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Linking Australia's Remote Schools to Space Education: A Pilot Study

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Abstract

The "Eyre Peninsula Space Explorers" program represents an innovative approach to primary school education, integrating the significance of space technologies and space exploration concepts with local contexts in the rural Eyre Peninsula region of South Australia. The program aims to inspire young students about the burgeoning Australian space industry, utilising two established launch sites within the region. Despite the potential economic benefits and job opportunities associated with the space industry, some elements of the local community have expressed resistance.

This paper outlines the program's purpose, methodology, and outcomes. The program emphasises the role of space technologies in supporting local industries such as agriculture, fishing, tourism, and mining. Students engage in a design thinking process, tackling local challenges using 3D technologies, guided by the inquiry question, "How might we use space technologies to solve problems on the Eyre Peninsula?" Additionally, the program underscores reciprocal benefits, exploring how the Eyre Peninsula can contribute to the broader space industry. To ensure effective implementation, the initiative begins with a teacher professional development course, equipping educators with the confidence and skills needed to deliver space education, focusing on science as a human endeavour, designing STEM learning programs, and teaching design thinking. Furthermore, community involvement is integral, featuring evening information sessions and student showcases to foster a connection between the program and the local population.

This paper presents the principal results of the Eyre Peninsula Space Explorers program, delivered in 2023 to fifteen schools within the Eyre Peninsula region, highlighting its impact on student learning, community engagement, and potential avenues for addressing community concerns. The study concludes with a discussion of the program's implications for bridging the gap between space education, local industry, and community involvement, ultimately contributing to a more informed and supportive community for the evolving space sector within the Eyre Peninsula.

Keywords: Space Education, Design Thinking, Eyre Peninsula, Innovation, Regional and Remote

Acronyms/Abbreviations
ATSF or The Foundation: The Andy Thomas Space Foundation
ME: Makers Empire
GDP: Gross Domestic Profit
STEM: Science, Technology, Engineering, Mathematics

1. Introduction

The Andy Thomas Space Foundation, Australia's National Space Not-for-profit, provides educational opportunities from Primary through to Postgraduate, PhD, and Beyond alongside industry engagement and outreach activities such as the Australian Space Forum. Across multiple previous and continuing programs, the Foundation has engaged with Makers Empire, an education technology company focused on design thinking and STEM education, with a comprehensive digital platform to empower student learning and teacher professional development capabilities to support.

The Eyre Peninsula Space Explorers Program, a collaboration between the Andy Thomas Space Foundation and Makers Empire, was funded by the Australian Government's Makers Projects – Community STEM Engagement Grant. The initiative aimed to inspire primary school students across South Australia's Eyre Peninsula to explore careers in the space industry by fostering curiosity and improving STEM skills. The Program specifically targeted rural and remote schools, raising awareness of STEM-related career opportunities in the national space industry.

Together the Foundation and Makers Empire designed, developed, and delivered this unique program. The initiative included a professional development Program for teachers, aimed at building capacity in space education, 3D design, and maker-based learning. The Program also incorporated local space-related activities, such as the commercial rocket launches planned at Koonibba and Whalers Way, to provide context and inspiration for students.

The program's learning objectives were designed to make students more aware of the space industry's relevance to their local area, deepen their STEM knowledge, and develop their problem-solving and critical thinking skills through design thinking. Teachers were encouraged to develop their own understanding of the space industry, connect with local experts, and integrate maker-based learning into their teaching practices.

The Program involved fifteen schools across the Eyre Peninsula, with teachers participating in both face-to-face and online professional development sessions. These teachers then implemented the Eyre Peninsula Space Explorers Challenge Course, which included content tailored to the region and collaboration with local space companies like Southern Launch. The outcomes and impact of the Program were measured by a research team from the University of South Australia.

2. Background

2.1 Program Funding

The Eyre Peninsula Space Explorers Program was enabled through the funding support of the Australian Commonwealth Government's 2022 Maker Projects – Community STEM Engagement grants. The grant Program 'aims to foster creativity and inquiry-based learning to support development of STEM skills in students and youth in design, engineering and programming through hands-on learning'[1]. The Andy Thomas Space Foundation was successfully granted AUD$100,000 to support a proposed Regional Space Education Program alongside Delivery Partner Makers Empire and additional supporters in research partner, The University of South Australia and Industry partner, Southern Launch. The Foundation's bid was further supported by a number of additional stakeholders including regional councils and schools. The grant at the time of funding was in its third round, having supported a number of programs across the nation in previous iterations. The key focus points of the Eyre Peninsula Space Explorers Program were the following:

- Supporting students and teachers living and learning in regional and remote areas in Australia – providing significant geographical barriers from metropolitan based learning experiences and resources.
- Engaging the local community – ensuring that a student's entire ecosystem of influencers are engaged and provided with access to knowledge.
- Showing how space relates to the lives and livelihoods of the local population – highlighting local industries such as mining, agriculture and fishing.
- Completing a research Program to examine the efficacy of developing knowledge specific hubs in the regions and to assess the importance of geographical context for teacher and student engagement – with the results intended for public release and supporting best practice development across Australia.

