

- 3. There should be a greater emphasis on discipline-specific professional development for teachers of STEM education, with a role for industry in connecting teachers with the latest developments in the field.**

As minimum qualifications for Literacy and Numeracy are more recent expectations around learning outcomes of all pre-service teacher programs, CSPA is keen to see what impact this will have on attitudes to the teaching of Maths in schools. Also CSPA believes that where there is a process for industry to provide teachers with authentic learning opportunities which utilise contemporary real world problems and challenges the teaching of STEM is enriched. The provision of curriculum qualified, engaging teachers, especially in the teaching of real-life Maths at primary, secondary and tertiary levels, is central to providing role models for all students to connect with STEM principles.

In moving to alleviate the current 'fears' around applying Maths concepts and basic practices of many teachers, it is also proposed that national strategies could be put in place to raise the confidence of parents in their understanding of basic concepts of Maths towards enculturing their children to be more ready, willing, confident and able to engage with Maths. Parents genuinely working in partnership with teachers will assist in the provision of positive models for students around engaging with Maths. In the UK, The National Numeracy Challenge offers the opportunity for adults to learn or refresh the maths needed for everyday life. This in turn would give more parents more confidence to talk with their children about the importance of maths in their lives. Conversely, for many parents who are not confident in this area they need to be aware of the

unintended detrimental effect that negative conversations about maths can have on their children. Fundamentally, numeracy skilling in Australia needs to extend beyond the school.

**4. A practical model outlining the key elements of successful school-industry partnerships for teacher professional development and support should be developed by the Forum.**

CSPA agrees in principle with this recommendation. A national clearing house that describes examples of effective models of school-industry partnerships would be a useful proposed outcome for the Forum. Descriptions of these partnerships would be greatly enriched by case studies of the roles played by key facilitators from schools and industry and how this impacted schools, industry, students and families. Parent knowledge (Pushor, 2017) and building good relationships with families would be very beneficial to the school in this space.

**5. Governments and industry should focus the public narrative on the prospect of well-paid jobs and the increasing importance of STEM skills and 21st century skills in the future economy.**

Various aspects of PR5 are addressed in the National Career Education Strategy (NCES) Report (Nov 2017) which has been listed as a resource for this Forum. In relation to common language, the use of 21<sup>st</sup> century skills seems to be somewhat dated whereas general capability skills (employability skills referred to by industry) seems more suitable and aligns with the Australian curriculum. For example, below is a list of the top ten future skills required for work in 2020 as suggested in a World Economic Forum report (the number in brackets indicates the skill's position in the 2015 list). Conceding that there would be enthusiastic discourse around which of the listed skills are learned through various content specific studies, it is proposed that STEM would majorly contribute towards the learning of the *italicised* skills in the list.

- i. *Complex problem solving* (1).
- ii. *Critical thinking* (4).
- iii. *Creativity* (10).
- iv. People management (3).
- v. Coordinating with others (2).
- vi. Emotional intelligence.
- vii. *Judgement and decision making* (8).
- viii. Service orientation (7).
- ix. *Negotiation* (5).
- x. *Cognitive flexibility*.

(Future of Jobs Report, World Economic Forum, 2016).

This is re-inforced by Adams (2017) who, with reference to others, suggests that the seven most important STEM skills include: Statistics, Problem-Solving, Creativity, Argumentation, Intellectual Curiosity, Data-Driven Decision-Making, and Flexibility. A report (2017) promoted by the University of Sydney shows that 75% of the world's fastest growing occupations require STEM skills, notably analytical skills, scientific skills, mathematics skills and technical skills.

The seven general capabilities within the Australian Curriculum encompass the knowledge, skills, behaviours and dispositions that, together with curriculum content in each learning area and the cross-curriculum priorities, will assist students to live and work successfully. These general capabilities could also highlight the various STEM related skills in disciplines outside Science, Technology, Engineering and Maths. Future foresighting of roles within industry, as they are anticipated to change in terms of required employability skills, may be explored within this narrative and compared to today's roles being filled by the students' parents, to encourage the

conversation of how STEM is embedded in current roles and how STEM skills may evolve in the future.

This whole narrative around STEM will require discerned national reflection as there has been much discussion and hand-wringing over the past forty years around a lack of student take-up of Maths/Sciences at secondary and tertiary levels. CSPA believes this change in culture will be a complex challenge and will require cooperation and participation from all education stakeholders – including parents. There has been much talk, it is now time to develop an effective national strategy and implement it. A goal of our education system should be to produce students who are mentally agile, creative, reflective and armed with an array of critical and structured thinking skills that prepare them for life-long-learning.

In the recently released strategic plan of Innovation and Science Australia (ISA) the first listed imperative for action is education and *better preparing students for post-school STEM occupations*. However, ISA notes that many early and mid-career scientists, for example, are *taking their publicly-funded PhDs and moving overseas* – Dayton (2018) describes this as a *postdococalypse*. Unfortunately, this ‘brain drain’ has existed in Australia for the past forty years and somehow this draining of confidence as well as talent needs to be addressed by governments in partnership with industry – otherwise it will be the same discussion and hand wringing forty years from now. In OECD countries, 60% of scientists work in industry and in the US 80% of researchers are in the business sector, while in Australia a little over 30% of Australian scientists work in industry (Dayton, 2018). Addressing this impasse could provide insight into strategies which are likely to have a positive benefit to STEM uptake by students.

