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Bringing space to your community: contextualising space technologies for the benefit of local communities

Darcey Watson[a], Sharon Morris[b]

[a] *The Andy Thomas Space Foundation, Level 3, McEwin Building, Lot Fourteen, North Terrace, South Australia, Australia 5000, d.watson@andythomas.foundation*
[B] *Makers Empire, Suite 30, Marnirni-apinthi Building, Start Up Hub, Stone & Chalk, Lot Fourteen, North Terrace, Adelaide, South Australia 5000, sharon@makersempire.com*

Abstract

Contextualising the impact and potential benefits of space technologies within local communities is critical for engaging students, teachers, families and the general public on the importance of the growing international space industry and its opportunities for future generations. Misconceptions around the importance of space industry investment can impact on understandings about the significance of space on the lives and livelihoods of everyday Australians; a notion likely experienced in other aspiring space nations.

To change this narrative and increase awareness of Space for Earth capabilities, The Andy Thomas Space Foundation, through their Education Fund program, the Kids In Space National Program, have enabled students and teachers to utilise design-thinking principles to directly address challenges within their own communities, taking the focus of space from something happening over 100km above the Earth to right in their very own backyards.

The Kids In Space Program, delivered by Edu-Tech start-up, Makers Empire, has been supported by several other government and industry organisations including the Australian Space Agency, encouraging students and teachers to grow their understandings of the space sector and its benefits to society, including the vast space career opportunities that are becoming available across Australia.

The program which provides professional development for teachers, a custom-designed education program, 3D printers and access to space industry professionals, challenges students to address one of two key challenges; to design something that could help astronauts work and live in space or use space technologies to help solve a problem here on Earth. The latter provides students with the opportunity to reflect on challenges within their community to consider how space technologies might make an impact.

An example of a program outcome includes students in one of the winning teams of the program's inaugural cohort, based in regional and remote Northern Territory, created an artefact that combined modern space technologies and traditional wisdom from Elders to measure tidal changes and predict flooding in a notorious local river, identifying the best time for hunting and gathering. Enhancing student curiosity and awareness of the space industry.

This example shows the widespread impact that space has on local communities through the lenses of students, enabling greater access and awareness to the opportunities and benefits that space brings Australia's people and economy, growing engagement in space and promoting an interest in future workforce opportunities within the space sector.

Keywords: (space, education, design-thinking, industry, national challenge, workforce development)

Acronyms/Abbreviations

ATSF or The Foundation: The Andy Thomas Space Foundation

ME: Makers Empire

ASDC: Australian Space Discovery Centre

STEM: Science, Technology, Engineering and Mathematics

NSW: New South Wales

1. Introduction

The Andy Thomas Space Foundation's Kids In Space Program was conceptualised in 2020, piloted across 2021 and 2022, and launched as a national program in 2023, to inspire students across Australia to develop interest and passion in STEM and space. Having since supported over 35,000 students and hundreds of teachers across each of Australia's states and territories, this flagship program is a first of its kind example of widespread, comprehensive educational impact.

This semester-long program features teacher professional development training, student directed participation through a customised space Challenge Course (learning program) and intra and inter school engagement through showcase activities (including state/ territory, with winners attending the national showcase), each underpinned by design thinking and maker-based pedagogy. Made possible through the Foundation's long-term partnership with Australian Edu-tech start-up, Makers Empire, the Kids In Space National Challenge has grown into a nationally and internationally recognised program, supported by a number of passionate sponsors and partners. In 2025 these supporters include, the Australian Space Agency, Fogarty Foundation, KBR, Department of Education Victoria, Northern Territory Department of Education, Toyota Foundation, each of whom share interests in supporting Australia's future space workforce, enabling industry growth, increased innovation and economic prosperity.

Throughout careful evaluation of data obtained across the pilot and national programs, the importance of providing local context to the relevance of space in student and teacher learning is fundamental to developing in-depth understanding and engagement. This concept and its impact on participation and future learning opportunities have been further explored.

2. Background

2.1 Misconceptions of the industry

Despite the long and inspiring history of space exploration and innovation, Australia's active participation in the sector is only comparatively recently renewed. With numerous government, industry and academic stakeholders across the nation producing world leading research and technologies, there is a similarly renewed requirement to better communicate the role and importance of space to the general population.

