AROSE

Australian Remote Operations for Space and Earth

Australia's STEM Engagement Ecosystem, Mapped

September 2026

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Document version 1.0, published 22 September 2026

Foreword

It is impossible to completely map the Australian STEM engagement ecosystem. There are so many brilliant programs led by passionate people, but the differences in scale, objectives and timing make it difficult to capture them all. The reality is that programs of all sizes and shapes each have the capacity to make a high impact on the "problem" of producing a capable workforce for the future. A heavily funded long-term national program can have just as much impact as a grassroots local initiative, but the gaps in the ecosystem mean that efforts at both ends of the scale are not having the impact that they could. A cohesive STEM ecosystem could make great progress to building a society full of good people who are able to collectively solve the big problems of the future.

I am looking at AROSE's STEM Strategy for the next 4 years and am committed to creating programs that genuinely fill gaps in delivery and do not duplicate what already exists. I also wanted to know if what I, and many others who work in the sector, think we know anecdotally could be supported by data. I set out to look at what exists, what the programs do, and who they serve.

In attempting to comprehensively map the ecosystem, I've looked at over 250 initiatives nationwide that aim to engage people in STEM and/or promote STEM careers and/or support them in STEM related occupations. I acknowledge that there are programs missing from this analysis. The difficulty in mapping is one of the sector's downfalls and illustrates the core problems of connection between and visibility of initiatives. The addition of further programs to this list reached a point of diminishing returns as with every pass and new batch of programs and information, the overall trends in the data remained the same, so I stopped looking for more and started looking for the gaps. I've used this data to identify some clear gaps and make recommendations for what could be done to reduce them.

I've worked in this sector for the last 16 years, leading some of the biggest teams in the ecosystem and been part of wide-reaching initiatives – in small business, university,

government and not-for-profit sectors. If someone who is embedded in the sector can't get a full view of it, how can we expect those we are trying to engage to understand how to interact with us?

This report calls for a greater level of collaboration across the ecosystem, and in the spirit of this, I invite you to engage with me and the data. I'd love to hear about what has been missed in this report, because a comprehensive and accurate data set serves everyone's interests.

A note on the use of AI in this project: I have used a large language model to help me conduct research, categorise and analyse data. All AI data was confirmed by me. The visual mapping of the ecosystem was also generated by the same LLM using this data. This collection and categorisation of data would have taken weeks without it.

Holly Kershaw, AROSE STEM Program Manager, September 2026

Executive Summary

Australia needs a sovereign STEM-skilled workforce, but we currently have a pipeline problem that starts in school and runs through to professionals entering the workforce. We don't produce enough STEM skilled professionals, we import a lot of our workforce growth, and not enough of our trained professionals enter or stay in their professions. Take engineering for example. Only 8.5 per cent of Australian tertiary graduates hold an engineering qualification, the sixth lowest share in the OECD. 70 per cent of the growth in Australia's engineering workforce in the five years to 2021 came from engineers born overseas and around 35 per cent of domestic students who complete an engineering qualification never enter the profession.

Against that sits a committed demand from AUKUS, infrastructure, resources and technology. The technology sector alone expects to need a further 230,000 workers by 2030, and the AUKUS submarine program around 20,000 direct jobs over 30 years. A student now in Year 5 will graduate from university in the mid-2030s, into the middle of that demand. We need to look at all points of this educational journey to understand how to keep these students engaged in STEM to ensure that we have professionals able to fulfil this demand.

We mapped the ecosystem so that what we contribute to the ecosystem next is additive rather than duplicative, and we're publishing it because the result is useful well beyond AROSE. It covers 254 initiatives, 90 with national or significant state reach and 130 smaller or local, plus 34 vocational programs mapped separately. Each initiative was coded on whether the provider has ongoing funding and whether the participants are engaged on an ongoing basis.

Australia has a genuinely good STEM engagement ecosystem. Nothing that follows is a criticism of the effort put in, or the quality of programs available. It is a description of a system that has grown in pieces, often in silos, to meet many needs without anyone making sure that these pieces fit together.

What we found

Programs cluster in the middle years and thin sharply at both ends. 70 of the 90 major entries reach lower secondary, compared to 16 for early learning and 14 early career. Of 16 major entries reaching the early years, just 5 involve repeated contact, and none of the 16 smaller initiatives do. This map looked at 36 teacher professional development offerings and only one serves early childhood.

We build what the funding buys. Too many programs are short-term by design, not because it is necessarily the best mode of engagement, but because funding skews toward quantity and short-term programs over longer term ones.

We are losing what is not sheltered. At least three organisations supporting women in STEM have closed within roughly 6 months of each other, and several others have gone quiet. Coding all 90 major entries by how they are funded shows that what survives is sheltered, and sustained engagement comes overwhelmingly from institutional budgets, endowments and industry partnerships. Only nine entries in the entire major map are funded through open competitive grant rounds, and three of those are now dormant, lapsing or unrenewed. Sustained engagement is rarely built on grants, and where providers manage it without institutional support, they are funding it from what schools pay them or from volunteer labour.

Sustained engagement goes to those who put their hand up. 94 per cent of programs that maintain repeated contact have students nominated or self-selecting into them, whereas just 23 per cent of whole-class programs are multi-touch. This pattern repeats geographically: of 103 programs offering repeated contact, 90 reach metropolitan settings and 28 reach rural and remote Australia.

Vocational pathways programs are being built in parallel to the system, with very little crossover. We mapped 34 career-specific programs, and 23 of them don’t link to other categories on the map, and almost all begin at Year 9 or later.

Finally, we are flying blind on evidence. Of 90 major providers, 12 have published or independent evaluation, 43 report their own outcomes, and 33 have no findable

evidence at all, and two are not applicable as data infrastructure. Evaluation is difficult, but if we cannot find it or it doesn't exist, it can't be used to inform decision making.

What needs to change

None of this requires anything new to be invented. Programs need longer funding, with evaluation supported alongside delivery, and grants structured so that they do not cost a provider to deliver them. Australia needs someone to own a national picture of what exists, supported in a way that it won't fall over with a change of staffing or government. Careers and vocational narratives need to be woven through delivery, rather than a system operating alongside that of traditional STEM engagement. Finally, future investment should be directed where opportunity for engagement is limited, including the early years, students with a casual interest in STEM and in early career support for women.