Utilising space as a tool for inspiration supports the long-term national goal enunciated by the Australian Minister for Industry and Science, the Honourable Ed Husic MP who has said "We will need more and more young Australians to pursue STEM skills and qualifications, so they're equipped to enter the global tech-based economy" [2], and by utilising space as a tool for inspiration to do so, students across the nation can aim for the stars.

2.2 Regional and Remote Education

Australia is a unique nation with a total population of 27.122 million [3], 87% of whom live within 50km of the coast [4]. Despite the geographic clustering, Australia has 46% of its schools, 30% of its teachers and 28% of its students located in rural, regional and remote areas [5]. While these schools make up a significant proportion of Australia's educational infrastructure, it has been reported that when compared with metropolitan schools, 'students attend school less frequently, are less likely to go to university and are more likely to drop out if they enrol' [6]. It has further been determined that around 25% of Australia's Indigenous population reside in these communities resulting in a disproportionate impact on Indigenous Australians [6].

Overall, these statistics indicate that these regional, rural and remote communities provide a well-established cohort of students across a wide variety of ages, each coming with a unique perspective, set of experiences and goals. However, there is a widespread perception that the nation's current educational capabilities insufficient nor suitable to adequately cater

to and support these students and communities, making the goal of generating a thriving and skilled workforce less achievable

With this background, the Eyre Peninsula Space Explorers Program was conceived with the aim of raising awareness of career pathways, increasing interest in STEM and supporting the development of a design thinking approach to facilitate learning across all possible interest points.

2.3 Eyre Peninsula

The Eyre Peninsula is an area of around 235,000 square kilometres and has a population of around 59,000 people [7], with most residing in larger towns such as Whyalla and Port Lincoln, while smaller communities are spread along the coast and inland, as seen in Figure 1. The region is well known for its local industries which include Agriculture, Commercial Fishing, Mining and manufacturing, and Aquaculture [8].

The region is responsible for 'generating almost AUD$4 billion in GDP annually' with 'products valued at AUD$3.2 billion being exported to domestic and overseas markets in 2021/2022' [8]. A total of 25,835 local jobs were reported in June 2022 with Agriculture, Forestry and Fishing as the largest and most productive employment sector (at 12.2%) generating AUD$752 million per annum [9].

Within the previously described key regions there are a number of space-based technologies that have been developed both in Australia and abroad to support in increasing both efficiency and sustainability. Whether that be in monitoring water pipelines for leaks, tracking cattle and other livestock through fenceless paddocks, monitoring weather conditions for abnormal or major events that could be detrimental as well as supporting in the response to natural disasters and emergency rescue situations. Whilst these examples are not unique to the peninsula, the support of these technologies can further support and maximise economic generation from the already thriving industries, whilst reducing the impact