A relatively recent survey conducted by the Australian Centre for Space Governance, indicated that only 20% of the Australian population were aware that Australia was home to a space agency [1]. Recent industry successes including the training of the first female Australian astronaut, Katherine Bennell-Pegg, and the selection of the ELO2 consortium to design, build and deliver Roover, has certainly increased awareness of the industry but the extent to which space has become a dinner table topic and more so the sentiment that these conversations hold, is unknown.

Anecdotally, discussions with teachers, students and other members of the public before participating in programs like Kids in Space, lean towards discussions mostly framed around the role of astronauts, interplanetary exploration and American private sector organisations started by existing billionaires. However, arguably the most critical applications and technologies developed and supported in Australia are focused on supporting life on Earth, including emergency detection and management, increasing productivity in mining and agriculture, monitoring habitat changes and supporting daily requirements such as banking, navigation and communications.

These 'space for Earth' focus points make up one of the two kids in space challenge prompts provided to students, enabling them to see the breadth and depth of opportunities within the industry, and potentially identify a pathway or a problem they might one day like to support.

2.2 Regional prowess in space industry growth

Each of Australia's states and territories is home to organisations, research institutes, universities and government bodies who each contribute to the space ecosystem in some way. South Australia is the proud home to over 100 space organisations, and across the nation, different regions have unique and specialised capabilities from launch and returns, to manufacturing, operations, analysis and so much more.

One example of space activity located largely in regional Australia, are operational launch and return sites, including current and future planned capabilities in South Australia and Queensland to name a few. These launch sites, due to the nature of their activities, are often located in regional Australia and engage local community members to support launch and return campaigns. A focus on local and First Nations knowledge contributes to safer, culturally sensitive and responsible practices, while increased visibility to the community enables members to see real opportunity in the space industry.

Furthermore, local knowledge and regional industry can be invaluable for the prosperous evolution of the space industry, ensuring that solutions have local and tangible impact. Examples of this include supporting the development of space technology for the purpose of improving mining and agricultural practices; two industries that represent the backbone of Australia's economy. Capabilities in autonomous vehicles initially designed for space missions have been applied to both sectors with great success, including the reduction of workplace injuries and increased productivity. Whilst this cross-sector influence is critical across all solution development processes, space specifically benefits as it supports the inherent need for a comprehensive and

holistic set of requirements to be considered prior to capability launch to maximise investment.

2.2 Regional prowess in STEM education

The Kids in Space program is built on evidence-informed learning principles that promote the development of learners that are curious, ask questions and think critically [2,3,4]. Tapping into students' general fascination with the wonders of space, provides the perfect canvas to activate this curiosity and deep thinking. While space can be something quite abstract and intellectually challenging, the Kids in Space Program has made space accessible to students by contextualising space as an integral part of their daily lives. Understanding that space technologies help to make their world a better, healthier and safer place, assists students to see relevance, make meaning and grow their fascination and wonder about space.

The program invites students to use design thinking, a problem solving methodology, to solve a space-related problem; to design something that could help astronauts live and work in space or use space technologies to help solve a problem on Earth. Researching and empathising with challenges in their own communities and developing innovative design solutions that draw on space technologies leads to deeper engagement as students and teachers grow their understanding of how the space industry can directly improve their lives. In cases where student-designed solutions have led to real community change, it provides a transformative learning experience that empowers students as active, civic contributors who recognise their own capacity to create positive, meaningful change. A rich example is illustrated in a remote First Nations community in the NT who advocated to decision makers for improved community access and improvements to health services via their space technology-inspired design solutions, which included a telecommunications tower, health clinic and airstrip.

3. Methodology

3.1 Program Improvements in 2025

The Kids in Space National Challenge, now in its third year, continues to evolve, drawing on continuous improvement data and analysis. The summative 2024 report documented a summary of teacher and student participation, engagement, outcomes and feedback. A range of evidence-informed improvements and recommendations were identified for 2025.