It is important to note that we are not putting AROSE forward to own national coordination, we would not be the right organisation to hold it. We would rather help whoever does, act on the gaps that are ours, and keep making the case that this is a workforce investment for the industries recruiting from this pipeline, not a cost carried by education alone.

Why are we doing this?

AROSE (Australian Remote Operations for Space and Earth) is a not-for-profit, industry-led consortium. We are the front door for industry and government engaging with remote operations capability, and we work as a neutral coordination point that translates operational expertise between sectors, and between Earth and space. Our members and partners span resources, energy, defence, agriculture, maritime, emergency services and space, and every one of them recruits from the same pool of STEM-qualified Australians. Developing the workforce is one of the three strategic objectives in the AROSE Strategy 2026 to 2030, and we exist to deliver against it, not only to advocate for it. As we set our STEM strategy for the next four years, we wanted a current picture of the national ecosystem, so that what we invest in next is additive rather than duplicative. What we found is useful well beyond AROSE, so we are publishing it for the sector to use.

We come to this with recent delivery experience rather than only a policy interest. Between January 2025 and March 2026 AROSE delivered AVISTA, a $1.7 million national STEM engagement and careers program funded through the Australian Government School Pathways Program, reaching over 300 schools, 50,000 students, and 20,000 teachers and parents, with almost half of our Western Australian delivery in regional and remote communities. This program ended with the end of the funding and makes us one of the organisations this report is critical of, which we address in a note on interests below.

There are hundreds of programs that an Australian student can engage in from early years to school to university and in their early careers, designed to promote STEM, STEM careers or a combination of both – yet Australia is still facing a shortage of skilled STEM workers to support a future of innovation and sovereign capability in key sectors in the economy.

The clearest evidence is the shape of the domestic pipeline, not just the projected shortfall in numbers. Only 8.5 per cent of Australian tertiary graduates hold an

engineering qualification, the sixth lowest share in the OECD, 70 per cent of the growth in the engineering workforce to 2021 came from overseas, and 35 per cent of domestic graduates never enter the profession.[1] A country that produces few engineers, imports most of its growth, and loses a third of the ones it trains does not have a recruitment problem. It has a longer-term engagement problem that begins in school.

The aggregate shortage picture is improving with Jobs and Skills Australia assessing 29 per cent of occupations in shortage in 2025, down from 36 per cent in 2023 with a cluster of engineering occupations moving off the list.[2] But shortages persist in the specialised disciplines that matter most to sovereign capability,[3] 139 occupations have been in shortage every year since 2021 and where shortages do remain employers increasingly report gaps in experience rather than qualifications. [4] Though it is important to note that easing is not the same as solved. Against it sits committed demand from AUKUS, infrastructure, resources and technology. The resources and energy sector projects more than 22,000 new jobs from projects likely to proceed to 2030, most of them in Western Australia, and the technology sector expects to need a further 230,000 workers by the same date. [5] A student in Year 5 today will enter the workforce in the mid-2030s, while this demand is still being filled, but research suggests that students may have already decided by this age if they wish to pursue a future in STEM. [6]

The term “STEM” has been used since the early 2000s but became part of mainstream political and education policy in 2014-2015 with the Office of the Chief Scientist’s *Science, Technology, Engineering and Mathematics: Australia's Future* and the *Benchmarking Australian STEM* reports, and the *National STEM School Education Strategy 2016-2026*. [7] In this time there has been a significant growth of the STEM engagement ecosystem as demand and policy have supported increased efforts to engage young Australians in STEM.

The result is a dedicated and passionate STEM engagement sector, working to engage people of all ages in STEM and promote the growth of Australia’s sovereign STEM workforce. However, there is a strong anecdotal sentiment in the sector that we could be doing better, and that it is a crowded and fragmented system. We don’t need less

STEM Engagement, but there is a need to understand what is out there so we can work to fill gaps rather than duplicate existing efforts and make the best use of the limited grant funding that is available.

This analysis sets out to verify if the trends on what is anecdotally accepted among STEM Engagement providers are correct, and if there are others that are overlooked.

Methodology

Every initiative was sorted into one of five categories based on how it delivers, then placed on a learning continuum running from Early Learning (0–5) through to Primary (F–6), Lower Secondary (7–9), Upper Secondary (10–12), Tertiary and VET, to Early Career.

The five categories are Places (museums and cultural institutions, libraries, observatories, government agency centres, environmental education centres), Programs (split into ongoing and short-term), Platforms (online resources, media and toolkits), People (role models, mentors, and the programs supporting them) and Backbone (the infrastructure that holds it together including coordination, funding, professional bodies and awards).

The map covers 254 initiatives, which resolve into 90 major and 130 minor entries once similar providers are aggregated, plus 34 vocational programs mapped separately. Major means national or significant state reach, and minor means regional or smaller. This is a supply-side judgement, not a verdict on quality or impact as public data on most programs simply does not exist, and regionally specific delivery is often the most powerful there is. In the minor layer, 154 were mapped and 130 classified as described below, due to limitations in available data. Some entries aggregate with many providers to keep the map readable, so that "Botanic Gardens" stands for every institution running its own programs, which is why the numbers quoted above do not necessarily appear to add neatly. Some providers also appear as several distinct entries. An entry in the list is not a consistent unit as it may represent one large program, an organisation with several smaller programs or an entire category.

The analysis then ran seven passes over the data: major programs, minor programs, careers programs, vocational pathways, early career support, teacher professional development and geographic spread. Each pass also identified new initiatives, which were added and applied retrospectively to the earlier passes.

Finally, the analysis looked at what has been termed engagement dosage which is whether a program delivered structured ongoing contact with the same participant. This

term has been adopted to describe this metric as “ongoing” has been used to describe the funding mechanism of initiatives in this analysis.

Full detail on sources, scope decisions and the use of AI is in Appendix A.