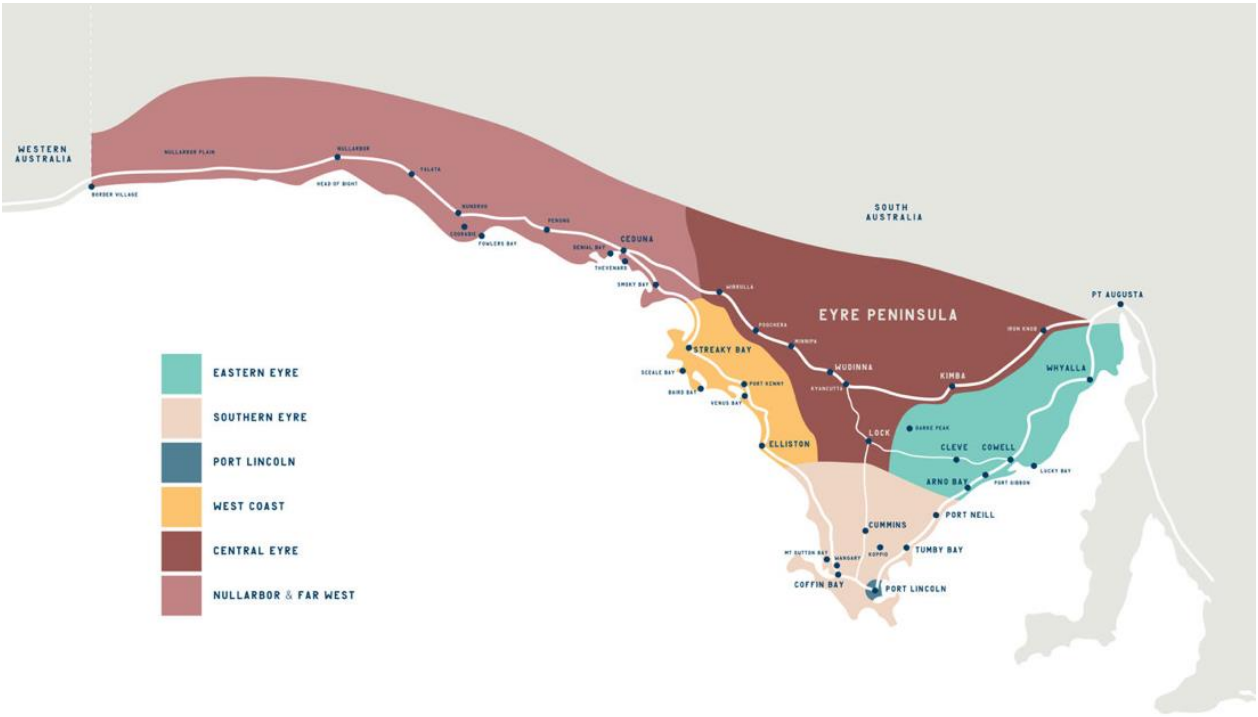

Figure 1 Map of the Eyre Peninsula Districts

on the environment.

Additionally, the Peninsula is home to one active testing range – the Koonibba test range and one proposed sub-orbital launch site at Whalers Way, both owned and operated by South Australian Launch Provider, Southern Launch [10]. The growth of these local capabilities not only attracts international launching organisations, but also increased tourism and scientific testing organisations to support post-mission operations.

Together these exciting prospects can inspire, encourage and one day perhaps offer employment to local community members, further supporting the growth of the ecosystem and increasing employment opportunities on the Peninsula.

There is therefore an opportunity to educate teachers and their students, as well as general community members, on the importance of space technologies in supporting their lives and livelihoods on the Eyre Peninsula. The Space Explorers Program created the opportunity to specifically highlight space as enabling GPS and Navigation Systems, Entertainment, Banking, Agriculture, Aquaculture and Natural Disaster Management. Each of these examples relate directly to an element of life on the Peninsula and were utilised as direct connection points in the program.

The key purpose of including these focus points was to inspire students to think that they too can be a part of the thriving Australian Space Industry without necessarily having to relocate. It also enabled the participants to provide their unique expertise and perspectives as locals to support their communities and to think about the importance of technological capabilities and their downstream impact.

3. Program Design

3.1 Program Updates for a Regional Community

The Eyre Peninsula Space Explorers Program was based on the Kids in Space Program delivered successfully by the Andy Thomas Space Foundation and Makers Empire from 2021-24. Adaptations were made to address the aims of the Program and needs of the teachers, students, and communities involved. Further content was added to the Makers Empire Challenge Course to explore the unique role the Eyre Peninsula might play in the space industry, potential benefits to the region and communities, whilst allowing students to make connections to the space industry through localised stories and examples and helping to create awareness of future job opportunities for the students in the space agency. The additional content included videos created in collaboration with the Australian Space Agency and Southern Launch, quizzes for students to respond to, localised design challenges, and resources for teachers. The video content addressed key industries on the Eyre Peninsula, including agriculture, mining, fishing, and tourism, and the potential benefits the space industry might provide for these industries. The content also explored the characteristics of the Eyre Peninsula that make it suitable for space launches and other industry activities including its southern location and the wide-open spaces. Students were also introduced to the space industry footprint that is rapidly evolving in the region through expert contributions from the Southern Launch team. Teacher guides and teaching materials were also developed to support teachers in making authentic connections for their students between their space-related learning and their local region, communities and future opportunities.

The Program was developed in collaboration with representatives from local government, industry and education leaders in the region. Local expertise and consultation was essential in ensuring community support of the Program and an authentically localised learning Program connected to national and global content.

The Eyre Peninsula's economy, as previously described, relies heavily on industries such as agriculture, fishing, and mining, all of which are increasingly dependent on technological advancements. By fostering a strong foundation in STEM, students can develop problem-solving skills, analytical thinking, and creativity. These competencies are crucial for innovating and improving local industries, ensuring sustainability and economic growth. For instance, advancements in agricultural technology can lead to more efficient farming practices, while innovations in renewable energy can help harness the region's abundant natural resources.

3.2 Program Content

Launched in March 2023, the Eyre Peninsula Space Explorers Program engaged fifteen schools across Eyre Peninsula during school terms 3 and 4, 2023. The Program involved two to five teachers from each participating school attending one face-to-face professional development day and three online sessions. Participating teachers then guided students through the Eyre Peninsula Space Explorers Challenge Course, enriched with region-specific content developed in partnership with Southern Launch.

Participating schools received a 12-month subscription to Makers Empire's 3D software, class management tools, and a 3D printer package, along with ongoing support.

The Program followed a structured activity plan, beginning with school and teacher registrations in Semester One, followed by professional learning and Program implementation in Semester Two. The Program concluded with student-led showcase days held in two regional centres on the Eyre Peninsula, Port Lincoln and Streaky Bay. The Program applies a blended approach to professional learning, combining face-to-face and online learning, with additional hardware, software and learning support provided throughout the program.