These included:

- increased information to teachers about localised examples of current research and progress in the space sector. In response, The Andy Thomas Space Foundation created a resource highlighting current developments and research relevant to each state and territory. Makers Empire staff used the state/territory-based professional learning days to incorporate localised examples, ensuring greater relevance and context for teachers.
- teacher and student requests for more examples of past design thinking projects, to provide inspiration and direction. Further examples of past projects were built into the professional learning days and mid-program online support sessions in 2025, to illustrate the variety and scope of possible approaches, with an increase in examples that highlighted localised design solutions.
- more comprehensive data on the effectiveness of the professional learning days in meeting the objectives of the program. Makers Empire staff included a needs assessment activity within the professional learning days to accurately gauge teacher expectations as well as making the goals of the Kids in Space Program more transparent. A summative evaluation on the effectiveness of the days was also conducted to inform future planning.
- additional collection of student data from a broader representative group aligned to the objectives of the program. In response to this identified need, the Andy Thomas Space Foundation and Makers Empire developed a student pre/post survey to measure key learnings and specifically, growth in awareness and knowledge about space, particularly as it relates to awareness of space in their everyday lives and their knowledge of careers in the space industry.

3.2 Regional Focus Cohorts

To further expand the reach of the program and support members of one of the Foundation's key target cohorts, regional groups were established as part of the 2025 program. Hosted across three neighbouring states on Australia's East Coast, these cohorts enabled the program to not only impact regional communities but highlighted the reciprocal nature between space and aligned industries, including those that are often the focus of regional areas. Each supported by local government or industry sponsors, these regional hubs were selected as areas not previously engaged, considered to be rural and to have a sufficient number of schools within a reasonable commuting distance (up to around 4 hours) to facilitate the program. The Parkes cohort was further selected to highlight the local space infrastructure to the community and to highlight the telescope's continuing importance to the space ecosystem.

Each regional group was presented a matching challenge to that of their metropolitan counterparts, enabling a direct comparison between projects and the likelihood of students using a local context issue for their design solution. Exposure to the Challenge Course, inclusive of space industry expertise and discussions on the impact of space on Australia as a whole, enabled students to gain a broad understanding, which through the support of their teachers (from the provided professional development training), enabled reflection and increased knowledge on the impact of technologies and capabilities on their own lives and that of members of their communities.

4. Results

4.1 Executive Summary

Total outcomes from the previous three years of the Kids In Space National Program can be seen through the executive summary seen in figure 1 below.

Figure 1 – Executive Summary

4.2 Student Projects

Throughout the 3 rounds of the Kids In Space National Challenge, numerous student projects have captivated industry, not only for their ingenuity and design thinking capabilities, but for their unique perspective on problems that are impacting everyday Australians across the nation.

A handful of the nearly two million designs have been selected to highlight these localised stories and to show the importance of contextualising space capabilities and technologies as a mechanism for societal and environmental good.

Looking back to 2023, the inaugural year of the program, program stakeholders were thrilled to see that one of the schools selected as the winners of the national finals after placing first in their territory showcase, demonstrated the importance of space for community protection and safety. The Gunbalanya Community School - in remote Northern Territory, proposed a satellite solution to monitor the movement of crocodiles and water levels in their local community following a distressing season of attacks and heavy rainfall. This project identified a challenge that was specific to this local community and utilised existing infrastructure, knowledge from Elders alongside proposed technical innovations to address this risk to public safety, whilst prioritising low environmental impact and displacement - a wonderful example of sustainable and responsible use of space.

In 2024, amongst several Earth-focused projects, Howrah Primary School from Tasmania proudly presented a project on local icon 'Neil the Seal' with students designing a system for tracking and alerting motorists to the presence of Neil, a Southern Elephant Seal who regularly causes traffic and other safety issues in Tasmania. The system is designed to alert motorists without causing a social media frenzy that could cause followers to flock to the location, see figure 2. This project along with several other animal management projects including designs to address overpopulation of carp in South Australia, protection and tracking of the severely endangered Little Penguins, see figure 3. and preservation of habitats for the Northern Quoll, in Western Australia, see figure 4, are clear examples of contextualised use of space technologies for the benefit of local communities. For more information on these examples see appendix 1.