The ecosystem as a whole

What was evident at every stage of this analysis is that Australia has a vibrant STEM engagement ecosystem, with strong networks of public and private providers working incredibly hard to deliver high-quality programs across the country. The problems identified in this report have nothing to do with the effort or the quality of what is on offer, and it is worth being clear about how much this ecosystem gets right before looking at where it falls short.

Australia has an incredible array of Places where people can engage with STEM, from early childhood through to adulthood. Questacon sees around 500,000 visitors a year, and its Science Circus carries that experience into regional and remote Australia[8]. Libraries are an important node for early science learning, supported by organisations like Children's Discovery, which has equipped more than 400 libraries and reaches over 80,000 children a year.[9] Botanic gardens, zoos, aquariums, planetariums and environmental education centres all deliver structured programs, and government facilities including the Australian Space Discovery Centre, the Geoscience Australia Education Centre and ANSTO let students engage with STEM at real working sites.

The variety of Programs available means there are STEM hooks for students at every level and every degree of existing interest — a season-long team experience like FIRST or STEM Racing, a one-day event like the Science and Engineering Challenge with its strong regional reach, or an institution like the Australian Mathematics Competition, running since 1978. [10] National Science Week gives the whole ecosystem an annual coordinated boost with over 1,000 events each August. [11] Some of this operates at genuine scale: Careers with STEM has reached almost 2 million students through every Australian high school[12], and Code Club runs over 2,000 weekly clubs. [13] On top of this, there are many small businesses and not-for-profit organisations delivering programs at real scale, both locally and nationally and with some reaching hundreds of thousands of students each year.

Diversity is increasingly well represented, and the role model layer that supports it is one of the ecosystem's real assets. DeadlyScience, a grassroots First Nations-led initiative, works with 800 schools; [14] the $25 million Indigenous Girls' STEM Academy supports young women from high school into graduate employment; [15] and EPIC Pathways mentors over 1,000 students from Year 7 into their first year beyond school. [16] Girls and women have options at every stage, from Robogals for eight-year-olds through to Elevate scholarships and She Codes. Alongside these sit Superstars of STEM, Future You and CSIRO's STEM Professionals in Schools, which brokers sustained partnerships between teachers and working STEM professionals, nationally and for free. Unsurprisingly, this is also the part of the map most likely to have published evaluation behind it.

Teachers are supported by decades-old, accreditation-endorsed associations in every jurisdiction, working tirelessly to support their members and keep STEM on the national policy agenda, and convening national events like CONASTA each year. Behind them, the Australian Academy of Science's Primary Connections, Science Connections and reSolve form a government-funded F–12 resource and professional learning support across both science and mathematics.

There is new energy in the sector, with space proving a compelling hook where students are able to submit experiments to and communicate with the International Space Station, CubeSats have become an accessible way for schools and students to reach space, and Australian of the Year and Australian Astronaut Katherine Bennell-Pegg promoting STEM career pathways across the country.

A government backbone does hold parts of this ecosystem together with Inspiring Australia coordinating science engagement in every state and territory, the STEM Equity Monitor providing a world-class participation dataset, and the Prime Minister's Prizes now awarding $250,000 for excellence in primary and secondary STEM teaching, placing teachers on equal footing with researchers. [17] In addition to this, the work of CSIRO STEM-INSIGHTS is working to help the sector, building capability for evaluation and connection.

This is an excellent ecosystem, with the capacity to build the sovereign STEM-skilled workforce our industries need. The gaps that follow are what stand between it and a whole that is greater than the sum of its parts.

What the analysis shows

This map was built through seven passes through the data — the major programs, then the minor ones, then careers programs, then vocational pathways, then early career support, then teacher professional development, and finally geography. Each pass looked at a different part of the ecosystem, with each one independently producing the same shapes and trends. The same patterns appear geographically and are set out across the findings below. None of this will come as a surprise to anyone who has worked in the sector, but it does let us quantify what we know anecdotally with numbers.

The crowded middle

Programs in the major and minor layers cluster in the middle years of school and thin out sharply at both ends, peaking at lower secondary (Table 1, Table 2).

The tendency for thinner ends diverges in the minor layer for only Tertiary/VET and Early Career, with industry-led programs and programs contributing to a slightly more robust offering for these stages.

Delivery type	Early learning (0-5)	Primary (F-6)	Lower secondary (7-9)	Upper secondary (10-12)	Tertiary / VET	Early career
Ongoing	12	38	51	49	14	11
Short-term	2	10	15	11	4	2
Resource	2	4	3	3	0	1
Mixed	0	1	1	1	0	0
Total	16	53	70	64	18	14

Table 1: Major program count by life stage, excluding the 34 vocational programs mapped separately. Note that some programs serve multiple stages, so the table total is much greater than 90.

Delivery type	Early learning (0-5)	Primary (F-6)	Lower secondary (7-9)	Upper secondary (10-12)	Tertiary / VET	Early career
Ongoing	6	22	27	23	14	14
Short-term	10	28	37	32	9	10
Resource	0	22	27	27	9	10
Mixed	0	7	8	7	2	0
Total	16	79	99	89	34	34

Table 2: Minor program count by life stage, excluding the 34 vocational programs mapped separately. Note that some programs serve multiple stages, so the table total is much greater than 130.

This has two key consequences. The first is that Years 5 to 8, where the research consistently tells us attitudes to STEM form, are underserved in comparison to secondary programs with no continuity across the primary to secondary transition, and no way for a parent or teacher to work out what the next step should be. [18] The second is that early learning is barely served at all. Little Scientists does excellent inquiry-based training with educators, and places like libraries and museums provide some opportunities, but the reality is that a sector that shapes children's first ideas about how the world works is being reached by just one national program designed specifically for early learning.

We build what the funding buys

Programs with sustained contact with teachers and students over time are rare in the early years, and elsewhere they are rarely open to every student (Table 3, Table 4). Most sustained programs also require teacher or student opt-in. Appendix B provides a deeper look into what the funding side of the ecosystem looks like, which plays a significant role in shaping these trends.