The logistical components of the Program were adjusted to meet the unique needs of the participating schools. As the Eyre Peninsula is geographically vast, it was decided to split the professional learning component into two cohorts based in two regional centres, to reduce travel time for participants and allow for more localised content to be shared. The Kids in Space Program includes two face to face professional development days which would be problematic for schools on the Eyre Peninsula due to travel distances and safety restrictions regarding travel, meaning that teachers would have been absent from their schools for at least four days to attend the professional learning days. It was, therefore, decided to offer one face to face day with the remainder of the Program delivered as a series of three online sessions.

3.3 Importance of STEM and Design Thinking Education

The Program recognises the importance of STEM (Science, Technology, Engineering, and Mathematics) and design thinking as essential educational elements for students on the Eyre Peninsula to help prepare them for future challenges and opportunities. This region, known for its vast natural resources and unique ecosystems, provides an ideal backdrop for integrating STEM and design thinking into education.

Design thinking, on the other hand, emphasises empathy, collaboration, and iterative learning. It encourages students to approach problems from multiple perspectives, fostering a mindset geared towards human-centred solutions. This is particularly relevant on the Eyre Peninsula, where community and environmental considerations are paramount. By incorporating design thinking into their education, students can learn to create solutions that not only address technical challenges but also consider the social and environmental impact.

3.4 Space Industry Relevance

Student understanding of opportunities and career pathways available to them are heavily developed as a result of the environment in which they are raised, meaning that the perspectives, beliefs and understandings of immediate families and friends as well as all those with influence on young people are critical to guiding career pathway decisions. As such engaging teachers, students and the local communities in the excitement and opportunities of space while framing the impact with a local perspective, students are able to relate to and find potential in future roles.

In addition, both the Foundation and Makers Empire, strongly believe that the impact of programs should last well beyond the formal and direct engagement of the program, ensuring that future generations of students are able to benefit not only from the investment of the program, but also from the resulting learnings. As such the professional development of teachers and the access to members of the public is critical in supporting this overarching goal and ensuring learning longevity.

It is further hoped through this continued learning and through the widespread engagement of the community that the area develops a suitable pipeline of skilled and passionate students with interests in STEM and aligned industries. Enabling the growth of impacts and benefits of space technologies on the community and strengthening both down and upstream technologies when they enter the workforce. By engaging in these industries not only can the economic value of the area increase but so too can the unique capabilities and workforce value proposition to encourage population growth and diversity within the region, thus increasing access to other benefits of larger areas through increased government investment and infrastructure.

3.5 Research Component

With specific Program aims for all stakeholders, including teachers, students, community members and industry representatives, the need to track the impact and success of the Program in meeting its aims was recognised as a priority. The University of South Australia was enlisted as a research partner. In-kind support from the University of South Australia was included in the Program proposal to measure the outcomes and impact of the program. A research team including a PhD intern was involved in collating and

analysing data collected throughout the Program to measure the following research questions:

1. To what extent does this professional learning Program increase teachers' creative confidence in the delivery of space-themed STEM programs?
2. To what extent does the Andy Thomas Space Foundation's 'Launching community space innovation from regional South Australia' Program positively impact students' attitudes toward STEM subjects?
3. To what extent does this professional learning Program help teachers become well-informed and confident in helping their students learn about space careers in Australia?
4. To what extent does the Andy Thomas Space Foundation's 'Launching community space innovation from regional South Australia' Program increase student knowledge about space careers in Australia?

The resulting data was intended to gain a greater understanding of the impact of the Program as well as the key requirements for the development of regional STEM capabilities and hubs for space-related education

4. Method

4.1 Program Timeline

The Eyre Peninsula Space Explorers Program was delivered to students across two terms in 2023 with additional teacher follow ups conducted in early 2024. The summary of the program can be seen below in Figure 2.

