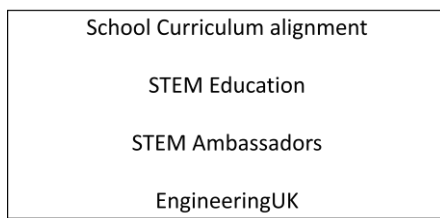


Solutions Address to ATSE's August 2023 Symposium on Engineering education: Can a crisis be avoided?

Introduction



In preparation for this Session, I filled five A4 pages with potential solutions.

However, a systemic problem like the invisibility of engineering calls for systemic and ambitious solutions.

This afternoon I will be offering just four of them in the categories shown on the slide.

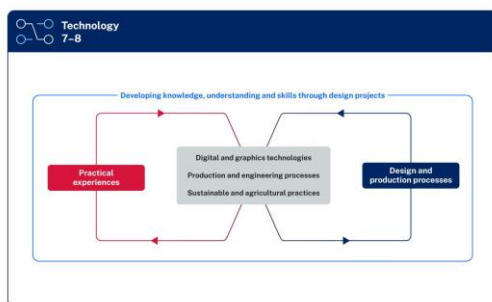
School Curriculum Alignment

"Net zero is the greatest engineering challenge ever."

"All of the skills needed to achieve net zero by 2050 are the 100%, number one, number one issue"

This is what Dr. Alice Bunn, Chief Executive of the UK's Institution of Mechanical Engineers in late 2022 replied when she was asked in a [TV interview](#) what specific STEM skills needed to be developed further.

The development of these skills clearly needs to be a focus area for any school technologies syllabus or curriculum.



This is the organisation of the new draft Technology Syllabus Yrs7-8 developed by NESAs, the NSW Education Standards Authority.

The content of the Production and Engineering Processes focus area is about enabling students to develop knowledge, understanding and skills in the use of materials.

Nothing there about clean energy, and nothing to convince a young person that learning to be an engineer could help save the planet!

This new Technology 7-8 syllabus, and also the new Science & Technology K-6 syllabus, are in their consultation phases and there is still time for changes to be made.

EA and ATSE should consider a joint submission to Education Ministers in all States on the need for meaningful consultation at all stages of the development of technologies-related school syllabuses. This to ensure that their organisation and content reflect current global and national engineering challenges; and that their language adequately describes the role of engineers and engineering processes.

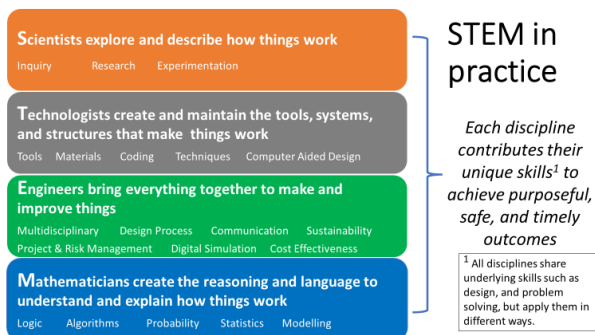
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STEM Education

"In 2015, all Australian education ministers agreed to the [National STEM School Education Strategy 2016–2026](#), which focuses on foundation skills, developing mathematical, scientific and digital literacy, and promoting problem solving, critical analysis and creative thinking skills."

This is the introduction on the federal Government's website to their [National STEM School Education Strategy](#). Not much about Engineering there – or Technology.

There is also little indication in the Strategy that STEM is a concept, or a way of thinking, or that it should be considered and taught as a balanced whole and not just as the assortment of skills and disciplines shown on the slide.



In the real world, engineers don't solve problems through the prism of each individual discipline. They seek out and appreciate the contribution of all disciplines, including the humanities. That is what STEM seeks to bring into the classroom. That is what this STEM in Practice slide illustrates.

STEM without Engineering is like an orchestra without a conductor!

Governments are constantly exhorting us to introduce STEM in primary schools – but how can this make sense to primary teachers when all they are familiar with is Technology?

Also, if modern engineering was better understood in primary education, there would be no need to add Arts to the acronym and call it STEAM. Or to add Medicine in secondary education and call it STEMM!

Advertising engineers as being all hard hats and hi-vis vests doesn't help at all.....!

We must assist teachers and in-school STEM Coordinators unpack Engineering from Technology as early as possible in our curricula. The problem is not in the content – it is in the language....

We must place more educational importance on the **practice** of engineering – all those skills shown in the green box on the slide. And that goes for tertiary education as well.

Let's create a STEM micro-credential to embed in all Bachelor of Education degree courses – and offer it to every teacher tapped on their shoulder by their Principal to be a STEM Coordinator.