Teacher professional development is where sustained engagement should be easiest to justify but is also a stark illustration of the trend to single-touch programs. In the 36 teacher offerings mapped, depth and reach do not seem to coexist. 18 of the programs are one-off workshops, conferences or study days, 6 are self-paced online and just 10

involve sustained contact. There is only one program for early learning. The largest professional learning instrument in the country has reached more than 50,000 teachers and it is self-paced online, and the deepest engagement is a five-day residential program taking around 70 teachers a year. The one program that manages both sustained engagement and mentoring, which is a year-long model working with whole school teams, has reached roughly 250 schools in a decade, but only in one state.

This trend is linked to the types of funding available. An independent provider competing in an open round is lucky to be able to secure $100,000 over two years, but many programs provide less, so without funds for sustained contact and KPIs based on quantity, you build a workshop and deliver it as many times as you can. Additionally, strict stipulations on eligible expenditure that don't include overheads, additional requirements for in-kind contributions, and oversubscribed funding rounds, make it very difficult to continue to deliver impactful programs. These are discussed in detail in Appendix B.

Engagement dosage	Early learning (0-5)	Primary (F-6)	Lower secondary (7-9)	Upper secondary (10-12)	Tertiary / VET	Early career
Single touch	8	20	26	20	3	3
Repeatable, unstructured	0	6	5	5	1	1
Sustained cohort	2	13	26	28	13	8
Sustained via educator	3	8	9	7	0	0
Mixed	1	4	2	2	0	0
Infrastructure	2	2	2	2	1	2
Total	16	53	70	64	18	14
Multi-contact	5	21	35	35	13	8

Table 3: Major programs by engagement dosage, excluding the 34 vocational programs mapped separately. Note that some programs serve multiple stages, so the table total is much greater than 90.

Engagement dosage	Early learning (0-5)	Primary (F-6)	Lower secondary (7-9)	Upper secondary (10-12)	Tertiary / VET	Early career
Single touch	12	31	39	33	10	11
Repeatable, unstructured	1	5	8	8	4	7
Sustained cohort	0	13	19	17	9	7
Sustained via educator	0	24	25	23	1	0
Mixed	1	4	5	5	3	0
Infrastructure	2	2	3	3	7	9
Total	**16**	**79**	**99**	**89**	**34**	**34**
Multi-contact	**0**	**37**	**44**	**40**	**10**	**7**

Table 4: Minor programs by engagement dosage, excluding the 34 vocational programs mapped separately. Note that some programs serve multiple stages, so the table total is much greater than 130.

We also need to consider how schools work when we look at how programs are designed. A sustained program costs a school more than a single visit does, in time, money, and coordination. A one-off incursion fits into a timetable whereas a weekly club needs someone to run it every week, usually a teacher volunteering their time. Providers design for what schools can accept as much as for what funders will pay, which influences the trend toward single-touch programs. This report maps supply and cannot measure that demand-side pressure, but anecdotal experience says it is real.

Distance compounds these costs, so we also see this play out geographically. Of the 90 major layer entries, 37 are substantively available in rural and remote settings and a further 29 partially so; on the minor layer, where most entries are single organisations rather than categories, the equivalents are 24 and 20 out of 130. This is worse for sustained programs, where of the 103 programs offering sustained contact, 90 are available in metropolitan settings, 59 regionally and 28 in rural and remote Australia. What this leads to is a remote student is offered far fewer programs with the option of a

follow-through. A funding instrument that pays for sustained delivery without also making it easier for a school to host it, and harder still at distance, will not change this.

We are losing what isn't sheltered

The current funding mechanisms for the ecosystem make it difficult for independent organisations. 29 of the 90 major providers mapped are independent not-for-profits, small businesses and volunteer bodies. They deliver sustained engagement to audiences at roughly the same rate as institutions, but more operate on a national scale, all while carrying their own costs. 9 of these independent providers fund sustained delivery from what schools pay them, and 4 run on volunteer labour. These organisations are absorbing the cost of national STEM engagement through fees, unpaid time and personal commitment. That is not a funding model, but a transfer from the people delivering the programs to the system relying on them.

It is worth noting that three major initiatives, Franklin Women, Homeward Bound, and Code Like a Girl, have all wound up in the last year. [19] All three were independent and had existed for over a decade and two of them cited the difficulty of securing ongoing support among their reasons for closing. At least 3 similar initiatives have gone quiet, with no social media posts in the last 3 years or expired website domains, which is not to say they have ended but could indicate a much deeper problem.

What survives in this space is institutionally sheltered: government-funded, delivered by an academy, university or peak body, usually with industry co-funding. ATSE's Elevate program shows what that shelter buys, with more than 500 scholarships with wrap-around support, and a 2027 round already scheduled.[20] Franklin Women has had programs able to continue under the shelters of Australian Academy of Health and Medical Sciences and the Association of Australian Medical Research Institutes.[21] Sustained contact is expensive, and very difficult to achieve on grants that don’t cover the true cost of program delivery, so this trend comes as no surprise.

The Khuda Women in STEM program, a $100 million, 20-year gift from the Khuda Family Foundation to the University of Sydney is an interesting case study in the power of an

institutional shelter.[22] It is building a guaranteed pathway to university for girls from Western Sydney, from Year 7 outreach to a funded undergraduate place, the only program that guarantees a university place at the end of the program (see Appendix B). It is new, having started with six partner schools in 2025, and its first Scholars cohort won't enrol in university until 2027. At this stage it is a bet on what long-term vision can buy, but twenty years is the kind of funding horizon this report argues for elsewhere, and rare enough that when it does turn up, it is worth treating as a model rather than an outlier.

The programs that have closed did not close because they stopped working and they represent a real loss to the ecosystem. Women make up 37 per cent of university STEM enrolments and hold 15 per cent of STEM-qualified jobs[23], and the layer meant to address that gap seems to be the one that is contracting.

Built for the already interested

Program design leads to continued participation from the already interested, especially with programs that involve repeated contact with a cohort, to the detriment of students with a casual interest. The gate is almost always the same one: someone has to be chosen or has to put their hand up. Of the 103 programs offering repeated contact, 94 per cent require students to be nominated or to self-nominate. Programs that cater to whole classes, by contrast, involve multiple touch points just 23 per cent of the time.