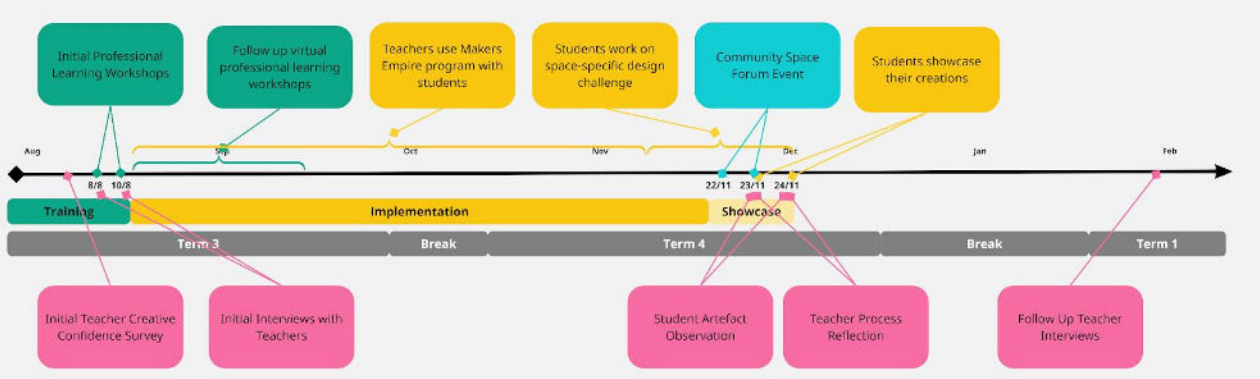

Figure 2 Eyre Peninsula Space Explorers Program Activity Timeline

4.2 Increased Space Industry Context for Accredited Professional Development Days

Previous Program experiences have highlighted that most participating teachers lack confidence and report a lack of knowledge in being able to deliver quality space education for their students. Efforts were made to draw on space industry expertise to strengthen this component of the professional learning program. This included guest speakers and teaching materials provided by the Andy Thomas Space Foundation, the Australian Space Agency, and Southern Launch.

A key aim of the Program was to increase and measure teacher creative confidence to empower educators to adapt and personalise the content for their students, creating truly localised learning experiences. By boosting teachers' confidence in their creative abilities, they are able to take ownership of the curriculum, tailoring it to reflect the unique needs and context of their communities. This approach ensures that space education is not just generic but resonates with the local environment, culture, and student interests, making the lessons more engaging and relevant. Measuring this confidence allowed us to track growth and provide targeted support, ensuring that teachers felt equipped to innovate and inspire their students.

4.3 Community Engagement Events

As a critical element of the Foundation's operating activities, public outreach and engagement is an element which is sought for inclusion where possible across all programs and programs.

With the Eyre Peninsula Space Explorers Program, a unique opportunity to engage directly with a community largely unfamiliar with the space industry and its potential for the region became apparent.

As such the Foundation arranged as part of the Program two community engagement evenings, one which was hosted in Port Lincoln and the other in Streaky Bay, maximising community access. The

information sessions provided a short context setter which included

information shared with the teachers as part of the accredited teacher professional development training, alongside a panel of space industry experts including representatives of the Andy Thomas Space Foundation, Australian Space Agency and Southern Launch before the conversation was opened for further discussion and audience questions.

The audiences were well composed of families, industry enthusiasts and members of the local government, each providing unique perspectives and questions.

4.4 Research Collection

This Program contributes to an ongoing partnership between Makers Empire and UniSA, centered on Design-Based Implementation Research (DBIR) to iteratively refine a pragmatic adaptive model for understanding learning within programs such as the Eyre Peninsula Space Explorers Program. The Program aims to understand the interaction of the project's educational design with complex cognitive, emotional, and social systems in learning, and to develop tools for measuring and providing feedback within educational contexts. The methodology involves Pragmatic Adaptive Modelling, informed by Activity Theory, and Contribution Analysis, a theory-led approach used when experiments are impractical. Data collection for the research component of the Eyre Peninsula Space Explorers Program spanned 15 weeks, engaging 645 students and 29 teachers, using surveys, interviews, and field observations to explore teachers' creative confidence, knowledge of space careers, and the impact on students' career self-efficacy. The analysis highlighted the role of teacher professional learning workshops in building creative confidence and the application of design thinking in classrooms, fostering real-world relevance and community engagement in learning.

5. Results

5.1 Program Summary

The program achieved positive results across all metrics assed, with widespread impact as can be seen through the below summary, Figure 3.

Figure 3 Executive Summary for the Eyre Peninsula Space Explorers Program

Within these designs and final projects were multiple examples of the impact of space technologies on the local community, as can be seen through the below examples:

Example 1: Tracking Prawns

Students from Elliston worked with a local prawn fisherman to help solve the problem of prawns being difficult to locate, track and monitor. They used satellite data to propose an innovative way for tracking the movement and numbers of prawns in local water and an app to share the information with the fishing industry. See Figure 4

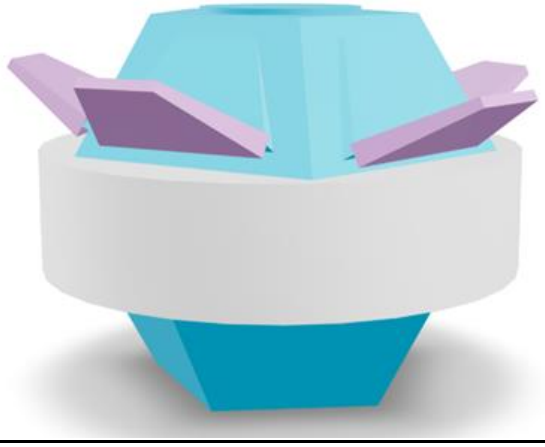

Figure 4 Tracking Prawns 3D Design from the Makers Empire 3D Design App

Example 2: Surfer Band

Gracie, Zahli, Jax and Azusa from Streaky Bay Area School identified a local problem around ocean safety. The design solution aims to keep surfers, swimmers and people in the fishing industry, safe. The band uses satellite space technology to track sharks and natural disasters and then it sends a message to the band wearer informing them of possible danger. This team of designers interviewed local community members to inform their solution. See Figure 5