**6. Industry should develop communication activities to illustrate real-world problems and change perceptions of STEM careers for students and parents.**

In supporting PR6, CSPA positively notes the inclusion of parents and suggests that availability of parents should also be considered when determining the timing of input from industry. Parents can contribute in this space through being part of the discussion around the range of occupations that require STEM content/processes. The conducting of School-Student-Parent STEM evenings, and showcasing occupations within the school community that require STEM skills/knowledge for example, would contribute positively to this.

**7. Industry should contribute to positive perceptions of STEM careers through hosting site visits, supporting events and collating and distributing relevant materials for teachers and students.**

CSPA supports PR7 in principle and once again CSPA refers to the NCES Working Group Report (Nov 2017) and notes that relevant materials need to be also made available to parents given the role parents play/should be playing through parent engagement with their children’s/young people’s learning. Such information could be made available on highly visible, user friendly and easily accessible parent portals on government/agencies websites and school websites. Again, the industry and government narrative to highlight the use of ‘implied’ STEM in current jobs will facilitate parent engagement through the family unit.

8. **Industry should be encouraged to showcase the success of underrepresented groups in STEM related careers as role models in their engagement with primary and secondary schools.**

As discussed elsewhere in this submission, the proposed changes around parent engagement, teacher training and a national Numeracy strategy could all play key roles towards addressing the underrepresented groups' agenda.

9. **Governments should prioritise and accelerate the introduction by 2020 of a national lifelong Unique Student Identifier to promote a more sophisticated analysis and understanding of student achievement in Australia.**

There are instances where a USI is already used from year 10 such as in VET and more broadly in various educational jurisdictions, for example the Learning Unique Identifier (LUI Number) from year 10 in Queensland. While there can be useful benefits to a USI such as when families shift between States and/or sectors of education there are obvious challenges to be addressed around privacy and confidentiality, and the different IT systems in various States/Territories and schooling systems. It is proposed that as the perceived advantages continue to outweigh the perceived disadvantages that this concept continue to be explored.

10. **Industry and industry associations should develop and provide data about future workforce needs, including vacancies and the skills required of employees both in STEM specific areas and areas where STEM skills are valued. This data should be collected in a centralised national repository and made freely available to maximise its use.**

In tending to agree with PR10 CSPA questions why this would be restricted to only STEM related areas.

11. **A STEM evaluation tool to gauge the success of school-industry partnerships should be developed by the Forum.**

This could be a very costly, extensive and complex process and any resultant tool could be of limited use given the context specific challenges around this broader education agenda.

Key elements of the National Career Education Strategy Report have grown out of contemporary discussion that impacts the broader STEM agenda. Notably the NCES working group was an inclusive group representing a cross-section of education stakeholders.

## **Composition of the STEM Partnerships Forum**

CSPA strongly encourages consideration be given to including parent representatives on the Forum. CSPA puts this suggestion forward based around discussion within this submission.

## **Resources**

Following is a list of suggested resources which could inform the STEM agenda with a focus on parent engagement. Many of the resources are from the Harvard Family Research Project.

### **Engaging parents in kids STEM education**

<http://www.usnews.com/news/stem-solutions/articles/2015/06/29/engaging-parents-in-kids-stem-education>

**Parents key in attracting girls to STEM**

<http://www.usnews.com/news/stem-solutions/articles/2015/06/29/parents-key-in-attracting-girls-to-stem>

**Arizona parents value STEM learning opportunities in afterschool programmes. Another opportunity to take ideas and get parents with skills involved in assisting in running program**  
<http://azednews.com/2015/10/09/arizona-parents-value-stem-learning-opportunities-in-afterschool-programs/>

**Texas needs more diversity in STEM – and this is how to do it.**

<http://news.utexas.edu/2015/08/24/texas-needs-more-diversity-in-stem-and-this-is-how-to-do-it>

**First robotics Australia – parents can be involved in this program – applying for grants etc.**

<https://firstaustralia.org/>

**Study finds parents don't understand STEM job opportunities**

<http://www.educationviews.org/study-finds-parents-understand-stem-job-opportunities/>

**STEM experts: involve parents in the learning process**

<http://www.educationdive.com/news/stem-experts-involve-parents-in-the-learning-process/401584/>

**Girls in STEM: parent stereotypes may discourage daughters from science, technology, engineering, math careers: study**

<http://www.ibtimes.com/girls-stem-parent-stereotypes-may-discourage-daughters-science-technology-engineering-1895719>

**STEM – use the power of PTA to make science, technology, engineering and math part of your mission**

<http://digital.graphcompubs.com/article/Use+The+Power+Of+PTA+To+Make+STEM+Part+Of+Your+Mission/1946171/0/article.html>

**STEM science olympiad and parents**

[https://www.soinc.org/for\\_ptas](https://www.soinc.org/for_ptas)

**A parents' guide to STEM**

<http://www.usnews.com/http://www.usnews.com/products/features/education-products-a-parents-guide-to-stem>

**My mum is a parasite scientist: that's RAD! (Katherine Andrews, 2017).**

[www.shop.qm.qld.gov.au/default/my-mum-is-a-parasite-scientist-that-s-rad.html](http://www.shop.qm.qld.gov.au/default/my-mum-is-a-parasite-scientist-that-s-rad.html)

This is a unit in the That's Rad! Science series developed by Griffith University (2017).

<https://thatsradscience.com/>

**10 STEM tips for parents**

<http://www.middleweb.com/3569/10-stem-tips-for-parents/>