Olympiads, academies, residential programs and enrichment pathways all recruit the keen and the high-achieving, and when there is a limited allocation, the same students tend to be nominated or opt-in time and time again. That allocation decision usually falls to a single teacher, made quickly, alongside everything else they are doing, and with no easy way to know which students would benefit most. For everyone else, the message is that STEM belongs to somebody else, which is the opposite of what we want because the students with a casual interest are where the greatest gains are available. When we include targeted groups in this wrap up, just 9 of the 90 major programs mapped are available for a student who has not opted in and not in a named cohort.

The careers layer rations in the same way. It is well populated but weighted heavily toward information rather than contact. Magazines, websites and toolkits are plentiful, and some reach impressive numbers, but not enough puts an ordinary student in a real workplace with real STEM workers, and what exists is state specific, targeted at equity cohorts, or selective. Before secondary school, only three career initiatives reach primary students, and the one with national reach is resource based, which again requires a teacher or parent to opt-in.

Parallel systems

Industry is now creating their own offerings to address their critical workforce needs at an increasing scale, especially in space, defence and resources. Mapping vocational pathways separately turned up 34 government and industry programs across every state and territory that include in-school VET, school-based apprenticeships, industry-school partnerships, trade training centres, and defence traineeships, and 11 of these connect to other programs on this map. Note that tertiary (university) and VET programs have been combined for the purposes of life-stage analysis, and where these cross-links exist most are university-facing programs. Defence's School Pathways Program started to close this gap but created a series of wide scale but short-lived initiatives. The space sector shows the same pattern at smaller scale, with at least 20 providers now delivering space-themed engagement, most of which did not exist a decade ago.

This is not criticism, as these industries identified a need and acted on it, and these programs also bring careers into the STEM conversation. STEM pathways aren't necessarily missing, but the delivery is being built alongside the ecosystem rather than within it. They are also almost entirely presented from Year 9, by which point many students have decided that STEM is not for them. Additionally, most VET-STEM initiatives sit in defence, aerospace and resources, which does not reflect the reality that every STEM industry needs trades. In a sector where women are 17 per cent of VET STEM enrolments, only one program was identified in the entire vocational map that is designed for girls. [24]

Additionally, programs that feature role models are one of the ecosystem's genuine strengths; however they do not connect to these programs at all. A student might meet a scientist through one program, a technician in another, and read about STEM careers in a third, with nothing linking them into a pathway they could picture themselves following.

We are flying blind

At the end of the day, as a collective ecosystem we do not know what is happening, who is doing it, how they are delivering it, what works, and very little of our efforts for delivery and evaluation are coordinated.

Some initiatives advertise their programs in depth, while others exist as a landing page with an email link. Evaluation is also expensive and time-consuming, and outside large institutions most providers are running on fumes. Unsurprisingly, the programs that can show evidence are disproportionately the institutional ones with existing research connections which are the same organisations that have the shelter described above.

Of the 90 major providers mapped, 12 have published or independent evaluation available, 43 report their own outcomes without independent verification, 33 have no findable evidence of outcomes at all, and two are not applicable as data infrastructure. That assessment was made from public sources, was deliberately generous, and recognises that some providers will hold evaluations they have not published. Only 45 per cent of independent providers have findable evidence of outcomes, compared to 69 per cent of institutions, which is important to consider when impact is used as a metric. That is a statement about who can afford measurement, not about who is better. We can't judge the value of initiatives solely based on whether there is evidence for it as doing this would be asking stretched providers to prove impact without support, and then judging them for not having the resources to do so.

On top of this, money for engagement flows from at least four federal departments, eight state and territory governments, industry and philanthropy, and we don't know what is collectively spent. The Inspiring Australia initiative administers grants and prizes

to encourage community-wide participation in science, technology, engineering and mathematics (STEM). Some are delivered at a federal level, and each state has different programs. Even within this single initiative designed for coordination, there are silos. Inspiring Australia coordinates public science engagement, but its remit was never designed to cover this whole system.

Limitations

This mapping and analysis are not perfect and there are several limitations to both the data and recommendations that follow.

The elephant in the room on STEM engagement is that longitudinal evaluation is very difficult, especially those that reach earlier years. You can't quantify whether a program delivered to a student in Year 5 leads to a STEM Career, but we should be able to track a rise in the delivery of programs to training and workforce outcomes if what we are collectively doing is working.

However, we don't know what we are collectively doing. This analysis looks only at the supply side of the STEM engagement ecosystem, because there is no data to quantify the demand side. It shows what exists but can't quantify where or who. We can't tell the proportion of programs delivered in-person over digitally or, if different programs are reaching different schools or the same schools repeatedly. An engaged school is likely to seek out engagement, which means that in many cases the students who are a priority for policy and funders are the hardest to engage. The data is also skewed toward institutional programs, with marketing budgets and published reporting. Small businesses, NFPs and voluntary organisations play a crucial role in the scale of program delivery, but we can't place a figure on the scale of this because it just isn't available.

Geography is difficult to quantify too, and in many cases, this has been inferred from what limited data is available. Program availability does not necessarily equate to reach, and we can't tell if a national program is run in two hundred metropolitan schools and three regional ones, or evenly across both. Around ten of the major entries are also category aggregations (botanic gardens, libraries, universities, planetariums etc) where

a single row stands for dozens of providers, and those rows are marked as regionally available if any member of the category is. A rudimentary analysis of initiatives in these indicates that the trends are the same without the extrapolation, though they could be added to a future analysis. That inflates the major layer's regional and remote figures relative to the minor layer. The precise proportion of the figures in these trends is therefore limited.

It is also very difficult to quantify the money going into STEM engagement programs, as noted in our findings.