Figure 5 Surfer Band 3D Design from the Makers Empire 3D Design App

5.2 Research Outcomes

The major finding of the research was that the Program goals of the Program are important, if not essential, to address. In the shift from programs designed to 'inspire' towards programs designed to build capacity, it is clear that we need to work in partnership with teachers in schools to creatively reinterpret the curriculum. The data collected showed that many teachers are in need of support to engage effectively with emerging technologies and to incorporate them into their classroom practice [11]. This goes beyond the simple provision of resources and extends to high quality professional learning that aims to build teacher confidence and empower them to develop their own learning activities for their students.

The second major finding of this research was that Program design appears to be effective in working toward its goals [11]. The Program design blends the provision of resources and direct curriculum support with targeted teacher professional learning. The research shows that this has been effective in achieving an initial improvement in teacher creative confidence and self-efficacy with respect to ongoing curriculum innovation. This is an essential step towards building a self-sustaining culture of innovation.

A further important finding was the capacity of the Program to increase what might be termed as an applied or situated understanding of space careers in Australia [11]. Both teachers and the students involved in the Program were moving beyond being able to name space careers to developing a deeper sense of how people who work in the industry make use of specific knowledge and skills and also the range and breadth of space-related careers, as seen in Figure 6.

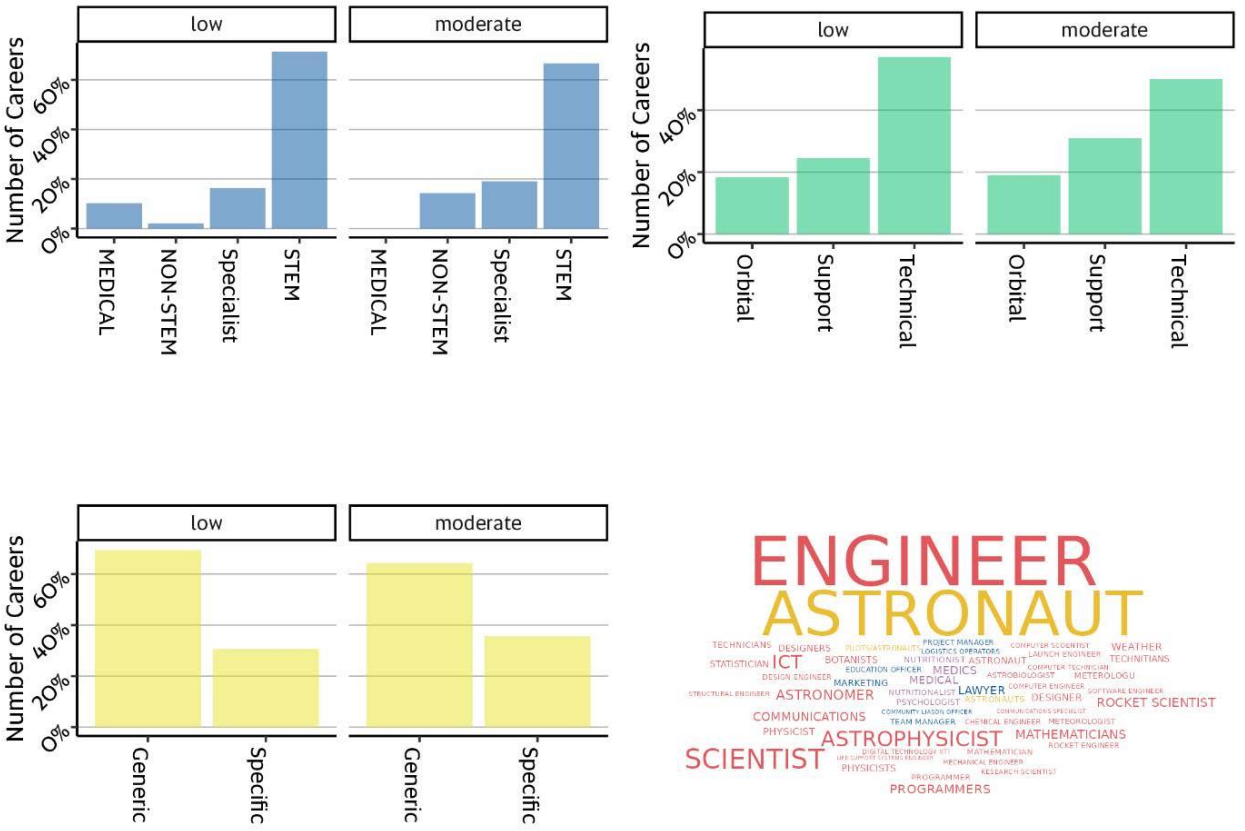

Figure 6 Space Career Awareness Graphs indicating increasing understanding

5.3 Engagement at Community Events

The sessions provided invaluable insight into the interests and perspectives of local community members and enabled a lively discussion touching on points of excitement, confusion, concern and opportunity. Essentially, an opportunity for the community to engage with space experts and ask the questions they have but might not necessarily be able to ask easily under normal circumstances with a further goal of breaking down the wall and extending the power of space as a tool for inspiration.