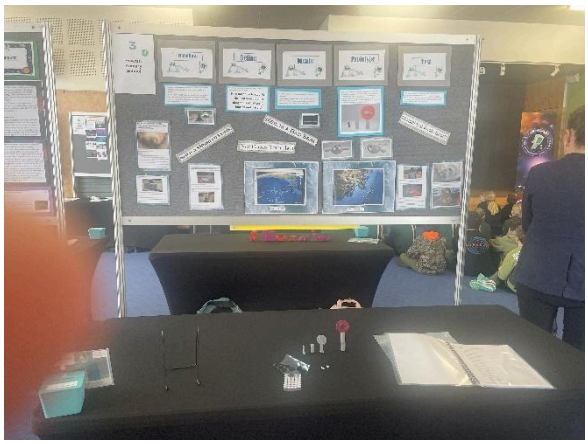

Figure 2 – Neil the Seal

Figure 3 – Little Penguins

Figure 4 – Northern Quoll

2025 has again seen numerous projects focused on the improvement or protection of lives and livelihoods across Australia. Another notable project was proposed by a team located in Wangaratta in regional Victoria, which aimed to address the impact on farmers caused through legislative changes to live animal exports, an issue very close to the heart of this regional farming

town. Students worked together to identify a more humane (almost luxurious) way of transporting livestock from their families farms across the seas to other awaiting nations. This solution was intended to support their families businesses, utilising satellite technologies and isolated environment practices.

Together these examples represent a minute number of the projects developed that have actively sought to address real world challenges, affecting real people within communities. As previously highlighted, the role of space in addressing societal and environmental issues is often overshadowed by industry stereotypes. However these applications are where the true power of space and national capabilities are evident, ensuring that lives and livelihoods are protected.

4.3 Project contextualisation

Through survey data students were asked to consider what they had seen or done in the period of a week that relates to space.

A comparison of pre and post data showed a growth in student understanding about how space relates to their everyday life and how space technologies can improve life on Earth. Their thinking expanded from predominantly night sky gazing to using navigation systems, satellite data for monitoring, using satellite maps for weather forecasting, Google Earth navigation, camera technologies in mobile phones, GPS, and research in space informing human health on Earth such as bone density.

Survey data collected about student awareness of jobs in the space industry also point to a significant growth as it relates to work-related roles on Earth. Pre-survey data primarily focused on responses related to travelling to and working in space including astronauts, scientists and explorers. Post-survey data showed a marked increase in career awareness with students identifying over 40 careers in the space industry, many related to space for Earth capabilities including construction workers, engineers, architects, meteorologists, geologists, space communicators, project managers, designers, data analysts, satellite operators, satellite trackers, satellite deployers, technicians, cybersecurity analysts, inventors, trainers and software developers.

Personal student reflections from year 5 students in 2025 also illustrated a growth in understandings about space as it relates to their own life and community context:

‘I have learnt that many of the things we use today would not exist if not for space scientists. Without space technology we would not have satellite maps, Google Earth and much more.’

‘I learnt that space technology isn't only benefiting space but it's also solving problems on Earth such as predicting floods.’

‘I learnt about space technology, why it’s so important and what it can do to save our world.’

Student reflections also highlighted a growth in student agency with students identifying their own ability to make meaningful choices and have the confidence and capacity to identify and solve real-world problems in their community. Students could describe the knowledge, skills and dispositions they developed throughout the program that supported this growth in learner agency including problem solving skills, design thinking processes and a range of skills and dispositions including team work, planning, creative and critical thinking, perseverance and learning from failure.

5. Discussion

5.1 Reviewed program engagement

The Kids in Space National Challenge has had an incredible reach since it launched nationally in 2023, reaching 268 schools, 643 teachers and over 35,000 students. The program is highly successful in building teacher confidence and competency in incorporating STEM and space projects into classroom practice.

Teachers value the exposure to a wide range of space organisations and resources, and the guidance through a design thinking process to engage students in space-related problem solving. Collectively, this equips teachers with the content and methodologies as well as the confidence to integrate space and STEM education into their learning programs.

This confidence and competency is consistently reflected in teacher feedback following the professional learning sessions:

“The best PD I have participated in. Engaging, hands-on, practical and full of fantastic ideas I can take back to school. Very excited to get started!”