There are three further difficulties with this analysis. First, it is difficult to find a benchmark that Australia can compare its ecosystem to, and the funding driving the ecosystem via the Inspiring Australia program exists in silos. Second, the second M in STEMM is only partly captured in this analysis, much how medicine and health are only partially considered STEM fields. Third, the engagement of community, parents, and families in STEM outside of campaigns like National Science Week is hard to gauge, as most programs are delivered in school contexts, despite evidence that shows that family attitudes have a significant influence on students' attitudes to STEM. [25]

A note on the first of these, the closest thing to a comparative dataset is the EC-OECD STIP Compass, which catalogues 8,732 national science and innovation policy initiatives across 68 countries, 197 of them Australian, but it is not a comprehensive look at any ecosystem. [26] It is a self-reported collation of federal policies only, with no state, university, not-for-profit or industry activity. Counts are not comparable between countries either, since they reflect how thoroughly each country completed a voluntary survey. There is also a constitutional limitation to comparison: we can't compare Australia to unitary states, where a national government does not have to negotiate with state jurisdictions to build engagement architecture. What it does show is that 31 per cent of Australia's public engagement activities at the federal level are reported as evaluated, compared to 17 per cent of other federations and 12 per cent internationally. 11 per cent of the programs have an equity and inclusion theme, compared to an average of 4 per cent internationally, the joint-highest rate with New Zealand in the

dataset. This reflects the evaluation data above, and that the layer that allocates the money can afford evaluation, whereas the ones that do delivery only cannot.

Finally, there is sampling bias in the programs mapped. Victoria, WA and SA all have recent ecosystem maps published by their state Inspiring Australia branches, and the other significant source of data was a sampling done by the Australian Space Agency. There is also personal bias with familiarity of specific areas of the sector, and an industry bias as an artefact of the source data. This bias was identified in early analysis of the data and partially corrected though limited by what could be found. There is also publicity bias, as there are incredible grassroots community-level programs out there that we don't know about because they have better things to do (like deliver programs) than tell the world about what they are doing.

What next?

Australia needs a sovereign STEM-skilled workforce. AUKUS is dominating the headlines in this respect, but even without it, we will need problem-solvers entering the workforce. The good news is that we already have an excellent range of programs and providers, and the below recommendations don't require anything new to be invented but focus on supporting what already exists. At the heart of it, the data in this analysis indicates that the ecosystem is fragmented and needs central coordination to increase impact. This echoes the findings of the *Pathway to Diversity in STEM Review*.[27]

Four recommendations flow from this analysis, ordered by what difference we believe they would make, not by how easy they are.

Fund for duration, and fund for the actual cost of delivery

This is the one that would change the most. The dominance of once-off engagement or programs that run for a single year is not a design choice made by providers; it is merely what two-year grants and numbers-based reporting buys. This system makes it difficult for providers outside of institutions to create and maintain programs with sustained engagement. A multi-year funding instrument for programs with demonstrated

capability (even a small one) would do more for sustained engagement than any number of new initiatives. It also may have kept some of the organisations we lost this year operating. The same question should be asked of the parts of the ecosystem that already have scale, particularly the Places layer, to understand whether the dominance of single touch programs is deliberate for impact or also an artifact of funding.

Longer term funding will not change things alone if the funding does not pay for the actual cost of the work. Money that cannot pay a CEO or a bookkeeper, that caps employee time, or that requires a provider to hire a contractor to deliver their own program, actively undercuts the organisation trying to do the work. In small business and not-for-profits, these aren't overheads – they are the cost of delivering the program, and critical to the survival of these organisations. The way that many grant programs are designed facilitate single-touch engagements, because they do not cover the costs of sustained delivery nor do reporting requirements favour ongoing engagement with a small group over single-touch at a grand scale. A large institution has a backbone of support that allows them to absorb these costs, but it is unsustainable for a business or NFP to be out-of-pocket when delivering a grant funded program.

We keep asking a sector running on fumes to prove its impact in its own time. If we want evidence, and we should, it must be funded as part of delivery rather than assumed as goodwill. A shared baseline of what "good enough" evaluation looks like and basic infrastructure to facilitate it would be a great start, so that small providers are not each inventing their own. The CSIRO STEM-INSIGHTS initiative is doing some promising work in this space, and it will be interesting to see if and how it might apply to the ecosystem at scale.[28]

Funding for sustained engagement will not produce results if schools cannot host it and these constraints are practical and anecdotally well-known. For school programs this includes curriculum time, teacher release, approval processes, and a coordination burden that falls on an individual teacher. Funders should consult with education departments and make changes that could include teacher release in program budgets rather than treating it as the school's contribution, favouring programs designed to sit

inside curriculum time rather than alongside it, and by asking providers to demonstrate what a participating school needs to do to take part. For out of school programs, the equivalent burden falls on parents to juggle enrolments, fees, and transport and the same questions are worth being raised at the design stage. This doesn't necessarily require new money in the system, but a different specification of what it buys.

Build and maintain a national picture

The 2020 evaluation of the National Innovation and Science Agenda's education initiatives highlighted coordination as the clearest gap in the Commonwealth's role, and recommended a national directory of initiatives, with STARPortal named as the exemplar. [29] It was owned and managed by Engineers Australia on behalf of the Office of the Chief Scientist from 2017 to around 2022; the 2021-22 annual report notes the platform and technology being developed, but the portal disappears from the organisation's reporting by 2023-2024 and the site is no longer available. [30,31] Six years later, this recommendation stands but the existing mechanism is gone.

Take the learnings from STARportal and other long running engagement initiatives like Inspiring Australia and use them to inform future infrastructure provision, with an organisation funded to own and maintain it long term (10+ years) in a way that is resilient to political cycles and changes in staffing. It needs to serve both sides of the ecosystem as audiences need to be able to find what is on offer to them and providers need to understand whether they are duplicating something that is already out there. This is the connection problem at the heart of this report. AROSE is not putting itself forward to own this function and would not be the right organisation to hold it, as our value here is as a neutral convenor.

A national picture would also support the sector to improve in an area where it currently underperforms, and it costs nothing. Several programs on this map have national reach and evidence behind them but sit well below the profile of much smaller initiatives and as a sector we could do a far better job of pointing at what already works, particularly to the teachers and schools who are trying to make sense of the options, as teachers still

report low confidence in being able to explain STEM careers. [32] It would also let us act on the losses we can see coming rather than reading about them afterwards.