A number of interesting themes of questions were raised during the session, including:

- Environmental impact of rocket launches to land and water
- Opportunities for economic gain in the sector
- How the Peninsula fits into the national agenda for space.

Each of which not only offered the opportunity for exciting discussion, but also enabled the Foundation and other industry partners in the room to make note of where communication with the public needs to be improved and can be made more clear.

The sessions whilst providing great insight could be improved in future iterations as limited uptake in engagement with the research survey was seen – resulting in minimal data being obtained from the sessions. However, the verbal feedback on the evenings and positive, energetic atmosphere enabled a lively discussion, which the Foundation hopes to achieve through future similar events.

5.4 Teacher Feedback

Teacher feedback indicates that the Program was positively received and valued in terms of learning experiences for the students they work with and their own professional learning.

Of particular significance was the teachers' self-reported growth in confidence and knowledge about design thinking. One hundred percent of teachers reported being more aware of the Australian space industry and feeling confident about making real-world

connections and sharing the local significance related to the space industry. Feedback from teachers included:

- 'I valued the chance to develop my knowledge on space themed teaching.'
- 'This Program gave students new learning opportunities in technology/STEM.'
- 'I enjoyed learning about the Andy Thomas Space Foundation, Makers Empire, 3D printing and how to use technologies to extend student learning.'
- 'It was great bringing local guests and experts in to talk to students.'
- 'Students really liked being able to apply something to an actual real-world issue.'
- 'High level of student engagement and collaboration was the highlight.'
- 'I enjoyed engaging with other teachers and sharing ideas.'
- 'It is great to have a showcase event where students can share their knowledge with other students and learn from each other.'
- 'It has been a really great teaching and learning opportunity! Thank you.'

5.5 Ongoing School Interest in Space and/or Design Thinking

The Makers Empire Learning Team have maintained contact with the participating schools since the completion of the Program allowing them to track ongoing activity related to participation in the program. All participating schools indicated plans for building on their Program experiences in some way. This ranged from continued focus on space education, using the Eyre Peninsula Space Explorers Challenge Course with other groups of students, connecting with local space companies and experts, embedding other opportunities for students to engage in design thinking in the curriculum, and making further use of the 3D printers and associated technologies.

One school, Elliston Area School, has actively embedded design thinking, and 3D design and printing across grade levels and curriculum areas. For example, a class of Grade 9 and 10 students developed proposals for a desalination plant to be built in the region based on fears of freshwater supplies drying up, and a class of Grade 7 and 8 students used design thinking to develop solutions to local people not wanting to swim or surf in the ocean, and the impact on tourism after several fatal shark attacks in the region.

Ongoing interest and engagement in space education and program's similar to the Eyre Peninsula Space Explorers Program is evidenced by the fact that seven of the participating schools submitted an expression of interest to be involved in the 2024 national Kids in Space Program and nine schools registered interest in other Maker's Empire programs.

6. Discussion

6.1 Program Highlights

The strategic design of the Program ensures that students address the intended learning outcomes, with the flexibility to shape the Program to address local contexts and interests. This was reflected in the diverse range of design thinking projects shared at the showcase events which presented proposed solutions to genuinely local problems including tracking prawns for the fishing industry, monitoring drought affected areas, and addressing specific environmental concerns in the region.

Technologies were used to bring space expertise to students and teachers including invited space industry guests from Southern Launch and the Australian Space Agency, as well as pre-recorded video content delivered through the Challenge Course.

The Eyre Peninsula Space Explorers Challenge Course provided students with a comprehensive digital learning experience to enhance their knowledge about the space industry. This foundation content provided a consistent structure to assist students and teachers to identify relevant space-related design thinking challenges, providing a catalyst to make connections and further explore space and space technologies within their local context or area of interest. The partnerships with Southern Launch and the Australian Space Agency enriched the experience for teachers and students through access to a network of space industry experts and resources. For example, the Australian Space Discovery Centre Space Communicators facilitated an interactive online learning experience for teachers.

Teacher's feedback suggests that they need support in accessing relevant resources and examples, such as past projects and connections to local examples and expertise. They welcome more professional development time to learn and effectively use new tools, like 3D printers and software, and appreciate opportunities to integrate these tools into other subject areas to maximise limited instructional time. Incorporating real-world applications, like videos on space industry careers, can make learning more relevant and engaging, and accessible for teachers and students.