My final comment on STEM as a concept? Don't dismiss it because it has failed to acknowledge Engineering. Think of it as a Trojan Horse which is already happily grazing in school pastures.

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STEM Ambassadors

STEM Ambassadors are professionals working in STEM fields who visit schools and educational settings to share their knowledge, experiences, and passion for STEM subjects.

They engage with students, deliver interactive workshops, provide career guidance, and help dispel common misconceptions about STEM fields.

Twenty-one years ago, the UK Government established a company called STEM Learning which, amongst other things, administers and coordinates their [STEM Ambassador](#) network.

Today, the network has some 30,000 volunteers who collectively contributed 640,000 primary and secondary school classroom hours to schools in 2020.

Of those 30,000 volunteers, 7,500 were trained by the Institute of Mechanical Engineering. **7,500!!!..** Participation by companies in the programme is considered both good for business and for education; with, for instance, Rolls Royce contributing 1,200 Ambassadors and the Thales Group 200.

STEM Ambassadors in the UK do not provide professional development for teachers. That is provided by STEM Learning. Think of them as tilling the ground so that programmes such as were introduced in the previous Session can be accepted more readily and take root more effectively.

Here in Australia, many companies and institutions run, or want to run, school outreach programmes, but they operate individually and not collectively. Good examples are the programmes administered by EA's indefatigable Caryn Morgan who has done so much to make this Symposium possible, and the excellent work being done by Helen Link and her team of enthusiastic EA engineers [promoting STEM in Newcastle schools](#).

We have a version of the UK's programme in Australia. It is the federally funded [STEM Professionals in Schools](#) programme administered by the CSIRO and run by Julie McClements.

Employing 8 full time equivalent staff, they currently have 1024 professionals on their books - of which 420 identify themselves as engineers. But, like all such programmes, its management still must negotiate individually with schools on access; and with companies for volunteers.

This might be a good place to expand from if we were to get behind – as I believe we should - a full-throated STEM Ambassador scheme in Australia.

Engineering as a Brand

Engineering UK was founded in 2001 to

- Inform and inspire **young people** and grow the number and diversity of tomorrow's engineers.
- Support **employers** and the wider engineering community to achieve this collective aim and engage directly with **schools** via their outreach programmes

Two decades ago, the UK faced the same problem of engineering invisibility that is being discussed at this Symposium today.

In response, their engineering community decided to treat engineering as a brand to be marketed to young people through school outreach programmes by a dedicated company called [EngineeringUK](#).

EngineeringUK is **NOT** just another engineering lobby group – it is governed jointly by the UK's professional and chartered institutions plus business and industry.

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School outreach is difficult – as anyone who has tried it will tell you. It is just not in the DNA of engineering companies and institutions!

It allowed the professional institutions to concentrate on their core business of registering engineers to keep the public safe.

EngineeringUK publishes an annual [Engineering Brand Monitor](#) which provides these sort of stats that keep their business focused. stats....

In the UK in 2019

- 76% of 11–14-year-olds;
- 73% of parents, and
- 70% of Secondary school STEM teachers

Didn't know much about what engineers do.

(Pages 11 & 34 of Engineering UK's [Engineering Brand Monitor for 20190](#))

They also run a [Tomorrow's Engineers website](#) promoting the wide range of careers in modern engineering, produce a [State of Engineering report](#), and promote and underwrite the [Big Bang Young Scientists & Engineers Fair](#).

In 2022 – just coming out of COVID – the Fair drew over 20,000 visitors from schools across the country.

Conclusion

STEM Education

- Engage with school curriculum development
- Unpack Engineering from Technology.
- Put the E firmly back in STEM.

Industry Outreach

- Identify engineering as a brand
- Create a company to market the brand
- Deliver the message through STEM
- Promote the message through STEM Ambassadors.

Raising the awareness of engineering amongst our younger generation, their teachers, their parents, and their guardians will go a very long way to removing – or at least lowering – all the other barriers that exist in the engineering education supply line.

So let's move on from identifying the problems – upon which we can all furiously agree – and seriously

consider acting upon the solutions detailed on the slide.

Proud to be an Engineer.

Without detracting from the impact of that last slide, let me share a personal aspiration to conclude my presentation.

My grandson is studying AgTech in Year 10, and his future career profile points him towards engineering.

I have no doubt that he will become one and, if he also became a STEM Ambassador, I would love him to turn up in the school car park with this sticker on the back of his car!



It felt uncomfortable for an engineer of my generation to display such a sign – and my wife whose car it is hates it - but hopefully the success of solutions born out of this Symposium will make it feel natural for future generations of Australian engineers.

I am happy to take sticker orders during this evening's networking session!