Connect the layers we already have

Vocational STEM pathways are not missing, they are separate. Every jurisdiction runs something, and little of it connects to anything else. Two changes would matter most, in addition to weaving careers through existing programs: bringing vocational pathway exposure forward from Year 9 and making the case that every STEM industry needs trades, not just defence and resources.

The role model layer sits apart in a similar way. We are good at telling students about STEM careers and less good at putting them in front of people doing the work. The role model programs we have are excellent but are not systematically linked to the careers information layer. A student might read about a career in a magazine, meet a role model at an event, and apply for a vocational program, without any of those three things knowing the others exist. Joining those two things up is cheaper than building anything new, and it would give students, parents and teachers a pathway they can picture.

Invest where the map is genuinely thin.

Three areas stand out where investment could make a real difference. The first is sustained programs for students with a casual interest in STEM, to truly deliver on the message that STEM is accessible to them. Second, the early years, where one dedicated national program is carrying a whole life stage and where the library network already provides the delivery infrastructure. And finally, early career support for women, where we have recently lost three organisations and may lose more.

What AROSE will do

We are not putting AROSE forward to own the national coordination function described above, and we would not be the right organisation to hold it. Our value to this sector is as a neutral convenor across industries that do not usually sit at the same table, and we would rather help whoever does own it than compete for it.

Four things follow from this analysis that are ours to act on. First, we will bring our STEM engagement forward to include upper primary and lower secondary, where this analysis shows attitudes to STEM are formed and where our own delivery has been weighted toward the later years. Second, we will facilitate programs that have both sustained contact and single-touch delivery, accepting that this means fewer students reached for the same money. Third, we will use our members as the connection between the role model layer and the careers layer, putting students and teachers in front of the engineers, geologists, pilots and remote operations crews who do this work, and using real operating sites and facilities as the setting. Fourth, we will publish our delivery and evaluation data, including where programs did not work, to show what we are doing and allow the sector to learn alongside us.

We will also keep making the case, with our members and with government, that the coordination, changes to funding structures, and the longer funding horizons this report calls for are a workforce investment for the space, resources, energy, defence, agriculture, maritime and emergency services sectors, and not a cost carried by the education system alone.

Conclusion

This exercise set out to test whether what the sector believes about itself is true, and it mostly is. Australia has a capable STEM engagement ecosystem, filled with great people and organisations.

What the data shows is that this ecosystem has come together in pieces, by different organisations and for different reasons, and that each piece is working toward a shared goal, but they don't quite fit together. Every other finding in the report stems from this. What we find is that programs are designed for maximum output rather than maximum impact, because that is what funding favours. This means that depth is not favoured because it costs more per student, and that regional and remote students get some of the experiences but only in a one-off with none of the follow through. Programs run by institutions and supported by ongoing funding survive beyond grant and political funding cycles, not necessarily the programs that work best. There is also not a wide view of the sector to prioritise which of these factors to address first.

The end-cost of these inefficiencies across the ecosystem falls on the students that we are meant to be serving. A student in Year 5 in 2026 will enter the workforce in the mid-2030s, the middle of the workforce demand that this report outlines. This student will encounter the STEM engagement ecosystem by chance, largely depending on where they live, whether their school has budget, their teacher has time and if they put their hand up.

This is not intended to criticise the people doing this work. It is a description of a system that has grown to meet several needs, in pieces, without anyone being given the job of making those pieces fit together. The opportunity here is in connecting all these pieces to make an ecosystem where the whole is greater than the sum of its parts and have a real impact on Australia's future.

Appendices

Appendix A: Additional Information

Data Sources

This is a desktop analysis. It drew on published STEM ecosystem maps from the Inspiring Australia branches in Victoria, Western Australia and South Australia, a 2023 sampling by the Australian Space Agency, web searches, a considerable amount of LinkedIn stalking, and 16 years of working across the sector.

Disclosure on Interests

AROSE has a direct interest in several of the funding programs this report examines, and as a provider of STEM programs would benefit from some of the recommendations that we make.

Between January 2025 and March 2026, we delivered AVISTA, a $1.7 million national STEM engagement and careers program funded through the Australian Government School Pathways Program, and we intend to apply for any further rounds that may be announced in future. This report is critical of that program for funding initiatives, including our AVISTA program, that ended after a single school year of delivery. We have kept the criticism because we believe it is correct, and we make it as one of the organisations it describes.

We have also applied unsuccessfully to several open competitive rounds, including Round 5 of the Women in STEM and Entrepreneurship program, which is discussed in Appendix B.

Out of Scope

Commercial curriculum and e-learning platforms are out of scope, as they deliver curriculum rather than engagement. Commercial program providers are included, because incursions and workshops are the default format for school STEM engagement. There are also several organisations that deliver programs across the whole curriculum,

and where STEM is not the core offering, they have been left out. Vocational initiatives were mapped separately, for reasons the findings make clear, and social media initiatives and influencers were out of scope.

Working with Schools

This report looks at the supply side of the STEM engagement ecosystem and infers gaps in demand which haven't and can't be quantified from a desktop survey. There is a compounding factor that this report does not discuss with respect to sustained engagement and that is school budgets and timetables. Sustained engagement for a schools-based program requires a commitment of time and workload that some schools are unable to support. The same goes for availability for teacher professional development, where the reality of school resourcing is that teachers cannot be released, even for a free program, because of the cost or availability of casual staff to replace them.

Major vs minor distinction

Major entries are national or significant state programs and minor entries are regional or smaller in reach. The designation reflects scale of reach only. It is not a judgement of quality, impact or value, and the analysis found that the distribution trends are the same in both groups.

Aggregation of entries

Where a category contains many similar providers, such as botanic gardens, museums, libraries, and environmental education centres, a single entry represents them all. This is for two reasons – to keep the data at a manageable level, as well as the general similarity of programs within these categories. "Botanic Gardens", for instance, covers the Botanic Gardens of Sydney, Royal Botanic Gardens Victoria, Adelaide Botanic Garden, Kings Park and many regional gardens, each of which runs their own programs. This keeps the map readable and does not distort the trends, since each of those programs would have been classified as minor if counted on its own. I would have liked to map these individually, but with a conservative estimate of at least 100 entries in this

category, the sheer number of individual offerings in these categories made it unachievable in this instance. Universities have been aggregated for the same reason – with around 40 universities in Australia, each running several programs, this is also a prohibitive number of entries. A future iteration of this exercise would aim to expand on these.