“The learning was very informative and was a good balance between the ideas/pedagogy behind the program and the ‘how-to’...”

“Very engaging, informative and has inspired me to open up the doors of technology and appreciate ‘space’ in our ever-changing world.”

Both teachers and students highlighted their increased awareness of the breadth of roles and opportunities within the space sector and the role of space technologies to improve life on Earth.

The methodologies that underpin the program foster the development of students as innovators and problem solvers who are equipped to identify and solve real-world problems. These are essential skills that Australia and the space sector needs, not only to drive economic progress but to address global challenges and build a sustainable future. Our young generation will require the capacity for creativity, empathy, ingenuity as well as the resilience to adapt and thrive.

In addition to growing their awareness of the space sector and how it can benefit their daily lives, students were able to successfully identify the transferable skills they developed that will support them to thrive in all aspects of their life.

They identified their growth in problem solving skills, creativity, project management skills, social skills, team work, creative and critical thinking, perseverance and resilience when learning from failure.

5.2 Regional Relevance

To further assess the efficacy of the regional approach and to see the impact of local examples on students, the Foundation and delivery partners, Makers Empire commenced a program supported by NSW Investment, called the NSW Space Discovery Program. Developed as a lead up program to the 2025 International Astronautical Program, hosted in Sydney, the NSW program aimed to highlight local industry and inspire students and their local communities to seek engagement in this landmark event. The specific inclusion of local industry, including Space Machines Company and Mawson Rovers, enabled students to hear about capabilities being developed in their local area, supporting the idea that everyone has a role to play in the space industry and that you don't need to move far from home to have an impact.

This program was another great opportunity to seek the impact of local expertise and influence on student projects, particularly with unique geographical distributions within New South Wales being included. Whilst a vast number of the projects delivered specifically focused on space for earth impacts, two projects of particular note as per judging discussions were:

The students from Menindee Central School addressed a community challenge drawing on local Indigenous knowledge and satellite imagery to predict the location of local First Nations sites on Kinchega National Park.

Motivated by compassion for current global conflicts, students used navigation systems and satellite imagery to support critical ration and medical provisions for civilians trapped in war zones.

These are two explicit examples of students looking beyond their personal needs to issues that impact and influence their own and other communities. Displaying one of the key takeaways of the program, using space to make a positive impact on the lives and livelihoods of individuals.

5.3 Future Directions

We continue to maintain a cycle of ongoing review and enhancement. Enabling opportunity for improvement and increased impact each year. Identified room for improvement in the future includes:

- placing greater emphasis on the examples of space for Earth capabilities to assist school communities to increase overall awareness of space capabilities employed in their own community.
- Highlighting additional career pathways featured in the Australian space industry.

6. Conclusions

Students' natural fascination with space - its wonder, adventure, and endless possibilities, creates an inspiring learning context where abstract becomes tangible and imagination meets reality.

The National Kids in Space Program transforms this captivation into educational empowerment, strengthening learner agency while developing the skills, confidence and collaborative problem-solving capabilities essential for navigating life's complexities, tackling real-world challenges and making meaningful contributions to society.

A lasting message from a past student participant that they ‘... learnt about space technology, why it’s so important and what it can do to save our world.’ - a message that encapsulates the program's impact and the desire for all space industry participants to reflect on the impact of space c

Appendix A: Student Project Case Studies

Our Lady of the River School, SA

This team of students designed a solution using space technologies, to track and then deal with the over-population of carp in the Murray River.

Gunbalanya School, NT

The Gunbalanya School in remote Northern Territory, proposed a satellite solution to monitor the movement of crocodiles and water levels in their local community following a distressing season of attacks and heavy rainfall. This project identified a challenge that

was specific to this local community and utilised existing infrastructure, knowledge from Elders alongside proposed technical innovations to address this risk to public safety, whilst prioritising low environmental impact and displacement - a wonderful example of sustainable and responsible use of space.

Charthouse Primary School, WA

Their solution is designed to help the local population of Little Penguins which are severely endangered. The students developed a data collection system that locates penguins and relays information about their habitats.

Howrah Primary School, TAS

The students presented a project on local icon 'Neil the Seal' with students designing a system drawing on space technologies for tracking and alerting motorists to the presence of Neil.

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