6.2 Research Component Impact

The research outcomes obtained through the completion of the Program have verified and validated

the importance of the program, its reach and opportunities moving forward for local communities either individually or regionally. The research has clarified the value proposition of the Program by highlighting its current and referencing its potential impact on not only the community but each of the students and their teachers. Whilst the Program is framed around space with a hope that students will find inspiration and interest in a career within Australia's growing space industry. Highlighting the transferable and aligned skills and industries is critical to the mission of the Foundation and supportive of Makers Empires focus on design thinking and the many applications of the pedagogy. Should students through this challenge be inspired to pursue any type of STEM or aligned career, supporting Australia's growth as an emerging technology leader, the Program will have been a resounding success. The current research outcomes support that the Program is heading in the correct direction and provides many avenues for further research collection and opportunities to refine and reaffirm the continuing growth and expansion of similar programs.

6.3 Best Practice Regional Delivery Approach

Building on the successes of the Eyre Peninsula Space Explorers Program, we believe that future efforts should concentrate on expanding teacher professional development to further enhance creative confidence and self-efficacy in space education. This will ensure the continued integration of emerging technologies like 3D printing and design thinking into classrooms and authentic, localised space education being provided for students. Additionally, further research is needed to explore how these practices can be adapted and scaled to other regions, with a focus on understanding the long-term impacts on both teachers and students.

A key area for future research is the exploration of how design thinking processes can be applied across different curriculum domains and how these practices influence student outcomes over time. Investigating the impact of regional partnerships, such as the collaboration with Southern Launch, can provide insights into how community engagement enhances the relevance and effectiveness of STEM education in regional areas.

This Program can serve as a model for regionally delivered educational initiatives by emphasising the importance of localised, authentic learning challenges. Highlighting the program's ability to boost teacher and student engagement through real-world applications and community involvement demonstrates its effectiveness as a blueprint for other regions. Additionally, showcasing the program's scalability and adaptability can help garner support for future projects in similar contexts.

6.4 Impact of Regional Relevance

The local geographical context and focus on engaging the community within this Program made it unique from previous collaboration programs undertaken between the Foundation and Makers Empire. This specialised way of approaching a widespread issue, being a lack of understanding of space career opportunities and contextualisation of the impact of space in individuals lives enabled great learnings not only for the students, teachers and communities, but as the Program providers to increase accessibility in future programs. The results of the research component comprehensively conclude on the importance of contextualising opportunities for students. Not all opportunities are equally accessible based on geography and whilst this is a long-term problem to solve, in order to minimise the impact on today's students, interim solutions to make the learning and opportunities more accessible to them is required.

Space, whilst it seems far above us, it's impacts are seen all around us and through the support of Southern Launch and the Australian Space Agency through their attendance to the community events and student showcases, students were able to get a glimpse of how they too can make a difference in this industry, right from their very backyard.

7. Conclusions

The funded Program concluded following the completion of the Student Showcases which took place in November 2023. And whilst the official Program has come to an end, the learnings and impact continue to spread. Following the project, the Foundation and Makers Empire have been able to reassess methodologies to increase geographically specific knowledge into future iterations of the Program where the intention would be to expand on and further assess the research components completed.

A number of learnings were enabled through the Program which includes:

- The importance of contextualising space as an industry as part of the accredited professional development for teachers.
    - Future iterations should include a community evening at the beginning and end of the program, which would:
    - Allow an understanding of public sentiment about space pre and post-program

    - Identify a formal research group representing the local community to ensure standardised research can be obtained.
    - Enable the community inclusive of parents and guardians an opportunity to understand the sector better to support their students through the program.
    - Provide an understanding of what additional resources could and should be provided to residents to ensure access to the industry.
- Speak with more local aligned industries – for the Peninsula this may have included BHP and Viterra to include further information about their current or future considerations for space-based technologies.

Future research would endeavour to look into the following:

- Implications of the Program on student and teacher confidence
- Awareness of space career opportunities as understood by teachers and students
- Continuation of Program themes and teachings in classrooms
- Additional curriculum links identified by the teachers to further support local contextualisation
- community interest and career awareness

Whilst there were a number of learnings obtained through the completion of the program, the overall Program was deemed a major success having seen the incredible scope and detail of projects presented by students and assessing the increased knowledge of teachers upon Program completion.

Students were able to address real problems within their communities and utilise existing or hypothesised solutions to remedy these. This enabled their problem-solving and design thinking skills to grow, whilst gaining confidence as a subject matter expert – understanding that no one can understand the needs and problems of their communities better than themselves. Confidence that we hope will encourage them to continue to pursue these solutions and perhaps one day become a space workforce leader in the region.

The next steps for the Program are still in progress, with the Foundation recently being successful in obtaining an industry grant to support another regional community in the completion of a Program aligned to the flagship Andy Thomas Space Foundation Kids In Space Program.

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