The use of AI

AI was used as a tool for data capture, to catalogue and organise program details, and for running extended searches for initiatives that might otherwise have been missed. The visual map was also laid out by AI. Every entry, figure and claim was verified manually as accurately as possible.

Appendix B – Funding Landscape

In researching this report, we also attempted to summarise the funding opportunities available for STEM Engagement, as well as where programs were getting funding. There are a few notable patterns in what is available, and they are noted below.

We spend a tiny portion of priority project funding on engagement

From the perspective of the Federal Government - The Future Made in Australia package is $22.7 billion over 10 years and the AUKUS commitment is estimated at $368 billion over 30 years, a combined investment of $14.5 billion annually. It is hard to tell exactly what is spent on workforce development, but from a grant perspective, the collective investment in workforce appears to be very low. An allocation of 0.5% annually to grants for workforce development programs would mean more than $72.5 million a year and could make considerable impact on the problem that we are collectively trying to solve.

Mid-sized grants don't exist

There are few open-competitive grant opportunities for STEM Engagement, and that which is available skews small, with few mid to large sized grants available. This goes a long way in illustrating why larger rounds are oversubscribed, and it feels like providers are in constant competition with each other.

Community engagement grants usually fall within a range of $1,000-$25,000 and usually go to a one-off event or a seed event for a community organisation. From experience, this amount does not usually cover the full cost of the event and usually has institutional funding alongside it or relies on volunteerism from the event organisers. Maker Grants are in the middle with $20,000-$100,000 available, as well as the NSW Environment Trust Grants which offer up to $250,000. The larger grants are few and oversubscribed – the most recent WISE round awarded close to $10 million over five years, which is genuinely significant, across five programs chosen from hundreds of applications. [33] Additionally, a program like the Department of Defence's School Pathways Program funded a wide activity range, with $11 million awarded across 10

programs for 15 months, a significant investment that created several initiatives that all ended after one school year of delivery.

In-kind is a cost, and often a required contribution

Some grants explicitly require in-kind contributions, while others prohibit certain expenses, including administrative activities. The effect is the same in both cases: a compulsory contribution from the applicant that cannot be assigned any value for reporting purposes.

Maker Grants requires at least 20% applicant contribution toward total eligible project expenditure. This means that a $100,000 grant only covers 80% of eligible costs and requires a contribution of $25,000, a significant cost to a small business or not-for-profit. This is in addition to tasks that are classified as ineligible expenditure that include administrative project management, the cost of preparing project reports, and project evaluation. NSW Environmental Trust Grants offers up to $250,000 and while not mandatory, in-kind contributions strengthen applications. Such in-kind expectations for these grants places an unsustainable levy on the organisation that does not have baseline funding from elsewhere and prevents some excellent programs from applying for support.

Fewer and harder to win

Larger grants seem to be consolidating, making them harder to win. WISE has consolidated, with rounds 1-3 awarding an average of $185,000 across 54 projects, round 4 awarding $15.9 million across 17 projects, to round 5 awarding almost $9.7 million across 5 projects. The next iteration of the School Pathways program has not been announced, but budget and strategy documents suggest that there will be some $30 million available in the next 4 years. [34] If well structured, this new round could set up some initiatives that have a lasting impact, though given the potential scale of the funding available, I'd expect that this will be very competitive and oversubscribed.

Frequency of Grant Rounds

Most engagement rounds are annual or two-yearly, with single year funding and clustered around delivery for National Science Week. While there are grant programs that are funded year-on-year, most of these sit within institutions and there is little opportunity to build ongoing delivery using these structures. Any program that needs to be renewed annually is not going to lead to a sustainable outcome for the grantee or the funder as you can't plan multi-year or sustained engagement when you don't know if you will be funded next year.

The funding that you can't apply for

Many grant programs have strict eligibility criteria that serve as a gatekeeper for funding, and while Philanthropy and Foundations play an important role in funding STEM engagement, funding at scale is often by invitation or partnership.

BHP Foundation explicitly does not accept unsolicited proposals and the Toyota Community Trust runs invitation-only rounds. Additionally, most philanthropy requires DGR status or an auspice arrangement.

Philanthropy is in many cases reinforcing the patterns of institutional sheltering, but at the same time providing some compelling examples of funding models that may move the dial on STEM workforce development.

The Khuda Family Foundation's $100 million, 20-year gift to the University of Sydney, announced in 2025, aims to build a fully guaranteed pipeline for girls from Western Sydney, from Year 7 outreach through to a funded undergraduate place. It is the largest single philanthropic gift in NSW, and the only program on the map that guarantees a university place at the end. At the time of writing, the first cohort of Scholars does not enrol at university until 2027, so it is a program to watch long-term as the outcomes are still years away.

There are also very isolated examples of government endowments which include Generation STEM, delivered by CSIRO through a ten-year $25 million endowment from

NSW Government to the Science and Industry Endowment Fund in 2017. [35] The program began delivery in 2019 and initial evaluation indicates that the programs are meeting their expected objectives but given the long-time scale it will be several years before the impact can be fully evaluated.

Decadal funding is exactly what this report argues for in "Fund for duration, and fund for the actual cost of delivery". It is long enough to survive a change of government, a change of Vice-Chancellor, and the usual two-year grant cycle that forces everything else in this ecosystem into short bursts. If evaluation of these programs can prove that a STEM pathway holds together better when it isn't re-applied for every two years, that is worth taking seriously as a funding model, not just admiring as a generous one. This scale of funding is unlikely to be available to a different type of partner as, while these gifts are ambitious and have great potential for impact, Australia is relatively risk-averse, and a small organisation may be seen as too risky for a program at this scale and this commitment is likely to remain sheltered in an institution.

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